THE DEFENCE OF LONDON 1915-1918

A. RAWLINSON
C.M.G., C.B.E., D.S.O.

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BY

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COMMANDER R.N.V.R. AND LT.-COL. R.G.A.

AUTHOR OF "ADVENTURES IN THE NEAR EAST, 1918-1922"

WITH INTRODUCTION BY

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INTRODUCTION

By ADMIRAL SIR PERCY SCOTT, Bart., K.C.B., K.C.V.O., LL.D.

Colonel Rawlinson has written this book on our defence of London against attacks from the air by Germany. He has to admit that we had no defence. He explains that a defence was, although late, gradually worked up, and that after 524 people had been killed, 1,264 injured (non-combatant men, women, and children), and £2,042,000 worth of property destroyed, we had taken reasonable precautions and the Germans did not enjoy visiting us any more.

He explains how blind men were used to locate airships or 'planes; it sounds strange, but it is true.

Colonel Rawlinson in the last chapter of his work points out—

1. The present state of inefficiency of our air defence.

2. He states that our Navy is no longer our first line of defence, which, of course, is quite correct.

3. As in the Navy a two-power standard is considered necessary for our defence, obviously the same standard should now be adopted for the Air. This principle has not been adopted, and, until it is, we shall remain in a dangerous position, into which our Government should never have allowed us to fall.

So much for the material. Colonel Rawlinson then deals with the fallacy of divided control, and the absurdity of not establishing unity of control over all the forces of the Crown.

Thrilling as the story is, and disturbing to the peace of mind of the Londoner, it contains no exaggeration, but is, in fact, rather a restrained narrative of sober fact. As Colonel Rawlinson's Chief, I am acquainted with all the details of the raids during the period when he was my Executive Officer; and, having read the book, I am prepared to guarantee it as absolute history, and, in the matter of the defence policy which he outlines so eloquently, I unreservedly endorse the policy he advocates.

It must be obvious to everyone that *unity of control* is the only solution by which it is possible to ensure the future SAFETY OF THE NATION.

PERCY SCOTT.

1923.

PREFACE

THE particulars of the various air raids made by the Germans on England and especially upon London during the Great War were, very naturally at that time, kept profoundly secret by the authorities.

For this there were two excellent reasons. First, it was of the greatest importance to keep the enemy in ignorance of any damage he might have succeeded in effecting by the raids; and, second, it was equally desirable to encourage by every possible means the admirably courageous spirit in which those dastardly attacks were from the first endured by the population of this country.

During the first year of the war no efficient defence against the German air raids existed. Heroic efforts were, however, subsequently made to create an adequate defence organization under conditions of the greatest difficulty, and at a time when all our resources were strained to the utmost by the demands of our armies in the field.

The later raids were carried out entirely by aeroplane squadrons consisting of "bombing" planes, specially constructed for the purpose, under the charge of pilots and navigators carefully trained for that particular duty. These machines invariably operated in concert with each other, working in "formations," each under its own leader. The

various aeroplane squadrons left their starting-points in Belgium at regular intervals, and their attacks were in consequence delivered in succession. By this means, not only had they each a better chance of identifying and reaching their objectives, but at the same time the problem of effective defence was rendered very much more difficult for us owing to the continuous nature of their attack.

Prior to these more elaborate operations, however, many raids were carried out which were of necessity very much in the nature of experiments, the possibilities of such long-distance attacks, delivered through the air, being questions with respect to which no precedents then existed. Each step therefore called for proof, both of its practicability and also of the value of any results which it might be possible to achieve by such means, before any considerable force was specially reserved or trained by the enemy for such an obviously hazardous purpose, the advantages of which were at that time more than doubtful.

Under these circumstances, what was "sauce for the goose" was mercifully also "sauce for the gander." For whilst our enemies were acquiring the experience necessary for the effective organization of their attacks, we on our side were afforded a lamentably brief and entirely undeserved opportunity of retrieving our position from the state of abject impotence in which our country found itself, owing to the culpable lack of prevision and initiative which had been displayed by our rulers. It is only fair to state that when once the country became

alive to its imminent danger and an overwhelming pressure of exasperated public opinion was brought to bear on the Government, every advantage was taken of this short respite to improvise a scheme of defence—no even elementary preparations for any organized air defence having been made before the war.

The danger to which the Metropolis was exposed was imminent, and the importance of preventing any disorganization of the great Government departments was vital. The control of all these departments was centralized in London, and one and all were striving their utmost to equip, maintain, and increase our forces in the field. This position produced a most merciful change in the attitude previously adopted towards the defences of London on the part of the nation in general and of the Government in particular. In fact, the stress of war brought about a feverish activity and a most commendable, if somewhat tardy, desire for efficiency in defence such as could have been produced by no other means.

The shackles of red tape, by which our officials are traditionally incapacitated, were for once discarded. Orders were given, expenses incurred, and responsibility accepted, in the urgency of the moment, which would have caused universal heart failure amongst our pre-war officials, only slightly more extensive, perhaps, than a similar state of affairs would probably produce amongst their post-war successors to-day.

It is of this period of stress, of the many shifts

and improvisations to which we were driven, of the lessons so quickly learned, and of the effective defence which was ultimately "put up," that I shall endeavour to give my readers some idea.

I have every confidence that such matters will be found of interest and that Englishmen will experience a certain satisfaction in the knowledge that if our enemies quickly learned how to attack us, we on our side were in no way behind them in intelligence and initiative. This was conclusively proved by the fact that the organization of our defence was able to keep pace with the development of the attack, in spite of the state of absolute "unpreparedness" in which the war found us, and which is so chronically and so lamentably characteristic of the attitude of our Governments towards the vital menace of attacks by "air."

If, therefore, by emphasizing the lessons of the past, this account of the early difficulties of our air defence can in any way strengthen the hands of those who, appreciating to the full the even more tragic vulnerability of our position to-day, are now so ceaselessly and loyally striving for the adequate increase of our air forces, it will have well served the main purpose for which it is written.

A. RAWLINSON.

LONDON,
July 13th, 1923.

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PART I

THE DEFENCE AGAINST ZEPPELINS

CHAPTER I

THE LONDON ANTI-AIRCRAFT DEFENCES, 1915: THEIR FIRST ORGANIZATION AND ARMAMENT

THE first air raid on London of which I have any information occurred on the night of May 31st, 1915, and was carried out by an unknown number of Zeppelins, quite probably by one only. Between ninety and one hundred small bombs were dropped in the east and north-east districts of London on that occasion; five people were killed and fourteen injured, whilst the structural damage done to buildings, in relation to the number of bombs dropped, was practically nil. These facts demonstrated conclusively the inefficiency of the bombs, then used by the enemy, for the destructive purposes for which they were designed.

Having at that time just reached home from Flanders, after making a somewhat too close acquaintance with a "Jack Johnson" (a large-calibre high-explosive German shell) during the attack on the Aubers Ridge on May 9th, the damage done by the number of bombs which had been dropped on London appeared to me, I remember, to be absolutely negligible.

To the inhabitants of London, however, who had a much less intimate acquaintance with the effects

of high explosives, and who had been brought up to consider their island as unapproachable by an enemy as long as our fleet remained undefeated, the matter presented itself in an entirely different light. In one short night they found that the confidence, which up to that moment they had reposed in the absolute security of their homes and property, had been sadly misplaced and was in no way justified by their actual position. The dropping of these extremely inefficient bombs, however, did infinitely more good than harm to the country at large and vastly increased our chances of emerging victorious from the great struggle in which we had engaged.

The enemy no doubt believed that the advent of their Zeppelin airships over London at night would create a panic amongst the inhabitants, very similar in effect to that which would have been produced by a similar event in Berlin. In this, however, they showed, as was often the case both at the commencement of the war and many times later on, that they entirely failed to appreciate the unyielding nature of that stubborn courage which gathers strength from adversity and has ever been the proudest attribute of our national character.

The result actually produced was a most effectual "waking up" of the population of London, who until that time had been inclined to be somewhat somnolent in their sense of fancied security. There was, of course, no sign whatever of any kind of panic, but there undoubtedly *was* a certain feeling of dismay. This was immediately followed

by a deep and universal anger that such attacks should be made upon our defenceless women and children. Above all arose a still deeper feeling of dissatisfaction when it was realized that no adequate system of defence existed, and that our homes lay at the mercy of the enemy, of whose murderous intentions no doubt remained. The result was that pressure from all sides was at once brought to bear on the Government, demanding that immediate steps should be taken to organize some form of defence, which, even if not capable of securing the safety of the town, should at least demonstrate to the enemy that no further attacks could be delivered with impunity.

The development of this movement, and its effect upon the authorities, took some little time to materialize, and it was not until after the raids of September 7th and 8th, more than three months after the first raid, that any really practical move was made to create and to adequately arm a special force for the anti-aircraft defence of the capital.

In the meanwhile the Admiralty had undertaken to organize some form of anti-aircraft defence, the Army's resources being already strained to the utmost by the requirements of the army in the field and by the necessity of providing reserves for the troops at the Front. The actual defence force consisted of a branch of the Royal Naval Air Service, under the very capable command of Commodore Murray Sueter, R.N., as Air Defence Commander, assisted by Commander Halaham, R.N., both of whom worked day and night and did wonders with the

entirely inadequate resources at their disposal. The bulk of the officers and men consisted of members of the Special Constabulary who had been commissioned or enlisted in the Royal Naval Volunteer Reserve, on the basis of part-time service only, under command of Commander Grenville Grey, R.N.V.R.

This personnel devoted four hours daily to their duty of defending London against air attacks, and during the remainder of the time pursued their ordinary avocations in civil life. They were armed with four 6-pounder Hotchkiss guns and six 1½-pounder Pom-Poms, with a few acetylene search-lights of less power than many headlights on motor-cars. There were, however, also two 3-inch naval guns, which were manned by Royal Marines and were quartered at the Tower Bridge and at Regent's Park. This armament had been increased before the raid of May 31st by four more 3-inch naval guns, which were manned by R.N.V.R. personnel. The armament of this force was both inadequate and unsuitable for the purpose for which it was intended, as not only was it quite impossible for it to inflict any injury upon Zeppelin airships, but it was equally impossible that these guns could be fired over London without causing considerable injury to the unfortunate people whom they were intended to protect.

On June 20th, 1915, I had the honour of being appointed a Lieut.-Commander R.N.V.R., for the purpose of training and commanding a squadron of armoured cars which was then being raised, and

on returning to London in August, after giving my squadron a month's hard training in camp on the South Coast, I was called into consultation by the Air Defence Commander, the urgent necessity at that time being to devise some means of rendering the armament and ammunition at his disposal more effective for anti-aircraft purposes. This somewhat flattering invitation was due to the fact of my having, during the previous winter, assisted in the organization of the Paris anti-aircraft defences, where I had successfully carried out many experiments, both in systems of anti-aircraft sighting and in the preparation of fuses and ammunition for this entirely novel form of gunnery.

Some time previously, from personal observation at the Front, I had become convinced that the development of the science of anti-aircraft defence could not fail shortly to become an urgent necessity, and I had devoted much time to the special study of the problems it presented. At that time no one knew anything at all about it, and therefore I had concluded I had as good a chance as anyone else of doing successful work in this quite novel field of operations. I was therefore busily employed, in what intervals of leisure the training of my armoured car squadron allowed me, in designing and making drawings of the various modifications and improvements which it was possible to make in the mountings, sights, and ammunition of the small number of inefficient guns which were then at the disposal of the London air defences.

Such was the position on the night of September

7th-8th when a Zeppelin, or Zeppelins, again appeared over London and dropped some thirty-five bombs in the south-east district. Not much damage was done on this occasion, sixteen people only being killed and some thirty injured, whilst the structural damage did not exceed £10,000. The effect, however, on public feeling, already stirring from its lethargy, was instantaneous, for petitions and protests were set on foot in all directions the next morning. During the next night, however, the same, or possibly other, Zeppelins came again, and dropped another fifty bombs in the East End of London (north of the river), coming as far west as Holborn and Bloomsbury, killing sixteen more people and injuring fifty others. This time the structural damage was more serious, as some thirty fires were started and damage done to the extent of over £500,000.

This raid, coming as it did the night after the previous one, showed that the enemy appreciated to the full their immunity from any danger from our defences, of which fact they were evidently prepared to take the fullest advantage, and the practical effect of this particular raid upon our own people was therefore probably greater than that produced by any subsequent attack. Not only was London's imminent danger clearly demonstrated with a cynical candour which it was impossible to misjudge, but the Germans had not hesitated to "hit the iron while it was hot" by delivering raids on two successive nights. Proof was thus afforded of the enemy's confidence that no effective defence

could then be organized by the Government, however strong might become the pressure exerted upon them by public opinion, in time to prevent the capital city of the Allies lying at the mercy of the enemy's airships when the further attacks which were then in preparation should be launched.

In reality the delivery of this second raid was a most fortunate event, as petitions and protests of all kinds having already been organized that very day, the machinery for exercising extreme pressure on the Government lay ready prepared for instant use by the public. The next day, therefore, citizens of all classes, from the Lord Mayor downwards, took steps to insure their participation in the general demonstration of dissatisfaction. Such was the unanimity with which this course was adopted that the Government, in vulgar parlance, "got the wind up" and "got a move on" at once, which under other circumstances it would probably have taken them still many months to initiate.

On the afternoon of September 11th I was busily occupied in completing the drawings of my new designs when I received an urgent command to go at once to the Admiralty for the purpose of having an interview with Mr. (now Lord) Balfour, who was then First Lord of the Admiralty. Having been ushered into the First Lord's room, I found him in consultation with Admiral Sir Percy Scott, whom I then saw for the first time. Mr. Balfour introduced me to Sir Percy Scott and informed me that the Government had appointed the Admiral to take charge of the gunnery defence of London. Also

that, as he was aware that I had had considerable experience of the organization of the Paris anti-aircraft defences, he had sent for me with the intention of placing my services at the Admiral's disposal, to assist in the establishment of a similar organization in London.

A discussion ensued as to the inefficiency of the actual armament of the London defences. I was able to furnish exact particulars as to the Paris defences and as to the guns and ammunition there employed. It was then suggested that the First Lord should authorize me to proceed to Paris, and to endeavour to obtain immediately from General Gallieni, the Minister of War (whom I knew very well), samples of the most efficient anti-aircraft gun and ammunition then existing in the Paris defences. These could probably be copied and might possibly even be improved upon here, the really important point being to obtain the actual article immediately, in order that our expert constructors might have the earliest possible opportunity of examining it. Mr. Balfour at once agreed that the necessary official letter should be written, and I then left the Admiralty with Sir Percy Scott, who thus became my chief, for whom from that moment I conceived, and still retain, the greatest admiration, respect, and affection.

There were many details to discuss during the next few days, but it was immediately decided that picked men from my armoured car squadron should form the nucleus round which should be built up a mobile anti-aircraft defence force. This force would

gradually be supplied with automobile guns and searchlights. A mobile defence would thus be created to supplement the fixed guns and searchlights, with whose positions the enemy could not fail to become familiar. In the meanwhile the Admiralty's official letter to the French Minister of War did not materialize, and under the circumstances Sir Percy, with characteristic decision, decided, on the 16th, to write a letter for me himself at once, to avoid any further delay.

It is such immediate unhesitating acceptance of responsibility which in war-time makes all the difference between success and failure, and which multiplies, many times over, the value of those who have sufficient natural independence of character, and confidence in their own judgment, to act, when necessity arises, on their own initiative. Of this Sir Percy himself is a most outstanding example, and for that reason alone, without taking into account his profound knowledge of every detail connected with gunnery, he was probably the one man in all England who could have produced at all, the results which he actually succeeded in producing in such an incredibly short space of time, in the face of the traditional conservatism so tightly bound with red tape which obtained at that time at the Admiralty.

It was on the morning of September 16th that he took this decision, and I was at that moment calling upon him at his house in my car. In a few minutes the letter was written, and one moment later it was safe in my pocket and I was on my way to Paris

in the car. The Admiral undertook to wire to Folkestone to instruct the naval embarkation officer there to ship both myself and car across to Boulogne by the afternoon boat. This was done, and I reached Paris that night, travelling, of course, all the way by road.

The next morning the first step was to visit my friends at the Paris Arsenal, to discover what suitable guns were at that moment available, so that I might make quite certain of not proffering a request which our Allies were not in a position to grant. To my infinite relief I found that one of the very latest "Canons Automobile" was at that moment ready for testing, prior to delivery with its automobile caisson (ammunition waggon) to a French anti-aircraft section at the Front.

Armed with this encouraging information, I forthwith visited General Clergerie, Chief of the Staff of General Gallieni, the Minister of War. I had known General Clergerie well during the previous winter, when I had been occupied resurrecting old French mortars from the Paris arsenals and conducting many experiments, with a view to the possibility of their use with smokeless powder in the trenches. At the same time I had carried out many further experiments with novel high explosives and modified forms of fuses, in all of which the General had taken the greatest interest. I was therefore confident both of his support and of his securing me an immediate audience from the Minister. The General was very pleased to see me,

and was kind enough to say he was much relieved to observe that I was still alive! I told him my business, and he took me at once to his chief.

General Gallieni was a most remarkable man, whose death, early in the second year of the war when at the very zenith of his career, was an irreparable loss to his country. I had not seen him since I had been sent back from the Front, to find him in Paris, during the first day of the Battle of the Marne. At that time he was certainly the coolest man in the city, where existed for the moment amongst the civilian population a truly extraordinary state of what the French call *émotion,* which, translated into English, approximately signifies *excitement.*

The Minister received me at once and read Sir Percy's letter; but he then proceeded to tell me that General Joffre, the Commander-in-Chief, alone could authorize the granting of any such request; the guns, as they became available, being allocated in advance to various units in rotation which were then awaiting them at specified dates in various definite positions, an arrangement with which the Commander-in-Chief alone had the power to interfere. General Gallieni, however, gave me a note to the Commander-in-Chief to say that, as Minister of War, he would be glad to grant the request of their ally, if General Joffre saw no objection. For this I thanked him very gratefully and took my leave, proceeding at once to the Commander-in-Chief's headquarters at Chantilly, 45 kilometres distant.

Knowing "Papa Joffre" (by which familiar

appellation the French Commander-in-Chief was known throughout his army) and also the Chief of the General Staff, who at that time was General Pellé, I felt so confident that my request would be granted that, before starting for Chantilly, I telephoned to the Arsenal to have all the spare parts and equipment of the gun and caisson ready for inspection that evening, and to have preparations made for finally testing the gun early the next morning, as I was desirous, if possible, of catching the ammunition-boat leaving Boulogne that night. Having taken these precautions to prevent delay, I got away down the good road to Chantilly at a speed which could be justified only by the urgent necessities of war.

Arrived at the French Headquarters, I saw General Pellé at once, and, the Commander-in-Chief being absent, the Chief of the Staff took upon himself to agree on his behalf, promising me he would telephone the Chief's acquiescence to the Minister of War at once, with the request that the Arsenal should be authorized to take my instructions for the immediate test and delivery of the gun and equipment. This business satisfactorily concluded, I was on my way back to Paris within half an hour of my arrival in Chantilly, and, on reaching the Arsenal, found all prepared for the "checking" of the parts and the official delivery of the gun, the caisson, and their complete equipment.

This very tedious and exacting part of the business took several hours, and it was also necessary to arrange for the testing to take place

in the fosse of the Fort of Mount Valerien at daylight, and for the provision of the necessary mechanics to drive the gun and caisson to Boulogne immediately after the completion of the trial. It was, therefore, not till very late that night that I finally sought my bed, with that feeling of satisfaction which is the reward earned by a strenuous day's work successfully carried out.

The next morning at daylight I was in the fosse at Mount Valerien to superintend the testing, and, all being satisfactory, saw the gun and caisson off on their 160-mile journey before 12 o'clock, promising to rejoin them on the road.

I then repaired to the Embassy and wired through, on our official line to London, for certain of my "armoured car" mechanics to be sent to Newhaven to meet me there next morning to drive my prizes up to London, and, that done, I took to the road once more myself.

Though driving an exceptionally fast car and sending it along at its best speed, it was no easy task to catch up the gun, as that most remarkable machine, the "Auto-Canon," with well over 100 horse-power, did an easy 50 miles an hour on the level, although its weight of over five tons delayed it somewhat on the hills. It was, therefore, not till just before reaching Abbeville, exactly 50 miles short of our destination, that I at last came in sight of the party. However, in Abbeville I passed them about 5 p.m., and kept straight on to Boulogne to arrange for the shipping of the gun and caisson that evening on the ammunition-boat,

which ran to Newhaven every night. The "Half-Section" (*i.e.*, the gun and caisson) arrived at Boulogne after dark, and, all having been made ready for them before their arrival, they were immediately shipped. Then, after entertaining the French party suitably at the hotel, I tendered them my best thanks for their assistance and got on board in time to sail before midnight, after another somewhat strenuous day.

Waking next morning at daylight, I found the ammunition-boat entering Newhaven Harbour, where my mechanics from London were ready and awaiting us on the quay. The car, the gun, and the caisson were then quickly slung on shore, and we were away for London soon after 7 o'clock, leaving a wire to be sent to Sir Percy to advise him of our arrival. I drove the gun the greater part of the way myself, to have the opportunity of explaining its many peculiarities to the mechanics, who, of course, had never seen anything like it before, and we reached the Admiral's house in London safely soon after 11 a.m.

Sir Percy was very pleased with our success, and told me he had advised the Admiralty of the gun's arrival, and arranged to show it to Mr. Balfour at 2.30 that afternoon. It was therefore driven straight on to our headquarters, where it was immediately cleaned till it shone all over, being subsequently driven down to the Admiralty and drawn up on the Horse Guards Parade under the First Lord's window at the appointed hour. When he came down, Mr. Balfour was kind enough to inspect

THE FRENCH 75-MM. AUTO-CANON

On its specially designed De Dion Automobile Chassis.

No. 1.—"In action."

No. 2.—Ready for the road.

both the gun and the party, and to express his satisfaction at the success and "dispatch" with which the commission had been carried out.

With regard to the success, it was evident, as the gun and ammunition were there to prove it; but with regard to the "dispatch," it was not, at the time, very clear what was meant. We heard afterwards, however, that such was the "dispatch" with which *our* part of the business had been carried out that the gun was actually under the First Lord's window in London *before the Admiralty official "dispatch" asking for it had been written!* And at that moment London lay defenceless and at the mercy of air raids, which were to be expected at any moment!

I have before me a rough copy of the report as to my journey, which I handed to the Admiral next day at his request, as follows:

"*22nd September*, 1915.

"SIR,

"On receipt of your orders in London at 11.30 a.m. on the 16th instant 'that I should endeavour to obtain from the French Government a 75-mm. anti-aircraft gun of the latest design, mounted on a special automobile mounting,' I left immediately by road for Paris.

"I arrived there the same night, and the next morning, having ascertained at the Paris Arsenal that one such gun was actually ready for delivery, I obtained an interview with General Gallieni, the Minister of War, and presented your letter to him. He, in the most courteous manner, explained to me that, much though he desired to grant the request, he was unable to do so, as the guns were all at

the disposal of General Joffre, the Commander-in-Chief, who alone had the power of disposing of them.

"The Minister, however, gave me a letter to the Commander-in-Chief, to the effect that he should be very pleased to grant the request, in the event of the High Command seeing no objection.

"I therefore proceeded at once to the French General Headquarters at Chantilly, where I saw General Pellé, the Chief of the General Staff, who without delay telephoned to the Minister, authorizing delivery of the gun, caisson, and equipment complete.

"I checked the equipment the same afternoon, and at daylight next morning the gun was officially tested in my presence.

"The gun, caisson, and full equipment left Paris the same morning, in charge of the French Arsenal mechanics, and was shipped at Boulogne for passage to Newhaven the same night.

"I crossed with it on the ammunition-boat that night and drove it up to London from Newhaven the next morning, where I had the honour of reporting its safe arrival to you before midday.

"The whole transaction, from the time of receiving your order in London, to the time of reporting the gun's arrival to you, occupied seventy-two hours.

"I attach photographs of the gun and caisson, and have the honour to be, sir,

"Your obedient servant,

"A. RAWLINSON

"(*Lieut.-Commander, R.N.V.R.*).

This somewhat unusual commission having been satisfactorily concluded, the gun and its equipment became objects of the greatest interest to the London

experts, and much of my time was taken up in explaining the methods of operating the various portions of its equipment. These included height-finders, range-finders, very special sights, and many "gadgets" of a kind at that time unknown in this country.

A gun's crew was immediately selected from the "ratings" of my armoured car squadron and placed in hard training on the new gun, as it might at any moment become necessary to "bring it into action" in defence of London.

CHAPTER II

THE FORMATION OF THE ANTI-AIRCRAFT DEFENCE FORCE, R.N.V.R.—THE FIRST FRENCH GUN IN ACTION IN LONDON

In the meanwhile the formation of the Anti-Aircraft Defence Force proceeded apace; gun-positions were selected for the fixed guns, searchlight stations were established, and personnel enlisted and trained, under the able supervision of Captain Stansfeld, C.M.G., R.N., and Commander Grenville Grey, R.N.V.R. For my part, I soon had in training a body of men, drawn from the R.N.V.R. Armoured Car Squadrons, who were destined in a very short time to develop into the R.N. Anti-Aircraft Mobile Brigade. The one and only gun at my disposal at that time was the French one, which was stationed at the Armoured Car Headquarters at the Talbot Works in Ladbroke Grove, the men being in billets in the immediate vicinity. Continuous training was carried out each day from early morning till late afternoon, when the men were allowed three hours' relaxation before "quarters" at 9 p.m., at which hour all officers and men "reported," and, having tested and prepared all the gear, "stood by" in expectation of any raid which might take place during the night.

I was allowed at that time absolute freedom in the selection of the most advantageous "site" on which to bring my single gun into action in event of a raid occurring, with the object of defending whatever might be considered to be the enemy's most probable objective. On reflection it appeared to me that the centre of the "City" would be, in the absence of all defence, the point most likely to be selected by the enemy as their principal object of attack. I therefore carefully examined that neighbourhood, with the object of selecting the gun-position from which it would be most likely that one could "hit" any Zeppelin endeavouring to drop bombs on the Bank of England, and where, at the same time, the firing of a high-velocity gun would do the least injury to the surrounding buildings.

The solution was not far to seek, as an ideal gun-position for our purpose was found in the Artillery Ground in Moorgate Street, and it was forthwith arranged with the authorities that the gun should go there and "prepare for action" on the first receipt of news of a Zeppelin having crossed the coast-line.

WE HAD NOT LONG TO WAIT.

On October 13th, after an arduous day's training, the men were dismissed to their billets at 6 p.m. I then repaired to my own billet to await their re-assembly for "quarters" at 9 p.m. A short time afterwards the telephone from the Admiralty which stood beside my bed rang furiously, and I was informed that "some" Zeppelins had just crossed

the coast-line and were apparently making for London, where they might be expected to arrive soon after 9 p.m.

It was then nearly 7 p.m., and my men were scattered in all directions and would not reassemble till "quarters" at 9 p.m.

I hurried to the Armoured Car Headquarters, and sent at once from there to collect such men as were to be found at their billets, and then proceeded to prepare all the equipment, which had been of course replaced in its various cases after "training" had concluded that afternoon. I also commenced to load up the "caisson" with ammunition. During these operations a few men began to "dribble in," and the automobiles were got out and filled up, the engines being set running to "warm up."

At 8.25 telephonic orders came through from the Admiralty to proceed with the gun to the Artillery Ground in the City. At that time I had not the necessary number of men present, to ensure the efficient working of the gun, and was forced to await their arrival in an absolute agony of impatience. For, knowing well that the gun under my charge was the only one in London which could fire high-explosive anti-aircraft shells, I also knew that it was for that reason *the only one* which had any chance whatever of seriously damaging or stopping the Zeppelins.

As nine o'clock—the hour for "quarters"—approached, the men turned up in batches, and, as it was then dark, the big headlights of the cars

and gun were lighted. We then waited only for a chief petty officer, who was an experienced man and whom I was anxious to take with us in case of casualties, as my men, though of excellent quality, were very "green" and had not then been "shot over." This man was most unfortunately late, and it was not till four minutes past nine that he appeared. When he *did* arrive the reception he received from his commanding officer may be imagined, but could not by any possibility be printed. However, at 9.5 we at last started, myself driving my own fast car and leading the procession, the gun and caisson following at intervals of fifty yards. All "headlights" were lit, and "sirens" were in use on each car. Every minute was of the utmost value, and not a second was wasted, the fastest pace at which the gun could possibly be driven, with any reasonable regard to *its* safety, being the pace set all the way.

At that time there was no system of "air-raid warnings," "raid shelters," or "maroons," such as was organized later on, and the streets on this occasion were crammed both with vehicular traffic and pedestrians. Everyone understood at once, in the light of their experience during the previous month, the moment they saw us coming, that an air raid was imminent. They did not, however, know "where to go" or "what to do," though none of them had any doubt at all that the *most pressing* and *most vital* thing they had to do was TO GET OUT OF OUR WAY.

I feel quite confident that no man who took that

drive will ever forget any part of it, and particularly Oxford Street, which presented an almost unbelievable spectacle. I had such an anxious job myself that I had no time to laugh, but I am sure I "smiled" all the way. After passing the Marble Arch the traffic in Oxford Street became much thicker. The noise of our "sirens" being as "deafening" as the glare of our "headlights" was "dazzling," the omnibuses in every direction were seeking safety on the pavement. I also observed, out of the corner of my eye, several instances of people flattening themselves against the shop windows, the public being at that time infinitely more fearful of a gun moving at such a terrific speed than they were of any German bombs, of whose possibilities they had then but little experience.

All went well, however, until, sinking the hill in Holborn, I glanced at my speedometer, and saw that it then registered 56 miles an hour. At the same moment I became aware that the road was "up" in front of us, and that the only passage left open for traffic was hopelessly blocked by a solid mass of omnibuses and other vehicles.

To "stop" at that speed was, of course, quite impossible; the only question to be instantly decided was "where to go"! As no other choice was offered me, I was forced to head bravely for the part of the road which was under repair, hoping for the best. The roadway there was protected by the usual "pole" supported on two trestles. As we approached this, we could see that the repair

was mercifully nearly finished, and that there was not much to fear from the state of the road surface beyond the pole. The infernal "pole" itself, however, I did not like the look of at all, as, being in a very low car, I was in painful uncertainty what would happen, not whether or not it would *hit* me, but *where* I should catch it, whether in the face or lower down.

In any case, however, we were "in for it," and, hoping for the best, I kept my foot well down on the accelerator, and charged the obstacle boldly without the least slackening of our speed. The next moment the car slightly "shook" from a small and quite insignificant shock, though the steering wheel gave my hands a horribly vicious wrench. At the same time, two halves of a broken "pole" went spinning high in the air, one on either hand.

Where they fell I don't know, and had no intention at that moment of stopping to inquire. Very mercifully the "pole" had been placed unusually low, and the front tyres hit it slightly from below. The blow was delivered not only with the speed of the car, but with the speed of the revolutions of the road wheels also, with the result that the stout old "pole" flew to "glory," and if it hurt anyone at all, it did not hurt or delay *us* in the least. We had experienced indeed a few moments of somewhat emotional uncertainty, but mercifully a damaged radiator was our only hurt, and not a fraction of a second of time had been wasted.

The road was excellent after the barrier was

passed, and as the pole "flew up" I observed a member of that most gallant and reliable force, the London Police, moving a great deal quicker and less sedately than he was accustomed to move. He was actually rushing, without his helmet and at top speed, towards the other pole which blocked the far end of the "road repair." This he succeeded in removing in the very nick of time, being just able to push it over on to the ground before we reached it, and, although the car bounded high in the air on passing over it on the ground, no harm was done nor was a moment lost.

No further incidents occurred until, keeping up our speed all the way, we finally drove on to the Artillery Ground in Moorgate Street, having traversed the whole length of Oxford Street in what must have easily been "record time." I kept straight on to the middle of the ground, swinging the car round so that the headlights should illuminate the gun position, which I had previously marked out, and to which the gun proceeded direct. Then, before the wheels of the gun had stopped turning, we became aware that a Zeppelin was in sight to the N.N.W., making straight towards us at a height of from 8,000 to 10,000 feet, and at a speed which I estimated at 50 miles per hour. The insistent roar of its engines, which was rapidly becoming louder, was being punctuated by the "boom" of the bombs which it was then dropping in Holborn and the Strand during its approach.

Of course our gun, illuminated as it was by the headlights of my car, was in full view from the

Zeppelin, and being, in their estimation and in accordance with their previous experiences, perfectly harmless, it attracted the Germans like "jam" does a "wasp." This fact, however, did not worry us at all, as the nearer they came to *us* the better chance we had of *hitting them*. I had, therefore, no idea of turning out the headlights, particularly as light was indispensable to enable us to bring the gun into action in the quickest possible manner, and to set fuses, sights, etc., in the very shortest possible space of time.

There was no time whatever to use any altitude finding instruments, or even a range-finder, and I therefore had to form a lightning estimate of the enemy's speed, and of what his altitude and range would be, on the course he was then following, by the time our gun was ready to fire. My report shows that I estimated the range would be 5,000 yards and the altitude between 7,000 and 8,000 feet by the time the necessary "corrections" for speed of target, range, and altitude had been "put on" by the sight setters, the fuses set, the gun loaded, and the telescopic sights focussed on the target.

As soon as I got the "Ready, sir," from the gun-layer, I instantly gave them, "Fire," and we then all watched anxiously, during the interminable seconds of the "time of flight" of the shell, to observe the "burst." When it finally came it was "short," but it must have very considerably surprised the enemy who had been informed, with what had been great accuracy a fortnight or so

previously, that there were no anti-aircraft *high-explosive* shells in the London defences.

Whatever his surprise may have been, however, he came straight *at* us without "swerving" at all. Almost as the shell burst the gun-layer called, "Gun no longer bears, sir," which signified that the target—the Zeppelin—had entered the "dead circle" which existed for the French auto-canons, as they could not be elevated more than 83°. Beyond that point, therefore, a small circle of space was left in which an enemy could not be fired at at all—that is, precisely at the moment when he was *right over the gun*. As, however, if we were fortunate enough to escape his infernal bombs, he quite certainly could not stop "exactly over our heads" all night, I busied myself with the necessary "corrections" for range and altitude. The range this time was set at 6,500 yards and the altitude at 10,000 feet, allowing for the inevitable "rise" the airship was bound to make after having dropped his bombs at *us*, which it was clearly his intention to do.

We prepared, therefore, to catch the enemy with a "corrected" fire as he came *out* of the dead circle, and in the meanwhile stood by for the bombs to fall!

They FELL all right, I don't know how many of them, but they made the devil of a noise, and brought down several of the houses on the Moorgate Street side of the ground, with a roar of falling masonry which it was pleasant to me to hear; for, as I explained at once to the men, if he

had hit the houses EAST of the gun, it meant that he had passed *over* us, and as he could not *come back,* we could therefore be sure of getting another shot at him; as the imminent danger of his putting the gun "out of action" before we could fire again, which *had* existed, was now past. As soon as he came into our field of fire to the eastward, I got the "Gun bears, sir," from the gun-layer, and immediately gave the word, "Fire." This time we distinctly saw the shell burst, *above* and *quite close* to the airship, but we saw no more, as a sudden fog seemed to form below the Zeppelin and he disappeared instantly and completely from our view from that moment.

An instant later, however, there was a great "booming" of explosions a little farther east, and it was evident he had not only dropped "all his bombs at once," but had also dropped all his water ballast—which had created the mist—in his endeavour to get out of sight, and to rise as quickly as possible out of danger from our high-explosive projectiles. These we were delighted to note he evidently did not relish, and quite certainly did not expect.

Some idea of the speed at which the operations of our party that night were carried out may be gathered from the fact that we left the Talbot Works, near Wormwood Scrubs, at 9.5 p.m., and that our gun was prepared for action, loaded, the sights and fuses set, and the first round *actually fired,* from the Artillery Ground in Moorgate Street at 9.25, only *twenty minutes* later.

The following is a copy of my report of the operations, rendered next morning:

From
LT.-COMDR. RAWLINSON, R.N.V.R.
TALBOT WORKS,
14. 10. 15.

To
O.C.
A.A. DEFENCE OF LONDON,
ADMIRALTY, S.W.

"Orders received 8.25 p.m., 13th inst., at Talbot Works, to proceed with 75-mm. French mobile gun to Artillery Ground, Moorgate Street.

"Was unable to collect men from their billets before 9 p.m., at which hour they had previously been ordered to parade.

"Left Talbot Works 9.5 p.m.

"On arrival at Artillery Ground, enemy aircraft was already in sight from 8,000 to 10,000 feet up—bearing N.N.W., unlighted by any searchlights.

"Gun was 'prepared for action' immediately and first round fired at 9.25 p.m.

"Range, 5,000 yards.

"Elevation, 40° (quadrant angle).

"Estimated perpendicular height of 'burst,' 7,200 feet.

"Bearing, S.S.W.; target directly approaching.

"Burst *short;* estimated speed of target, 50 miles per hour.

"Second round, 9.27 p.m.

"Range, 6,500 yards.

"Elevation, 48° (quadrant angle).

"Estimated perpendicular height of burst, 10,200 feet.

"Burst, *high, behind,* and *beyond.*

"Target, directly receding.

"Estimated speed of target, 50 miles per hour.

"The airship was inclined upwards and rising rapidly (both perpendicularly and on an inclined course), bearing E.S.E.

"Between the two rounds, the target passed nearly perpendicularly over the gun, and dropped bombs which fell 100 yards distant, in Moorgate Street.

"Was unable to continue firing owing to target being obscured by fog or smoke.

"A second enemy aircraft came into sight at 11.25 p.m., bearing S.S.E.; estimated distance, 15,000 yards. Gun was kept trained on it, showing elevation (including tangent elevation), 22°. Followed target whilst in sight, but did not fire.

"This target was not illumined by searchlights and remained in view three to five minutes, disappearing in N.E. direction. It never came within range of the gun.

"(*Signed*) A. RAWLINSON.
"(*Lieut.-Commander*)."

During this raid thirty-nine bombs were dropped, of considerably greater power than those used in the previous raids, thirteen fires were caused, thirty-three people were killed and seventy-seven injured, whilst the structural damage was estimated at £50,000.

From the point of view of the defence, the most interesting part of the proceedings was the effect on the commander of the Zeppelin, produced by the burst of a high-explosive shell in his immediate vicinity.

It appeared from the evidence of our other gun-stations, where officers observed the bursts from various angles and distances, that the shell in question burst just above, and close to, the enemy's airship. There was no possibility of mistake, as the "detonation" of a projectile charged with high

explosive is easily distinguished from the "burst" of a common shell which is charged with black powder, and the two rounds fired by our gun from artillery ground were the only two high-explosive projectiles fired in London that night.

The fact, that the enemy dropped all his remaining bombs immediately our shell burst, was clearly proved, as they all fell close together in the neighbourhood of Petticoat Lane, E.C. This was the district over which the airship found itself at the moment when our gun "bore" once more as the target left the "dead circle" over our heads, at which instant the gun was fired.

The simultaneous dropping of the water ballast was equally clearly demonstrated, as, whilst on the "burst" of the shell the target instantly disappeared from the view of those immediately beneath it, it remained clearly visible to observers who were farther away, and whose view therefore was not obstructed by the spray of the falling water.

These facts having been clearly proved, it became our urgent duty to profit by the lessons learned, and to organize our defence in the light of the invaluable experience we were acquiring.

CHAPTER III

IMPROVEMENTS IN ARMAMENT: HIGH EXPLOSIVES AND TIME-FUSES

THE first and most important fact, demonstrated on the night of October 13th, was the immense superiority of the high-explosive projectile over the common shell with which our guns were then supplied. This fact had already been most conclusively proved in the field on the French Front, and it now became apparent that a similar superiority existed for purposes of anti-aircraft defence. The first step, therefore, was to ascertain what high-explosive projectiles existed in our magazines, and by what means they could be made available for the defence of London.

The very first inquiries, made with the above object, disclosed a truly lamentable situation, such as would have discouraged any less practical and independent a commander than Admiral Sir Percy Scott. We ascertained at once that the only high explosive then authorized for use in the guns of His Majesty's Navy was "lyddite," a "picric" explosive of which only a very meagre supply existed beyond the requirements of our fleets.

Infinitely more serious, however, was the fact that there existed no "time-fuse" which was con-

sidered "safe" to use with high-explosive projectiles. We were also immediately informed that, although the matter had been under consideration for years, no satisfactory solution had yet been reached, and that therefore the idea of firing high explosives with "time" fuses must be dismissed! Meantime London still lay defenceless!

Such a situation, however hopeless it would have appeared to less competent commanders, presented no elements of "novelty" to our experienced Admiral, and only served to spur him on to devise for himself the weapons, indispensable for the defence which he had undertaken, which the resources of the Admiralty were apparently unable to supply. It was, of course, obvious that, as the French were regularly using high explosives with "time" fuses, the problem was by no means one which was beyond solution. The Admiral was well aware that for nine months previously I had been employed in testing high explosives and manufacturing fuses; on receiving the above very definite and unsatisfactory answer from the Admiralty, he therefore did me the honour of sending for me to his office. He then propounded the problem and instructed me to study it and to give him a report, at the same time authorizing me to obtain and inspect the drawings of the standard fuses then available for use with naval ordnance.

This commission was executed on the spot, and within an hour I had the pleasure of handing him a sketch of an existing fuse, modified in a manner

which rendered it "*absolutely safe*" for use with *any* high explosive. Armed with this solution, which he immediately understood and approved, Sir Percy immediately sought out the Director of Naval Ordnance, and then the fun began!

For the benefit of those who are not familiar with the peculiarities of guns, fuses, and high explosives, I will endeavour to explain the difficulty which existed, in simple and non-technical language. The outstanding fact which caused the difficulty was that, should what is called a "premature" explosion of the projectile take place before it has left the gun, a "high-explosive" shell, by reason of its comparatively "*instantaneous detonation,*" will blow the gun to pieces. A "common shell," on the other hand, by reason of its "*slower explosion,*" will rarely do much damage, as it will probably have left the gun before its explosion is complete.

We had, then, to consider the dangers of "fuses" which are the most common cause of "prematures." In a "time" fuse the shock of discharge ignites a slow-burning composition. This is constructed to burn a varying time in accordance with the "setting" which is given to the fuse, and finally communicates with the charge in the projectile, and so causing the "burst" of the shell at the desired moment *during* its flight.

The danger is that, as the shock of discharge is required to set in action certain more or less fragile and complicated mechanisms for the purpose of igniting the composition, it *may* at the same time

"break down." By that term is meant that some part of it may fail. The shock of discharge will in that case instantly detonate the high-explosive projectile while it is *still in the gun,* with disastrous results to all concerned.

All the fuses for high explosives at that time in use for naval ordnance were "percussion" fuses. In these the shock of discharge acts only in freeing certain mechanisms, previously locked, which are then operated by the "impact" of the shell at the termination of its flight. This is an entirely different and very much more simple operation than that which the "time" fuse is called upon to effect. At the same time a system had been approved, and was in use with naval ordnance, by which the "action" of these "percussion" fuses might be "delayed," in order that a certain space of time should intervene, *after* the impact, before the detonation of the shell. The object of this device, which is known technically as "delayed action," was, of course, to permit of the projectile penetrating armoured defences *without bursting,* the burst subsequently taking place in a much more effective position.

The simple modification which I had the honour of suggesting, and which gained the instant approval of the Admiral, was that this "delayed action" device should be applied to the "time" fuse as well as to the "percussion" fuse, so that should the "time" fuse "break down" in the shock of discharge, the officially approved "delayed action" would be there to interpose itself and so to

render impossible any "premature" detonation of the high explosive *in the gun*. This was all the easier and more practicable as the projectile would be 1,000 feet away from the gun in half a second, and it was quite simple to set the "time" half a second earlier than usual, the first half-second of flight being, of course, of no importance in anti-aircraft work, as the enemy aircraft were hardly to be expected to come and "sit on the end of our guns." In this simple manner was born the *safe* "time-fuse" for the high-explosive projectiles indispensable for anti-aircraft fire, the production of which the authorities had for so long declared to be impossible.

This was the first controversy in respect of ammunition, but many others were to follow, as we met with every kind of opposition from the gentlemen who, in far-off pre-war days, had been placed in charge of "Design," and who were much opposed to any "unofficial" innovations. As illustrating the lengths to which this obstruction was carried, a similar department was even successful later on in preventing the use of *French* ammunition in our *French* guns, as the "design" had not been previously approved by the regular design authority here.

In the meanwhile any guns suitable, or even unsuitable, for our work were hard to come by. It was therefore decided that recourse should again be had to the generosity of our French allies. On this occasion the request was immediately granted, and in due course we received a further three auto-

mobile guns and thirty-five of the standard 75-mm. field-guns, for which we were to build the anti-aircraft mountings here. At the same time we were supplied with 20,000 rounds of French ammunition.

Thanks to the independent attitude taken up by Sir Percy Scott in claiming, and obtaining from the First Lord, authority to place his own orders for armament, we were subsequently enabled to go ahead with our organization; and in the month of November we counted upwards of 150 guns of various classes and calibres in preparation for use in the London air defences. Ammunition, however, was a great difficulty, and much of my time was spent in testing metals and high explosives, with the object of ascertaining what was the best combination of "tensile strength" of shell and available high explosive, which would furnish the ideal projectile for our purpose.

The problem is a difficult one, for it must be remembered that every pound weight of metal which is fired into the air has to *come down again*. In firing, therefore, over London, it was very necessary, for the safety of the inhabitants, that we should ensure that our projectiles came down in very small pieces such as would cause the least possible damage to life and property. The question thus became one of the proper "fragmentation" of the shells. This depends on two factors in combination—first, the actual "speed" of the detonation of the high explosive, and secondly, the "tensile strength" of the metal of which the shell is con-

structed. If, however, the resistance offered by the "case" of the shell—that is, its "tensile strength"—is correctly proportional to the "speed" of the detonation, the projectile will "contain" the force of the detonation for the necessary fraction of time to ensure its breaking into minute fragments on bursting. This is what is meant by a good "fragmentation," which is also largely dependent upon the actual design of the shell—that is, on both the form and thickness of its walls and base.

These matters now became my special study, and, having contrived to ensure the safety of the "fuses," I next proceeded to experiment with the object of ensuring a satisfactory "fragmentation" of the projectiles. The great fault of the standard form of projectile was that, in order to meet the chamber-pressure of the gun—that is, the "propulsive force" exerted by the explosion of the propellent charge—the bases of the standard projectiles were always made of a considerably heavier section (thicker metal) than the walls, the latter also being "tapered"—that is, gradually reduced in thickness from the base to the head—for the same purpose.

The effect of this system was to make it tolerably certain that, when the shell burst, the "walls" would fly to pieces, whilst the heavy "base" remained intact and became itself a most formidable missile. In order, therefore, to protect inhabitants of London from the showers of such "missiles" with which they were threatened, we were finally successful in producing an entirely novel design of projectile. This design, notwith-

standing the fact that it became at once "anathema" to the official experts, was nevertheless approved by the Admiral and immediately manufactured from my drawings, by certain engineers in France, for use in our anti-aircraft defence.

The main point about these projectiles was that their base, instead of being "flat" and of extra thickness, as in the regulation model, was, on the contrary, "doomed"—that is to say, rounded off. By this means the danger of the base of the shell remaining intact after the burst was eliminated. The extra resistance of the base, called for by the "chamber-pressure" of the gun on that portion of the projectile, was, in this design, obtained by its "domed" *shape* instead of by extra thickness. At the same time, the resistance offered by the "domed" base to the *interior* pressure of the burst was, by its shape, approximated to that offered by the walls of the shell, and a most satisfactory and uniform fragmentation was obtained, both the base and the walls being blown into equally small fragments.

A further point of great importance for a projectile which it was proposed to fire over populous districts, was to ensure that, in event of the fuse proving "blind," and the shell therefore falling "intact" instead of being blown into small fragments in the air, the high explosive employed should be such as would not be detonated by its impact with the ground. Finally, however, a satisfactory high-explosive mixture was found and a test made, with the result that shells charged with

this mixture were fired at a range of 100 yards into a solid concrete target without any detonation occurring.

Thus was eventually produced a novel design of "stream-line" high-explosive projectile for anti-aircraft defence purposes, which had the following important advantages over the regulation model:

1. Its flight was longer.
2. Its cost was less.
3. It was in every case reduced to small fragments on bursting in the air.
4. In event of the fuse proving "blind," no detonation occurred on the projectile reaching the ground.

The shells now to be fired, therefore, by the naval anti-aircraft guns in London, whilst they became infinitely more dangerous to the enemy, were no longer a danger to the inhabitants of London. In the case of the projectile, as in that of the fuse, the matter became simple and easy from the moment that we were freed from the pre-war regulations with respect to official tests and approvals by the various departments and from the masses of red tape by which they were bound.

Simultaneously with these modifications in our ammunition, much work was necessary to mount such guns as we were able to obtain upon suitable mountings to enable them to carry out the "high-angle fire" which was indispensable for anti-aircraft defence. No such gun-mountings were at that time available. It became, therefore, a matter of the greatest urgency to produce them. It was

also a matter of the greatest difficulty at that time, as every dockyard and ordnance factory was working day and night to the full extent of its capacity. We were therefore reduced to confining our designs to models which could be produced by ordinary engineering staffs and works, without calling for the special accuracy and experience which are ordinarily insisted upon in the production of mountings for the guns of His Majesty's Navy.

With regard to the thirty-five French 75-mm. guns, we obtained a design from Paris of a high-angle mounting which, though far from ideal, was easily and quickly made, and answered its purpose well for those guns in fixed positions. The matter of mounting the British-made guns on automobile mountings was more difficult. Excellent high-angle mountings were, however, produced by Messrs. Vickers for their 3-pounder guns, and were fitted to Lancia (Italian) light lorry chassis, to which special gun-platforms were added. Two 3-inch 20-cwt. high-velocity British guns were also supplied to the Mobile Brigade, one of which was mounted upon an excellent Daimler lorry chassis, and the other in accordance with a special design, of which more will be heard later.

The defence was now divided into two portions, one comprising the guns and searchlights occupying fixed positions, which was under command of Commander Grenville Grey, R.N.V.R., the other consisting of a mobile force, of which the Mobile Brigade was under my command and was quartered on the northern heights of London at Kenwood,

No. 1.—3-pounder Vickers' Q.F. high-velocity gun on high-angle anti-aircraft mounting and Lancia chassis.

No. 2.—3-inch 20-cwt. Q.F. high-velocity gun on high-angle anti-aircraft mounting and Daimler chassis.

whilst a further mobile force with lighter guns also operated farther afield, under command of Major Lucas.

The headquarters at the Admiralty were under the control of Captain Stansfeld, C.M.G., R.N., a most experienced and capable officer, and Admiral Sir Percy Scott commanded the whole defence force, of which he was himself at once the moving spirit and the principal asset.

Note.—A copy of the report rendered by Commander Rawlinson to the First Lord of the Admiralty, Mr. (now Lord) Balfour, dated September, 1915, giving a comparison of the anti-aircraft defences of London and Paris at that time, is attached in the form of an Appendix at the end of this volume.

CHAPTER IV

THE ANTI-AIRCRAFT MOBILE BRIGADE, R.N.V.R.: THEIR ARMAMENT AND TRAINING

FROM the month of November, 1915, onwards, this account of the defence of London must be confined to that part of it which came specially under my personal observation. And as up to May, 1917, when I was transferred to the Army, I had the honour of commanding the Mobile Anti-Aircraft Brigade, it is to the records of the actions and movements of that force that my story must be principally devoted.

The armament and searchlights eventually to be allotted to the Mobile Brigade by the Admiralty were as follows:

4	75-mm. quick-firing French "auto-canons," mounted on special French automobile mountings
1	3-inch 20 cwt. high-velocity, quick-firing, high-angle British gun, mounted on a special Daimler motor-lorry
1	3-inch 20 cwt. high-velocity, quick-firing, high-angle British gun, mounted on a "trailer" mounting
8	3-pounder high-velocity, quick-firing, high-angle Vickers' guns, mounted on Lancia motor-lorries
—	
14 guns.	

4 automobile searchlights, mounted on Tilling-Stevens chassis, the dynamos producing the propellent current being capable of operating the searchlight when the chassis was stationary.

One of the French guns was provided with its own " caisson " (ammunition waggon), mounted on a similar chassis to the gun, and fitted to take 200 rounds of ammunition as well as the equipment of range-finders, fuse-punchers, telephones, etc. The remaining French guns were supplied with ammunition lorries of Lancia manufacture; an adequate supply of lorries of this type was also to be provided for the British guns, so that the mechanically propelled vehicles would in the end amount to fourteen guns, four searchlights, and twenty-four other automobiles. For the adequate manning of this force at all times, I was required, first, to estimate the number of officers and men necessary for their working, and secondly, to obtain them. The officers and the mechanical " ratings " (N.C.O.s and men) were to be drawn from the armoured cars, and the remainder raised by special enlistment. The comparatively simple task would then remain of training them for their special duties.

On October 13th the Mobile Brigade was in possession of one gun and caisson, and consisted of a squad of armoured car mechanics. The gun was in the Talbot Works and the men billeted in the vicinity. By November 9th, however, the new brigade was able to take part in the Lord Mayor's

Show, and to produce five automobile guns and one mobile searchlight, all of which were completely manned by trained personnel of the R.N.V.R.

In the meanwhile we had, by the courtesy of the Grand Duke Michael of Russia, obtained the use of the palatial stables at his house at Kenwood, Hampstead, as barracks. There, the men, guns, searchlights, and equipment, were all assembled under one roof. On December 5th the brigade paraded there for inspection by the Admiral with seven automobile guns, two mobile searchlights, fourteen other motor vehicles, and a complete equipment of instruments, telephones, etc., completely manned by thoroughly trained and specially enlisted men, under the command of nine selected officers, ready, in fact, to proceed wherever its services might be required. On that occasion the Admiral informed me to my great delight that their Lordships had that day promoted me to the rank of Commander, R.N.V.R., to mark their appreciation of the progress made.

Although a great deal had been done, great efforts were still required, the most difficult part being the pushing forward of the supply, mounting, and equipment of the guns. I was also charged with the preparation and checking of the thirty-five 75 mm. guns which were in course of delivery from France for use as fixed guns in the London defences. The supervision of the construction in England of the mountings upon which they were to be mounted also fell to my lot, and,

THE ROYAL NAVAL ANTI-AIRCRAFT MOBILE BRIGADE IN THE LORD MAYOR'S SHOW, NOVEMBER, 1915

Five guns and one searchlight. Commander Rawlinson on the leading auto-canon.

as the equipment and construction of these guns is of a uniquely complicated nature, the demands made on my time were such as to leave me a great deal less than I desired to devote to the supervision of the training of the men.

The extraordinarily short space of time, in which the force became effective, was entirely due to the spirit and application with which the men themselves faced their arduous training duties, and they thereby earned my deep and lasting gratitude; for they made light of all the hardships of the unusual conditions under which they were called upon to live, and devoted themselves heart and soul to the mastering of their duties. I have had the honour of commanding many different classes of men, in many different countries, under a great variety of conditions, but I shall always recall with the deepest appreciation the spirit in which the men of the Mobile Brigade tackled their work, and the intelligence with which they mastered its most complicated details and carried out their duties on all occasions.

With regard to the mechanics, they were selected from the armoured car personnel and were exceptionally efficient before their selection; and in their case no conditions were imposed as to their physical qualifications, all being classed as A 1. The case of the remainder was, however, different, as they were specially enlisted, and such enlistment was confined to those who were not physically qualified for service at the Front.

This resulted in the R.N.V.R. Anti-Aircraft

Force becoming a veritable *corps d'élite,* as the number of applicants far exceeded the demand, and a careful selection was made in each case. The ranks, therefore, were made up of all classes; each individual, however, having some special recommendation, and being exceptionally proficient in some particular line.

It was, indeed, frequently astounding to find the extraordinary "diversity of talent" which was at our disposal. If there were calculations to be made, there were "Wranglers" from the Universities to carry them out. If drawings were required, there were skilled draughtsmen available. If costs were to be estimated, there were business men of high attainments ready for the purpose. The same applied to our elaborate telephone equipment, to our electrical outfit for our searchlights, and even when we were required to "camouflage" the guns and cars, a skilled artist was at once found available for the purpose in the ranks. There seemed no end to the skilled resources of the personnel, and with it all, the discipline and obedience to orders was beyond all praise. So much so was this the case that, during the twenty months that I had the honour to command the brigade on what was technically considered active service, I was *never once* called upon to exercise my powers of punishment upon any member of it.

How many commanders, I wonder, could say the same?

Through the worst of the winter the enemy were doubtless completing their preparations for future

attacks, and though on various occasions they visited the northern portions of England, yet in London they allowed us a short but sorely needed breathing space to continue our organization. Guns came to hand by degrees, training was continued, and practice for "action" during raids carried out until a very high state of efficiency was reached. On March 31st and April 2nd and 3rd, Zeppelin raids again took place, by which dates we were in a position to offer a much more serious resistance. This was equally the case in the fixed defences; but with respect to the Mobile Brigade, I see that on March 31st we sent twelve guns to eight stations, as well as two searchlights; on April 2nd we sent thirteen guns to eight stations, as well as three searchlights; and on April 3rd thirteen guns went to seven stations, and three searchlights; so that considerable progress had been made during the winter.

On February 16th what was to us a very sad event happened. The Army at last took over control of the London anti-aircraft defences, and we therefore lost our most efficient and much respected commander, Admiral Sir Percy Scott. It was thanks entirely to his fearless personality, and to the uncompromising attitude which he took up in the face of pre-war customs and regulations, that so much had been achieved, and that, from an absolutely negligible quantity, the efficiency of the London defences was now becoming a very serious consideration to the enemy.

In order to illustrate the difficulties with which he was confronted and the characteristic spirit in

which he met them, I will venture to quote one letter only of the many which it was necessary for him to write in the course of his difficult and arduous task, under the heavy burden of responsibility which he well knew rested upon himself personally. The letter was addressed to the First Lord of the Admiralty, and is as follows:

October 18th, 1915.

"DEAR MR. BALFOUR,

"On September 10th you asked me if I would take the gunnery defence of London under my charge. I accepted, and in doing so, considered that you intended me to procure what was necessary for the gunnery defence of London.

"Up to last week I was led to believe that the Admiralty had ordered guns for the defence of London.

"On Friday, the 15th, you informed me that they had not done so. I at once ordered some guns. The firms with which I placed the order wrote to the Admiralty for confirmation. The Admiralty have not confirmed the order.

"If I am to be responsible for the gunnery defence of London, I must be allowed to do things in my own way, and not be interfered with by the Admiralty. If the Admiralty are to settle what guns are to be used for the defence of London, and how they are to be obtained, then they become responsible for the gunnery defence of London and I resign.

"If I am to remain in charge of the gunnery defence of London I must have a free hand to procure what is wanted, how and best I can, and not to be handicapped by Admiralty red-tapeism.

"PERCY SCOTT

"(*Admiral*)."

This letter bore instant fruit, and thanks to our leader's enterprise and independence, none of the short but invaluable respite, which had been granted us by the enemy, had been wasted in following the tedious pre-war official routine.

Just before the Admiral handed over control, the Mobile Brigade had the great honour of receiving a command from His Majesty the King to send to Buckingham Palace for his personal inspection a party of personnel and a sample of the various types of mobile anti-aircraft guns and searchlights of which their armament consisted.

The parade took place in the grounds of the Palace, where the King personally inspected the operations which were necessary to bring the various guns and searchlights into action. His Majesty was also graciously pleased to express his great interest in the considerable progress which had already been made in the novel science of anti-aircraft gunnery. His Majesty's approval was the more valuable to us as his own personal experience in the Navy had rendered him exceptionally competent to judge of the difficulty of the special problems presented, and of the success with which they were being studied and surmounted. The whole brigade, therefore, felt spurred on to still further efforts by the great encouragement afforded them by His Majesty's approval.

At this time the brigade was constantly exercised in taking up air raid positions at night. On these occasions, of course, no one except myself was aware whether or not the warning was a genuine

one, but the training afforded by these "practice" raids was excellent, and we were by these means constantly enabled to effect improvements in our organization and equipment. A quantity of suitable gun and searchlight positions were selected all round London, and these were occupied by whatever number of guns were available, on the outskirts north, east, or south of London, in accordance with the direction from which the warnings received indicated that an attack was to be expected.

In particular the practice enabled us to train our telephone operators in their duties, which were most important, as the success of our manœuvres during a raid depended to a large extent upon the instant and correct communication of all information as to the enemy's movements.

At each selected station a permanent wire was connected with the nearest telephone exchange, and to this, immediately on the arrival of the gun at such station, the operators proceeded to attach their field telephone, reporting at once to me at Headquarters over their own wire. Looking at the reports written at the time, which I have before me, the wonderfully short space of time, after the receipt of a "warning," in which the various stations reported their guns "ready for action" at their various stations, is surprising; for, not only were the distances great and the traffic frequently heavy, but, before reporting "ready for action," all instruments had to be unpacked and tested, the telephone connections made, the guns "jacked up" and levelled, and ammunition, fuses, etc., prepared.

As an illustration I will take a practice "turn

out" on December 28th, 1915, when most people were enjoying Christmas festivities, and men of the Mobile Brigade were far from being as well trained as they later on became.

On that occasion air raid warning was received at Kenwood Barracks at 6.17 p.m. By 6.20 p.m.—that is, in three minutes—the first gun left for its station. All the six guns then available were turned out, and the *last* of them left for its station at 6.25, *eight minutes only* after the first warning was received.

No. 1 gun was reported "ready for action" at Aldwych at 7 p.m.
No. 2 gun was reported "bogged" at Higham Hill at 7.35 p.m., "ready for action" at 8.20 p.m.
No. 3 gun was reported "ready for action" at Manor Park at 7.45 p.m.
No. 4 gun was reported "ready for action" at Becton at 7.24 p.m.
No. 5 gun was reported "ready for action" at Streatham at 7.24 p.m.
No. 6 gun was reported "ready for action" at Clapham at 7.20, though, owing to difficulties of making telephone connection, it did not so report till 8.20 p.m.

The average time occupied in reaching their stations and preparing for action was well under one hour.

With regard to this practice raid I see my report is supplemented by the following remarks:

"In view of the mobility shown by these guns, it is submitted that a further manœuvre might be carried out to demonstrate the possibility of these

guns "changing their positions" in the event of an attack developing from a contrary direction to that originally foreseen.

"Presuming that in consequence of information received the mobile guns took station on the northern outskirts to resist an attack from the north, and that subsequent information showed that the attack was developing from the south, it is submitted that notice could be given to the mobile guns to change position to southern stations, and that note could be taken of the time occupied in such manœuvre in order to show what advantage it might be possible to take of their exceptional mobility.

"A. RAWLINSON
"(*Commander, R.N.V.R.*).

"*December 29th*, 1915."

My suggestion was adopted and a trial was made in accordance with it, of which my report is not available but to which I will refer later on.

On the taking over of the London anti-aircraft defences by the Army, it will be of interest to examine the progress which had been made in their organization and armament during the five short months in which they were under the sole charge of Admiral Sir Percy Scott.

The table on p. 55 gives the details of the progress made. From this it will be seen that on September 15th there were *twelve guns only*. These were inefficiently mounted and of unsuitable calibre. By February 16th, however, *fifty guns* were already available upon suitable mountings, and a further *ninety-eight* were already far advanced towards

THE R.N.AA. MOBILE BRIGADE ON PARADE AT KENWOOD

No. 1.—Commander Rawlinson demonstrating the new high-angle anti-aircraft gun-mounting to H.I.H. the Grand Duke Michael of Russia and Admiral Sir Percy Scott.

No. 2.—L. to R.: H.I.H. the Grand Duke Michael of Russia, Admiral Sir Percy Scott, and Commander Rawlinson.

completion, the necessary high-angle mountings having already at that time been several months under construction.

GUNNERY DEFENCE OF LONDON.

Progress from September 15th, 1915, to February 16th, 1916.

Progress up to following Dates	Number of Guns Available						Total
	French 75-mm. Fixed Guns	6-pr.	3-in.	4-in.	4.7-in.	Mobile Guns	
15.9.15 -	—	4	8	—	—	—	12
13.11.15 -	—	4	11	—	—	9	24
17.1.16 -	—	12	18	3	—	9	42
16.2.16 -	1	17	18	4	—	10	50

Guns for which Mountings are being Made

4.7-in.	- - - - -	10
4-in.	- - - - -	4
3-in.	- - - - -	1
6-pr.	- - - - -	17
3-pr.	- - - - -	4
French 75-m.m. (possibly 34)	- -	30
15-pr. B.L.C.	- - - -	20
2.95-in. Russian	- - - -	12
		98
16.2.16 - Guns "Ready for Action"	- -	50
In Preparation	- - - -	98
Total of Guns provided for the A.A. Defence of London on 16.2.16	-	148

Still more important than the above number of guns was the fact that an adequate supply of efficient ammunition had been provided, capable of inflicting the maximum damage on the enemy's aircraft with the minimum risk of injury to the City and its inhabitants. A complete defence organization had also been established, gun and searchlight stations erected, and men enlisted and trained, whilst the formation of the Mobile Brigade created an exterior line of defence which was independent of the fixed defences and was capable of being employed, if needed, in other parts of the kingdom.

The task was so unusual, the difficulties so great, and the urgency so vital, that the success, which our most conscientious and capable Admiral had achieved in so short a space of time, will be allowed by all to have merited the hearty appreciation both of the Government and of the public. At that time, however, secrecy as to our measures of defence and their progress was indispensable, in order to avoid giving gratuitous information to the enemy with regard to our resources; no mention was therefore made of the efficiency with which Sir Percy had carried out his arduous and multifarious duties.

As he himself would be the last person in the world to draw attention to his success, I deem myself fortunate indeed to have at last an opportunity of enlightening the public on that point, although I have unfortunately not space enough to enumerate the half of the very gallant and indomitable Admiral's achievements in the successful discharge of his most onerous duties.

CHAPTER V

THE ARMY TAKES OVER CHARGE OF THE LONDON DEFENCES: EARLY RAIDS BY ZEPPELINS

When the Army took over charge of the London defences, the Mobile Anti-Aircraft Brigade came under the orders of Field-Marshal Lord French, Commander-in-Chief of the Home Forces, whose general headquarters were at the Horse Guards. This, however, was for "operations" only, and the force continued to be "supplied" and "paid" by the Admiralty.

My recommendations with regard to the advantages which it might be possible to obtain from the rapidity of movement, of which the brigade under my command was now capable, were seriously considered, and I received orders to carry out tests to demonstrate the accuracy of my estimates.

In early March, therefore, it was arranged that a practice alarm should be given and that the mobile guns should proceed to a line of stations covering the north of London. On all guns being reported "ready for action" in those stations, a further order was to be given that the attack was about to be delivered from the south, and that the guns were at once to "move" and to occupy a

line of gun-positions covering the approaches to the City from that direction.

This manœuvre was most successfully accomplished. I only regret that I have not a complete copy of my report upon it, and must therefore to a certain extent rely upon my recollection of the operations.

Amongst the many gun-positions with which our duties rendered us familiar, I am only able to recall *ten* which were occupied that night. The distances traversed, however, and the time occupied in carrying out the change of position, can hardly fail to be of interest, Central London in each case having to be traversed, and the change being ordered between 10.30 and 11 p.m., at which hour the street traffic is still heavy.

The stations which I recollect were:

North.		South.
1. Finchley.....	changed to	Wandsworth.
2. Palmer's Green	,,	,, Clapham.
3. Higham Hill	,,	,, Streatham.
4. Wanstead Flats	,,	,, Beckenham.
5. Beckton	,,	,, Grove Park.

The distance to be traversed from Higham Hill (just east of the reservoirs opposite Tottenham) to Streatham being the longest distance, and passing through the heart of the City, I took charge of that gun myself to "set the pace," and Captain Stansfeld, C.M.G., R.N., who commanded the whole R.N.V.R. force, came with me in my car, to make sure I did not "*set it too fast.*"

Anyway, we had a great drive, and although our distance was the longest, we reached our new position in as short a time as any other detachment; in fact, the Admiralty's own report of the operations, which I have before me, records that not six minutes elapsed, after the first gun was reported "ready for action" in its new station, before the last gun did likewise and the movement was complete, a fact which speaks volumes as to the skill and efficiency of the mobile force. The most instructive part of the operation, however, was that all guns had reported themselves to the Admiralty over their own telephones as "ready for action" in their new positions *within thirty-five minutes* of the original order being given to move.

This result was so convincing to the authorities, of the well-founded nature of the claims to exceptional mobility which I had put forward for my guns, that I was at once instructed to carry out a further test over much greater distances.

Of this long-distance trial I have the report before me, the main results being as follows:

Three separate sections were dispatched to three different stations.

Each section consisted of two guns, one ammunition-waggon, and one "general service" lorry (carrying the gun-crews).

Full gun-crews, telephone staff, and all instruments and equipment were carried.

Each section was under the command of its own regular officer.

The stations, times, and distances were :

Station	Distance	Left Barracks	Reported Arrival	Time in Transit	Average Speed
Great Dunmow	45 miles	10 a.m.	11.10	1 hr. 10 mins.	36½ m.p.h.
High Wych	25 „	10 a.m.	10.45	45 mins.	32 „
Malden	48½ „	10 a.m.	11.23	1 hr. 23 mins.	35 „

The total car mileage covered during the operation was 958 miles, giving an average of nearly 80 miles per car. As evidence of the efficiency of the mechanical staff, it should be noted that no involuntary stop was made by *any* car, whilst the fact that no accident of any sort occurred, even at the high average speed which was maintained throughout, furnished conclusive proof of the skill and training of the drivers. This was especially remarkable as all started at the same time, and, as long as the columns followed the same road, their march became a veritable "road-race" between them. If I have, as I hope I may, any readers who take an interest in motors, *they* will realize at once, as I did at the time, that this was really a wonderful performance. Those who drive much know what the maintaining of an average speed of only 25 miles per hour entails, even in a light touring-car. These, however, were heavy guns and lorries fully loaded. It cannot, therefore, fail to be appreciated that these drivers were the right stuff for the job, that they had been exceptionally well trained in a good school, and that, in fact, they were just the men that people in London would wish to see driving

the guns to their positions when the enemy were about to attack, and the bombs about to fall, as they could rest quite confident that NO TIME WOULD BE WASTED ON THE ROAD. The authorities were of that opinion also, I think, though very little was said about it at the time.

One result of these trials was that we soon began to receive orders to prepare to dispatch guns and crews for duty in many other parts of the country, but more raids were to come before that position developed.

On March 31st we turned out twelve guns and two searchlights, on receiving the report that Zeppelins had crossed the coast; but though we received further news of them and they came within hearing of some of our stations, yet none of our guns came "into action." We were, however, very considerably "heartened up" by hearing, at 2.35 a.m., that the Commander-in-Chief at the Nore reported a Zeppelin on the surface of the water at the mouth of the Thames, and that destroyers had been sent out to take possession of it.

This proved to be a valuable capture, as much was learned as to the progress made by our enemies from the examination of the crew. On being brought ashore, the prisoners, instead of being at once shot, as they appeared to expect, were immediately separated from each other. Each was subsequently examined individually, and from a careful study of their various statements it became easy to distinguish which of them were true and which were false. The second officer of the airship,

on his arrival on shore, acted with a childlike innocence and candour which was not without its humorous side.

On being informed that he was not to be shot on the spot, he at once asked that his sister might be communicated with and informed of his safety. On this being instantly agreed to, he then furnished his sister's name and address. It appeared that she was the wife of a well-known landed proprietor in the Eastern Counties, and had been living there for years. Her brother, the Zeppelin officer, having often stayed there, was thus perfectly familiar with the country, and his local knowledge had no doubt proved of the utmost value in guiding the movements of the enemy's airships.

A suitable party was, of course, duly dispatched to advise his sister of his safety, and, having done so, did not fail to see that she accompanied them on their return, and resided in future in a spot where her services would no longer be at the disposal of the enemy during the remainder of the war; that, of course, representing the humorous side of the incident—at any rate, *to us*.

On the night of April 2nd we turned out thirteen guns and three searchlights, and occupied eight stations, in response to the Field-Marshal's warning received at 10.58 p.m. "Bombs" were dropped, and Zeppelins both heard and seen by some of our stations that night, but none of our guns "came into action," as the fog was thick on the ground and visibility very bad. Guns returned to barracks 5 a.m.

On the 3rd we again turned out thirteen guns

and three searchlights and occupied seven stations, but though Zeppelins crossed the Yorkshire coast, yet they apparently were lost in the fog, which was very thick in all parts of the country, and no action resulted.

About this time Zeppelins made several raids on the northern portions of the country and on Scotland also, as they doubtless discovered that, in the foggy weather which then prevailed in the South, easier objectives were to be found in the North, and London therefore enjoyed a short respite. The northern districts, however, very naturally clamoured for defence, and as the Mobile Brigade was the only force immediately available, I received orders to detach guns and lights immediately for the defence of the cities of Dundee, Edinburgh, and Sunderland, a stronger party being at the same time detached to North Walsham to operate in defence of the Norfolk coast.

This, of course, was a great compliment to our mobility and efficiency, but it left us sadly short of guns, men, and particularly of officers. At the same time we received a further compliment from the military authorities, in that they sent us squads of officers and men of the Army, to occupy the quarters of our men who were on detachment, and to be trained by us for anti-aircraft duties on the French guns which were to be mounted in the fixed defences of London.

Matters were in this condition when on April 24th, 25th, and 26th a further succession of three raids was delivered. On these occasions we were only able to turn out three guns and one search-

light, and our staff of executive officers was reduced to one (myself). The three guns, however, were manned, and the military detachment under instruction was utilized for the manning of one of them, whilst I proceeded myself with one "auto-canon" to the "trap" position—of which a description will be given later—which lay 20 miles distant in the open country east of London.

On the 24th the warning was received at 8.15 p.m., and the guns proceeded immediately to their stations. Searchlights were "switched on" at various times and places in the fixed defences during the night, but no enemy materialized, and our guns returned to barracks at 5.30 a.m.

On the 25th the warning was received at 10.57 p.m.; at 11 p.m. information was received from the Horse Guards that one or more Zeppelins were at that time south of *Romford,* 12½ miles from Liverpool Street, and that I could use my own discretion where I brought my guns into action. As we had then received our first warning of the raid *exactly three minutes previously,* it may be imagined that my gun had not, at the moment, got very far on its road to its position 20 miles distant. As a matter of fact, it was actually in the barrack yard, just ready to start.

I gave instant orders, however, that telephone connection should be at once made with an "emergency station" which we had established on Hampstead Heath, one minute's drive from barracks, and jumped on to the gun myself to take it there. At the very moment of starting, when the sky was

already stabbed by the beams of searchlights in all directions, glancing up I saw a Zeppelin several miles to the eastward, heading south, and instantly jumped down again and prepared the gun for action where it stood in the *very centre of the barrack yard.*

Here indeed was a situation the possibility of which my wildest dreams had never contemplated. As, however, the airship continued on its career southwards, out of range of the gun, we soon afterwards moved off to the emergency station at the top of Hampstead Heath, where we could see much better, and from whence we hoped we might at any rate obtain a chance of "saluting" the enemy on his homeward road. However, as we saw no more of him, we shortly afterwards moved off to our proper station 20 miles away, where we passed the rest of the night without further incident, returning to barracks at 5.30 a.m.

On the 26th we again turned out three guns and a searchlight between 10 and 11 p.m.; aircraft were heard overhead at several stations, and searchlights were switched on, but no enemy was seen, and guns returned to barracks at 4 a.m.

These three raids came on *successive nights,* at a time when our headquarters staff was greatly weakened, and the strength of the brigade much reduced by sections detached for purposes of "coast defence." During the day, also, my time was more than occupied with the ordinary multifarious duties which fell to my lot, in addition to the extra work entailed by the training of the military detachments

attached to our headquarters for instruction. On May 5th, therefore, I forwarded the following memorandum :

From
O.C. MOBILE BRIGADE,
KENWOOD BARRACKS,
5.5.16.

To
O.C.
R.N.V.R. ANTI-AIRCRAFT
DEFENCE FORCE,
ADMIRALTY.

"SIR,

"I desire to call your attention to the present situation at these barracks.

There are here at the present time	7 mobile guns, 1 mobile searchlight.	
Arriving next week ...	2 mobile guns.	
Total	9 guns and 1 searchlight.	
R.N.V.R. ratings now in barracks (including H.Q. staff and sick)	Mechanics	41
	A.B.'s	22
	Total "ratings"	63
Military detachment for instruction		48
Total		111

Grand total ... 111 men, 9 guns, and 1 searchlight.

"There is at present available for duty *one* executive officer (myself).

"I submit that I am unable *alone* to conduct the ordinary duties of the barracks in the usual manner, and I desire to place the fact on record *now*, in event of any future irregularity or inefficiency occurring.

"I have the honour to be, sir,
"Your obedient servant,
"A. RAWLINSON
"(*Commander*)."

What was the exact effect of this effusion I do not know, but I am convinced I must have been pretty well "worn out" and very "anxious" before I wrote it. On considering all the circumstances and

the possibilities, however, I am not now surprised that I considered some such statement to be necessary at that time.

On April 24th our detachment on the Norfolk coast was also "in action," and reported as follows :

"*Operations of Detachment of R.N. A.A. Mobile Brigade at North Walsham,* 24/4/16.

"8.40 p.m.—Field-Marshal's warning.

"12.5 a.m.—Very heavy bombs about 10 miles W.S.W.

"12.25 a.m.—Airship heard approaching from W.S.W. Searchlight switched on. Bombs dropped, one of which put our searchlight out of action. Sky was overcast, and without the light we were unable to see the enemy.

"1.30 a.m.—Airship heard approaching from N.W. Searchlight, having been repaired, was switched on, picked up the target, and kept it well in the beam. Four or five bombs were immediately dropped at the light, but no casualties occurred, and it remained effective. Both guns opened fire at range 2,000 yards, altitude 7,000 feet. Range was obtained at the second round. All shells burst close round the target. No. 3 gun fired eleven rounds; No. 4 gun fired seven rounds; No. 3 gun scored a *hit,* as per evidence attached.

"4.40 a.m.—Coastguards reported they could see a Zeppelin in difficulties about 10 miles out to sea. Observation was kept on it by telescope until 5.15 a.m., when it finally disappeared.

"*Note.*—The following independent witnesses state that they observed the hit :

1. Lieutenant Mackenzie Ashton, R.N.V.R., and gun-crew at Bacton.
2. The Coastguards at Bacton Coastguards' Station.
3. The Officer Commanding the military patrol at Walcott Gap.

4. Chief Petty Officer Smith and gun's crew at Somerton.
5. The Officer in charge of the Armoured Train at North Walsham.

"Their statement is that 'they observed the Zeppelin to be hit in the after part of the hull near the rudder, the stern giving a sudden drop when struck, but afterwards recovering its horizontal position.'

"Chief Petty Officer Lyne was in charge of the gun.

"A.B. Wesley was the gun-layer.

"I wish to bring to your notice the excellent manner in which all hands carried out their duties, as in spite of bombs falling all round them, which they could all hear descending, all remained perfectly calm and 'carried on' as if at drill.

"I have the honour to be, sir,
"Your obedient servant,
"P. A. MACKENZIE ASHTON
"(*Lieutenant, R.N.V.R.*)."

NORTH WALSHAM,
24.4.16.

Such was the report of my officer on that occasion, which was duly forwarded by me to the Anti-Aircraft Headquarters in London, but I am not aware that the hit was ever acknowledged. My own note covering this report may be of interest, and is as below:

"It is reported to me that, though one of the operators was blown off the searchlight and rendered unconscious by bomb concussion, and that the light was at the same time extinguished, the repair of the searchlight was immediately undertaken, and completed in time to enable it subsequently to take further part in the action.

"Taking the above in conjunction with the satis-

factory working of the guns, under what appears to have been a considerable fire of bombs, I trust the spirit and efficiency of the men will meet with your approval."

"(*Signed*) A. RAWLINSON
"(*Commander*)."

More guns now began to come to hand, and especially the 3-inch 20-cwt. gun, for which we had had a special mounting made by the orders of Sir Percy Scott.

This mounting was constructed by Mr. R. E. L. Maunsell, the Chief Engineer at the South-Eastern Railway Works at Ashford, the design having been prepared by Mr. Whale, the designer of Messrs. Armstrong, Whitworth and Company, in conjunction with myself, and under the supervision of Sir Percy Scott. This entirely novel design proved a great success, and we were later on called upon to come into action on the Horse Guards Parade with it, in competition with the latest mounting of a similar kind which had been produced at Woolwich, and which was manned by R.G.A. personnel. The following extract was taken from the *Daily Telegraph* of Saturday, May 20th, 1916, and gives a short account of that incident:

"*New Anti-Aircraft Guns.*

"The King paid a visit of inspection to the Horse Guards yesterday morning, and witnessed part of a competition in progress on the parade ground between two anti-aircraft teams.

"Field-Marshal Viscount French, Admiral Sir Percy Scott, Mr. Balfour, and a number of other naval and military officers witnessed the proceed-

ings, as also did a crowd of spectators. The guns were of the new type and were drawn by motor-cars. The two guns were brought into position in front of the Admiralty, and the heavy weapons were brought into action with extraordinary celerity.

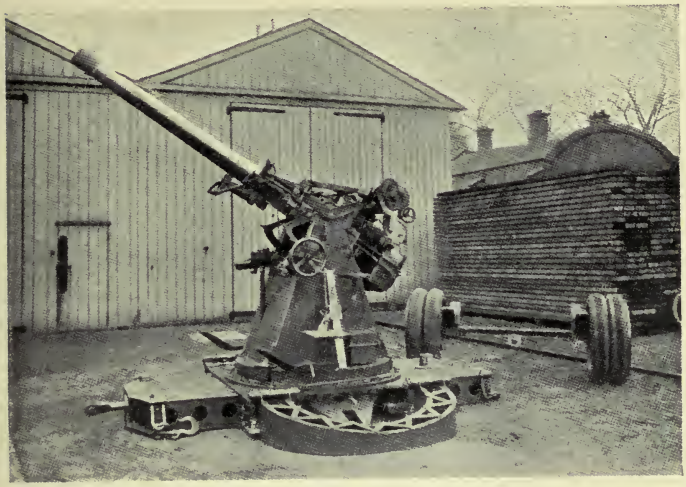
At the finish of the inspection they were taken round the parade ground until a speed of 40 miles an hour was attained by the R.N.V.R. gun, which was magnificently handled and proved itself far superior to the Woolwich product.

"The performances of the two crews were greeted with very hearty public applause, and Viscount French and his staff cordially congratulated the officers in command. The two guns, with their motors, were subsequently driven away at a rapid rate."

During the month of May the General Headquarters Staff of the Home Forces at the Horse Guards was diligently occupied with the organization of the anti-aircraft forces which were being generally called for all over the country, for defence against the enemy's raids. The officers and men required for the various classes of batteries and brigades were officially enumerated, and the whole organization was sketched out to the last detail. This was a comparatively easy matter for the officers to whose department this duty fell, who were familiar with every detail and military requirement of the British guns and men. When, however, it came to the French guns and equipment and the personnel required for their efficient working, they found themselves entirely at sea; and in the case of a mobile force such as I had the honour to command, they were even more so, as no such class of *automobile* guns existed in the British Army.

THE "TRAILER" MOUNTING

Specially designed and constructed for a 3-inch 20-cwt. Q.F. gun of the R.N.AA. Mobile Brigade.



No. 1.—The "trailer" gun "ready for action."

No. 2.—Ready for the road, Commander Rawlinson on left.

It was proposed that the Mobile Brigade should eventually consist of sixteen 75-mm. French auto-canons, which should operate in sections—that is, in pairs, that being the unit employed by the French Army, for which all the French equipment was designed and prepared. Mobile searchlights were also to permanently form part of the brigade. In view, however, of the delay which might be expected to occur before this force was available, I received instructions that the "establishment" contemplated for the moment was eight mobile guns and eight mobile searchlights, for which force, according to the regulation Army strength of personnel laid down for British guns and automobiles, they proposed to allot me 16 officers and 386 men. At the same time, I was asked to furnish an opinion as to what I considered my requirements in the shape of personnel to be.

I have before me a copy of my answer, which is particularly "illuminating," as showing how costly in man-power is the British system of Army Service Corps personnel in addition to military gunners in the case of a mobile force.

My answer was as follows:

"*Army establishment* for eight 75-mm. mobile guns and eight mobile searchlights: Officers, *16;* men, *386.*

"I estimate that, with *naval* personnel under our present conditions of Admiralty supply, I can man, detach, and mechanically upkeep *sixteen* 75-mm. mobile guns (acting in pairs—*i.e.,* the French unit) and *eight* mobile searchlights with—Officers, R.N.V.R., *11;* naval "ratings," *300.*

"That is, with *5* officers and *86* men *less* than the numbers of the military establishment allowed for *half that number of mobile guns* and the same number of searchlights."

"The strength under my command on May 31st being *7* officers and *193* men, I should only require *4* additional R.N.V.R. officers and a further *107* naval "ratings" to complete the personnel necessary for operating the whole *16 mobile guns* and *8 searchlights*."

"(*Signed*) A. RAWLINSON
"(*Commander*)."

This statement was so surprisingly at variance with the Army customs, that I was immediately called upon to explain how such a position became possible. This I was only too happy to do, as the facts were beyond dispute, and reflected upon the main principles upon which the Army mechanical transport was organized.

The explanation was, of course, that, as the mobile force under my command had originated from a squadron of naval armoured cars, we had our own mechanics, mechanical stores, repair department, etc., and took entire charge of our motors. At the same time, the whole force was self-contained, the mechanics learning gunnery duties and the gunners rudimentary mechanics, so that each class of "rating" was able to help the other, and all became practically interchangeable when required; all mechanical stores being drawn from the Admiralty, and mechanical repairs executed by our own mechanics, on my responsibility as commander without the intervention of any other department.

In the Army, however, every detail which has to do with the mechanical equipment is under the charge of the Army Service Corps Mechanical Department, to whom all requirements have to be referred, and by whom all mechanical parts are supplied and repairs effected. The mechanical personnel is therefore entirely separate from, and in addition to, the remainder. Much time is therefore lost, and in many cases two men are required to do the work which might easily be done by one only, and the expense is proportionately increased.

My very "revolutionary" statement was very well received at General Headquarters, and it was allowed to be correct in the case of the quite exceptionally constituted force under my command. The Naval Mobile Brigade was, indeed, entirely outside all the usual customs and regulations of the Army. It was nevertheless recognized as being remarkably efficient, and therefore, in the face of the urgent demand for defence, to be encouraged rather than immediately disbanded; especially as no other similar force was then in existence to replace it. The situation, therefore, was accepted, and the immediate result was that I was supplied with some more R.N.V.R. officers and informed that I should be allowed to increase the personnel further by special enlistment, as and when more guns became available.

In the meanwhile many officers and men of the R.G.A. were attached to us for instruction in the handling of the 75-mm. French guns, which were to be mounted in the London anti-aircraft defences.

CHAPTER VI

THE SUMMER RAIDS, 1916: HEADQUARTERS OF ROYAL NAVAL MOBILE BRIGADE AT KENWOOD BARRACKS, HAMPSTEAD—DETACHMENTS ON THE EAST COAST

THE stables at Kenwood, which, with the consent of the Grand Duke Michael, the occupier, and of Lord Mansfield, the owner, we had taken over for use as barracks, answered admirably for that purpose.

The total strength of the brigade on June 27th, 1916, is shown on pp. 76 and 77, one detachment having then rejoined headquarters from Dundee.

This force was accommodated in the barracks, and room was left for still more men should they be required. The barrack routine was carried on as on board ship, and all "ratings" slept in hammocks which were "stowed" every morning as on board His Majesty's ships. Kitchens and a canteen and recreation room had been constructed on the premises, and all the buildings were well enclosed and were quite private, being built round a large yard in which our drill and gun instruction were carried out. We had also our own telephone switchboard, worked by the somewhat elaborate staff of expert

INSPECTION OF THE R.N.AA. MOBILE BRIGADE BY ADMIRAL SIR PERCY SCOTT AT KENWOOD HOUSE, DECEMBER, 1915.

No. 1.—The brigade on parade.

No. 2.—Commander Rawlinson inspecting the guns' crews.

telephonists which was called for by the peculiar nature of our duties. The barracks, in fact, answered our purposes admirably. Above all, both guns and men were under one roof, and were instantly available to proceed anywhere at any time.

The Grand Duke and his family were in residence at Kenwood House all the summer, and I received frequent invitations to join their hospitable board, whilst they were on all occasions most kind to the officers and men of the brigade, giving them the use of both a cricket ground and a golf course in the grounds, so that even during their hours of relaxation the men were still instantly available if required.

It became my custom, after any specially interesting raid, to go across to the Grand Duke's house at Kenwood, where I always received a cordial welcome, to have breakfast, and during that meal to tell them the various incidents of the night.

On those occasions the contrast between the atmosphere of that happy family home, and that of the miserable districts in which so much of our work was done, was most striking. For, even if the conditions in the East End of London during the raids were exceptionally miserable, there is no doubt that conditions at the Grand Ducal breakfast-table were exceptionally enjoyable; and the most remarkable beauty and charm of the ladies, as well as the deep interest which all invariably displayed in the events of the night, served to emphasize the contrast in a manner of which I shall always retain a most vivid and delightful recollection.

PARADE STATE.

ROYAL NAVAL MOBILE A.A. BRIGADE.

KENWOOD BARRACKS, JUNE 27, 1916.

"Assembly" sounded at 10.30 p.m. All vehicles had left barracks by 10.38 p.m.

Vehicles left positions outside barracks in sections at 10.44 p.m., took up positions in a private road about half a mile from barracks, exercised action, and returned to barracks by 12.40 a.m.

On Parade : 6 Officers. 4 C.P.O.'s. 5 P.O.'s. 38 other R.N.A.S. ratings. 50 other R.N.V.R. ratings.

	Officers.	Men.	Guns.	Searchlights.	Vehicles other than Gun and Searchlight Cars.
Headquarter Staff:					
Commanding officer	1	—	—	—	1 C.O.'s car
Orderly officer	1	—	—	—	—
Surgeon	1	—	—	—	—
Catering C.P.O.	—	1	—	—	—
Mechanical P.O.	—	1	—	—	2 light lorries
Repair staff	—	2	—	—	2 G.S. waggons
C.O.'s driver	—	1	—	—	—
Cyclists	—	2	—	—	5 cycles
Telephone operator	—	1	—	—	—
Cooks, orderlies, storekeepers, etc. ..	—	5	—	—	—
Guard	—	5	—	—	—
Total	3	18	—	—	10 other vehicles

Headquarter Gun Sections:	*In charge of:*					
1. Havering ..	C.P.O. Flatt ..	—	22	2 75-mm.	1	1 caisson
2. Rainham ..	Sub-Lt. Jackson	1	15	2 75-mm.	—	2 amm. lorries
3. Wanstead Flats	Sub-Lt. Nelson	1	9	1 3-in.	—	1 amm. lorry
4. Palmer's Green	Sub-Lt. McGrath	1	16	1 3-in.	—	1 ,, ,, 1 tractor 1 lorry for carrying lifting tackle
5. Acton	P.O. Bacon ..	—	17	2 3-pdrs.	—	1 amm. lorry
Total	5 Stations	3	79	8	1	8 other vehicles
	Men sick ..	—	3	—	—	—
	Men on leave ..	—	13	—	—	—
TOTAL AT HEADQUARTERS	Headquarter Staff and 5 Stations	6	113	8	1	18 other vehicles
On Detachment:	*In charge of:*					
1. North Walsham	Lieut. Ashton ..	1	25	2 3-pdrs.	1	2 amm. lorries
2. Sunderland ..	Sub-Lt. Booth	1	26	2 3-pdrs.	1	2 ,, ,,
3. Edinburgh ..	Sub-Lt. Curwen	1	26	2 3-pdrs.	1	2 ,, ,,
Total	3 Stations	3	77	6	3	6 other vehicles
BRIGADE TOTAL	Headquarter Staff and 8 Stations	9	190	14	4	24 other vehicles

(*Signed*) A. RAWLINSON,
COMMANDER, R.N.V.R., O.C. R.N. MOBILE A.A. BRIGADE.

On July 9th we received warning of a raid, and turned out eight guns and one searchlight. Five stations were occupied to the north of London, the force on parade consisting of 6 officers and 113 men, but the enemy did not reach London and no action resulted. Our detachments on the East Coast were also called out during the month, but no Zeppelins were seen except on the night of the 30th, when our detachment on the Norfolk coast had one in sight for some time although it never came within range of their guns.

On the night of August 2nd and 3rd, however, our North Walsham detachment was "in action" on the coast, near Bacton, on two separate occasions during the night. Many bombs were dropped in the surrounding country, but the enemy seemed unusually fearful of our gun-fire and, increasing their speed, rose to great altitudes immediately they were fired at. This appeared to indicate that the *hit*, previously recorded as having been made by this detachment, had not been without its effect upon the enemy; who treated our guns and our privately designed high-explosive ammunition—in that district, at any rate—with a respect which we considered very flattering.

In the intervals of raids and training during the summer, I was very frequently required to go to France on questions of supply for our mobile French guns, ammunition, and equipment; and also to see that adequate supplies were kept up for the thirty-five French guns which were then being supplied for the fixed defences of London. On these

occasions I kept in close touch with all the experiments and improvements which were being carried out in anti-aircraft gunnery by our allies in France.

I regularly visited the French Anti-Aircraft School at Arnouville, near Paris, the Commandant of which was an old friend of mine, and was present at many of the more important experiments which were carried out both there and at the École Pyrotechnique at Bourges, with a view to the improvement of anti-aircraft sighting and ammunition, and of the various "aerial," range and height-finding, instruments generally.

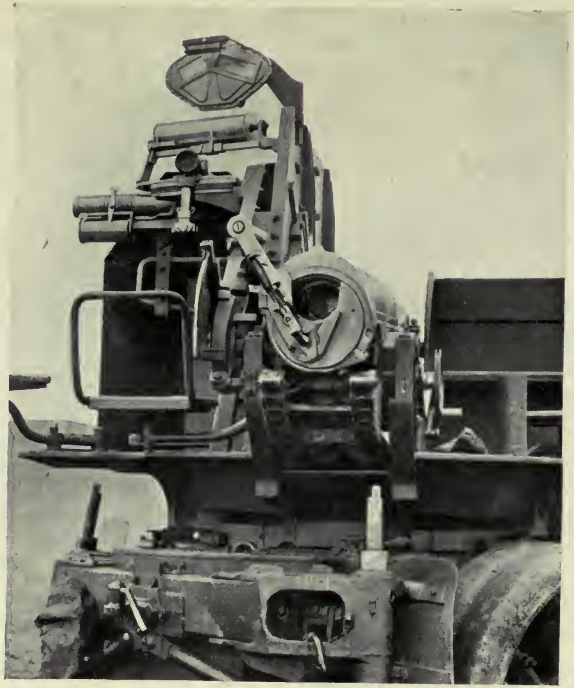
The most interesting of the inventions was a certain "electro-magnetic" system of sighting, for use against aeroplanes. This was produced by a very gifted French engineer, M. Brocq. It was an entirely novel and automatic system of sighting, and was subsequently adopted in the French Army with conspicuous success. The inventor was kind enough to present me with a set for demonstration purposes, and I gave a demonstration of the working of the device at Fourth Army Headquarters in France just previous to the commencement of the Somme battle in 1916. The system, however, was too great an innovation to be adopted for the British anti-aircraft guns at that time. The date of the demonstration remains in my recollection, as, leaving the Front in my car during the preliminary bombardment before our men first went "over the top" on the Somme, the "drum fire" of our guns was plainly audible to us, on this side of the Channel, all the way to London.

The Brocq system itself is so ingenious that a short description of it may be found of interest.

In all anti-aircraft sighting, it is necessary to consider the two different senses—*i.e.*, planes—in which the movements of the aerial target take place: the one vertical—that is, "up or down," the other horizontal—that is, "right or left." The guns, therefore, in all cases require to be "swung" in *both* these "planes" simultaneously, in order to follow the course of the target in the air.

The movement of the gun in each "plane" is controlled independently by a separate member of the gun's crew, who is furnished with a telescope which moves with the gun, and which it is his duty to keep fixed on the target. Thus far, the necessary manœuvres are common to all guns and are comparatively simple. The difficulty, however, with a fast moving aerial target, is to correctly estimate the speed at which the target is moving in *each* sense, and to give the necessary "correction"—that is, "divergence" between the line of sight of the telescope and the line of fire of the gun in *each* "plane"—which will result in the placing of the shell the right distance to the right or left, and above or below the target. This is the only means by which it can be ensured that when the "time of flight" for which the fuse of the shell is "set" shall have elapsed, the target and the projectile shall *arrive simultaneously* at the *same identical spot in the heavens*, with disastrous results to the target and to the great satisfaction of the gunners.

It is to the reliable automatic performance of



"Ready for action" in gun-pit; elevation about 60°.

French "goniograph" anti-aircraft sights—E.M. corrector dials at top, gun-"housed" breech open.

this exceptionally difficult task that many of the brightest brains, on both sides during the war, devoted much mental effort. The solution of the problem effected by the electro-magnetic system of M. Brocq is by far the most practical and ingenious which I have seen, and achieves the above apparently impossible feat in the following manner.

Two more telescopes are provided, which are placed some little distance from the gun and work independently of each other and of the gun. Each of these telescopes moves freely in one "plane," but is operated by a "gear" in the other "plane." These two "gears" are each set in motion by the turning of an independent handle. The turning of a handle, therefore, is necessary to enable each telescope to be kept "on the target," and the movement of each handle therefore represents the movement of the target in either the "horizontal" or the "vertical" plane as the case may be.

To each of these handles is attached the "armature" of a separate magneto, so that, as they are turned, an independent electro-magnetic "current" is set up by each. These currents vary, in force and direction, according to the "speed" and "sense" in which the respective handles are turned. The speed and direction, of the movements of the target through the air, are thus *translated,* by means of these handles, into electric currents which vary in a corresponding measure.

The currents are then carried through a "rheostat" (an instrument for varying electrical resistance), where their "strength" is varied according

to the "range"—that is, according to the distance of the target from the gun. From the "rheostat" each of these currents goes direct to its own separate "dial" on the gun, where needles record their *power* in terms of "degrees" and "minutes," and their *direction* as "plus" or "minus" in the vertical plane, and "right" or "left" in the horizontal plane.

These are the "degrees" and "minutes" of the angles of "deflection," which it is necessary to give in the sense indicated, to the axis of the gun in each plane, in relation to the line of sight of the gunlayer's telescope, in order that the projectile and the target shall meet at the expiration of the time of flight of the former.

Two "sight-setters" are provided, whose duty it is to "deflect" the telescopes of the gun-layers in accordance with the "correction" required. The gear by which this operation is effected also records the angle of "deflection" actually given. In the case of the electro-magnetic corrector (as the Brocq instrument is called) the "deflections" given are recorded by needles acting on the *same dial* as the needles which record the strength and direction of the currents. It is only necessary, therefore, for the "sight-setters" to deflect the telescopes so that their deflector needles shall follow the movements of the electric needles on the *same dials* to ensure that the "corrections" made correspond exactly to the movements and speed of the target as recorded by the electro-magnetic currents.

Although this device is somewhat difficult to

explain, yet in its working it is extremely simple; and should the target, during the "time of flight" of the projectile, continue to follow the same course at the same speed as it was doing at the time the gun was fired, its fate is certainly sealed. It must, however, always be impossible to control the flight of the projectile *after it has once left the gun,* and the possibility of unforeseen movements of the target *during the "time of flight" of the shell* must therefore always impart a certain element of uncertainty to anti-aircraft fire.

It may be of interest here also to describe the "trap" gun-position which has been previously referred to. It was well known to us that every effort was being made by the enemy to locate the various fuse and ammunition factories which were at this time in course of erection in all directions round London, with the object, of course, of their destruction by bombs from the Zeppelins. Under these circumstances a peculiarly bright "brain wave" originated at General Headquarters, Home Forces, which resulted in the reservation of a special tract of ground to the north-east of London, a little east of the course usually followed by the enemy's airships on their way from the coast.

This tract was enclosed, and treated as "secret ground" under military protection and supervision. Nobody was allowed access to it, and it was quickly understood in the neighbourhood that important secret manufacture of explosives was being carried on there by the Government. In actual fact, the only plant established there was a certain

outfit of electric lights. These could be turned on when required, and produced the effect of a factory working overtime when seen from the air at night.

In certain prominent positions in the vicinity we had established gun and searchlight stations to which we repaired on receiving warnings of the Zeppelins' approach. The lights of the "trap" were then turned on, and it was always hoped that the "bait" might prove attractive, and that some satisfactory shooting might be obtained. However, although I have been there during several raids myself—in the absence of any other available officer—and have heard many sounds of aircraft passing in every direction, I have no recollection of any gun having ever actually "come into action" there, and could not help reaching the conclusion that the "secret" of the place was at any rate no "secret" to the enemy.

The drive to this position on raid nights was always most interesting. It was necessary to travel right across the poorer districts of the north and north-east of London, passing just south of the end of the line of reservoirs on the River Lea. These sheets of water formed the principal marks from which the airships took their bearings on approaching London from the north-east. On the approach of the guns, on their way to their stations, the whole population of this district invariably "turned out" and gave us a reception which was always most gratifying. It is difficult to describe the feeling shown, nor by what means its absolutely spon-

taneous and genuine character was brought home to us. It was, however, impossible to mistake the sentiments of the people, and I have often seen poor women with streaming eyes, holding up their children to see the guns as they passed, making it easy for us to realize the relief which it must have been to these poor defenceless people to see that at any rate some sort of defence was being provided for them, and that the wholesale murder and destruction of which they had seen so many instances could now no longer be carried out by the enemy without risk of punishment. Such sights as these were not without an excellent effect upon our hard-worked men, who were thereby sensibly encouraged to further efforts, till they considered no task too hard or day too long which would enable them to add to the efficiency of the defence of these poor helpless women and children who reposed such pathetic trust in their protection.

On the arrival of our later auto-canons from France, we found that the French had "camouflaged" them in a truly remarkable and most effective manner. It was, in fact, hard to conceive that any colour existed which was not to be found somewhere in the kaleidoscopic and dazzling appearance which they presented. I inquired, of my friends at the Paris Arsenal, who was the genius responsible for the production of this remarkable colour effect? I was then told that one of their mechanics happened to be, in civil life, the "painter" who was responsible for designing and producing the scenery at the opera, and

that, having been given a "free hand" and every kind of paint, he had succeeded in producing the astonishing works of art with which they had had the honour of supplying us.

As I was personally strongly of opinion that we should shortly be subjected to attacks by day as well as by night, I obtained leave to bring the remainder of the vehicles of the Mobile Brigade up to the standard of colour of these most artistic French productions. With my French friends' hint to guide me, I therefore inquired whether, amongst the "galaxy of talent" of every sort of which our men formed such a unique example, there was not perchance to be found a "scenic artist" (which I believe to be the correct English term) who was capable of at least equalling these French *chef d'œuvres* (masterpieces)?

I was immediately informed that we had, in fact, a "rating" who knew the job by heart, and could paint "everything anything," "to look like nothing" (*sic*). As that appeared to be a qualification upon which it would be impossible to improve, he was given plenty of paint and a car and told to "carry on." The result exceeded our wildest hopes, for, when the car was brought out to be inspected, it appeared as if the whole Zoo was sitting on it. It fairly dazzled the eyes, with the stripes of the tiger and zebra, the spots of the leopard and giraffe, intermixed with the vivid colours of certain portions of the baboons and the birds of paradise. That, of course, was at close quarters, but at a distance it was every bit as

invisible, against any background, as was the French opera expert's production.

In order to test the efficiency of our colour scheme, we proceeded, upon one of our practice drives, to Chobham Common. There we stationed various guns in various positions, and then searched for them from a distance of four or five miles with telescopes. The guns which were painted the ordinary naval grey were clearly visible, but both the French and English artistic productions were quite invisible, and from that day onwards all our cars were similarly treated.

On our return from this practice march, we had the only accident which I ever personally saw during my period in command of the brigade. On reaching Virginia Water on our return to London, in order to practise our spare drivers in driving the guns on narrow by-roads, we left the main road and cut across through narrow lanes to rejoin the main road again at Staines Bridge. On reaching the bottom of the steep hill on which stands the giant construction erected by the late lamented Mr. Holloway, the "pill expert," the surface of the narrow lane gave way under the weight of one of the guns. The famous auto-canon then promptly disappeared into a deep and very boggy ditch, from which no means at our disposal sufficed to drag it out again.

Being afraid to use the other guns for the purpose of towing, in case the road might give way further and so engulf the whole battery, I cast about the country to see if I could not assemble a number of

horses sufficient to pull the gun out of the bog. Whilst so employed, I had the good fortune to come across a very forlorn and desolate-looking "traction engine" in the corner of a field, and hastening back to the column I, with every confidence in the resources of the brigade, called for a man to stoke up and drive a traction engine!

A certain Yorkshireman at once stepped forward, and coal having been procured, he quickly got steam up, and very soon appeared rattling the old engine along like a motor-car, and whistling his delight on the steam whistle with deafening persistency. A wire hawser was promptly attached to the gun, and with a great "plop" it was dragged out of the deep hole in which it had been so contentedly reposing. The motor then being promptly started up again, the column made their way home without further incident. The only difficulty we experienced was in getting our Yorkshire "rating" to *part* with his traction engine, which he was most anxious to drive home in rear of the column, as he explained, "in case of further accident."

One evening early in August at about 6.30 we quite unexpectedly received orders that the brigade was to move to Norfolk, and to there extend along the coast either side of the north-easterly point which is marked by the Happisburg Lightship. It was explained to me by General Headquarters, Home Forces, that the move was urgently called for, and that it was considered that, by attacking the airships on the coast, it might be possible to so hamper their concerted movements as to render

their reaching their main objective—the City of London—a matter of much greater difficulty.

I was then asked "how soon could I be ready to move?"

My immediate answer, I afterwards understood, caused considerable surprise, and great doubts were entertained whether we could by any possibility carry out the operation in the time I suggested. It was 6.30 p.m. when I received the order, and I informed General Headquarters that I could march out of our barracks in London with the whole brigade at daylight next day, and have the guns in position on the Norfolk coast before dusk that night—that is, within twenty-four hours of the original and unexpected order.

I received orders to "carry on," and there was, of course, no sleep for any member of the brigade that night. All kit, however, was packed during the night, and at 3.30 a.m. the whole brigade paraded, leaving by road at the first streak of dawn. In the meanwhile I telegraphed to Lieutenant Mackenzie Ashton, the officer in command of our detachment at North Walsham, to obtain a field for us to pitch our camp in, and to meet us himself at the outskirts of the town at 1 p.m. next day. A party was left behind to collect the heavy baggage and to bring it on by train, and thus we left the barracks where so much good work had been done and progress made, and to which we were not destined to return.

CHAPTER VII

THE MOBILE BRIGADE ON THE COAST: THE RAID OF SEPTEMBER 2ND-3RD, 1916

Our column marched out of London at daylight on that beautiful August morning, consisting of *twelve automobile guns, three mobile searchlights,* and *twenty other motor vehicles,* including ammunition-waggons and motor-cycles. We carried with us ammunition, mechanical spares, telephones, and all our "height" and "range" finding instruments, as well as rations; our tents and full camp equipment leaving by rail the same morning. I had the honour of leading the way and setting the pace, feeling proud indeed of the very exceptional force then under my orders, which had reached such a remarkable state of efficiency in the short space of ten months from its first inception.

We followed the Great North Road through Welwyn to Stevenage, where we halted and breakfasted, afterwards going on through Baldock to Royston, and then through Newmarket and Thetford to Norwich. Keeping a nice easy speed, with the column opened out to 150 yards interval between cars to avoid the dust, we had no mechanical trouble of any description. Having met Lieutenant Mackenzie Ashton outside North

Walsham, as appointed, at 1 p.m., we closed up the column and proceeded to the field he had obtained for us, where tents were promptly pitched and a temporary camp established. I was then able to report with a certain degree of satisfaction at 1.30 p.m. to the Horse Guards that, having accomplished a very successful march of 150 miles, all our guns and personnel were "present" and would be in position on the coast before dark that night. After a good meal, all hands then turned in to rest, always excepting the unfortunate commander, whose duty it was to "carry on" 5 miles more to the coast, and there to select and mark out gun and searchlight stations on a 20-mile front whilst the men obtained some rest.

This was done, and our telephone staff were at once put to work to run out telephones along the whole front, ready for the guns to take up their positions at night. That night all guns and searchlights moved into the new line, and, having reported to General Headquarters that the whole force was in position, each gun and searchlight then spoke individually through to the Horse Guards over its own telephone connections, and the Headquarters Staff were kind enough to express their approval of the prompt and efficient manner in which the whole operation had been carried out.

Our march had taken place during the period of the full moon, at which time Zeppelins usually abstained from attack, and we therefore both expected and obtained a few days' exemption from their attentions. These were busily employed in

reconnoitring the whole coast and in laying out the more permanent positions in more detail than had been possible on the first afternoon of our arrival.

Our temporary camp near North Walsham was promptly struck the next morning and a permanent headquarter camp established within a few hundred yards of the coast near Bacton, close to the spot where the German submarine cable reaches the shores of England. The principal reason for the selection of this spot for our headquarters was that a telephone existed from the Coastguard station there to the Happisburg Lightship anchored some 8 miles out to sea. This lightship was the "mark," or "landfall," which the Zeppelins were accustomed to "make"—that is, to "pick up"—on reaching the coast after their passage from Jutland to England over the North Sea. At this lightship they were in the habit of assembling, taking from that point their new bearings for their overland passage to London.

By insuring constant communication with the lightship, we could therefore rely upon receiving the earliest possible notice of the enemy's arrival off the coast. On one occasion this was productive of a somewhat humorous incident which most faithfully illustrates the peculiar mentality of captains of lightships, and the absolute loss of all sense of proportion from which they suffer after a lengthy continuance of such terribly desolate and depressing duty. The frame of mind produced is one which contemplates the actual lightship as the most important object on the surface of the globe, the

remainder of the earth only existing for the purpose of affording some solid ground to which the "almighty lightship" may attach its anchor.

On the occasion in question we knew some seven Zeppelins were expected to "rendezvous" at the lightship that evening at dusk, after their passage across the North Sea, in order to take their bearings for a raid on London. Two Zeppelins had already arrived, and the others were momentarily expected. At that moment an urgent message was brought to me that the captain of the lightship insisted upon speaking to the commander personally at once. On my hurrying to the telephone, expecting that at least an extra dozen Zeppelins had turned up, I was greeted as follows:

Captain speaking: Is that the commander of the guns ashore?

Myself: Yes.

Captain again: I can't have this d——d telephone on board here just now, and am going to cut it off.

Myself: I'll be d——d if you shall do anything of the kind! What the devil is the matter?

Captain: Well, I'm going to cut it off, that's all.

Myself: If you dare to do anything of the kind, I'll send a boat and have you brought ashore under arrest, for the whole country is now waiting for information from your ship. Give me your reason at once, and, whatever it may be, remember that your orders are that the telephone shall *not* be touched, and you will do so at your peril.

Captain: I am captain of this ship, and I want to *shift my anchors,* as I am afraid they are not holding very well, and I must cut off the telephone, as the wire might get broken before I can get my ship firmly anchored again in its proper position.

The next reply and the rest of the conversation cannot possibly be written down, but the impression created on board the lightship by the unmistakable emphasis with which my orders were given was such that the anchor was *not* shifted *that* night at any rate. We thus got our invaluable information as to the enemy's movements, even at the risk of the lightship dragging her anchor, an event which, in the captain's estimation, would have been about the same thing as an "upheaval" of the universe or the END OF THE WORLD, and have borne no comparison at all with such a minor incident as the destruction of London by bombs or otherwise.

On several occasions in the month of August various Zeppelins had been exploring the south coast of the Wash, obviously searching for Sandringham House, where Her Majesty Queen Alexandra was at that time in residence. I therefore received orders to supply a detachment for the defence of that neighbourhood. The distance from Bacton to Sandringham is about 40 miles as the crow or the Zeppelin flies, but much nearer 50 miles by the narrow Norfolk lanes. Within an hour, however, of receiving the order, a detachment of two French 75-mm. auto-canons, with their ammunition-waggons and searchlight, was told off and on its way to guard Her Majesty Queen Alexandra.

Having inspected the detachment and their equipment before they started, I then "raced on" ahead of them myself to inspect the ground and select the gun-positions. On arrival I had an interview with that most charming of equerries, the

late Colonel Sir Arthur Davidson, who authorized me at once to select whatever positions I thought would be most effective, and to make whatever arrangements I thought best with regard to the men. This duty was instantly carried out, and I was able to meet the guns on their arrival and to take them direct to the quarters allotted to them. These were already being prepared, and consisted of a building in the village which had been a school-house, but which was at that time unoccupied and offered ample accommodation for the whole party.

The beautiful house at Sandringham nestles amongst lovely woods about a mile from the south-eastern shore of the Wash. From the point of view of a Zeppelin searching for it at night, however, it is, most mercifully, remarkably difficult to find. I was therefore most careful in the placing of my guns and searchlight, in order that they should be so placed as not only to give no indication of the actual position of the house, but also if possible to lead the enemy to conclude that the special point which the guns were there to defend was situated in quite another direction.

With this object, the guns were placed about a mile apart, each being also about that distance from the house. The searchlight was then placed a mile from each gun, in the direction *opposite* to that in which lay the house. Our three stations thus formed a triangle, and it was hoped that the effect of this arrangement would be that, when the light was switched on and the guns came into action, the enemy would conclude that the house was probably

within the triangle formed by the two guns and the searchlight defending it, whereas it was in reality some distance *outside* that triangle.

It was interesting to observe that our assumption as to the enemy's probable line of thought proved perfectly correct. For when, later on, a Zeppelin really did attack and the light was switched on and both guns came into action, the enemy assumed confidently that his objective lay *within* the triangle formed by the two guns and searchlight, and no bombs were therefore dropped in the immediate vicinity of the house. The village, however, which lay some little distance away *within* the triangle formed by the guns and light, suffered considerably.

During the latter part of August we were very busy perfecting the arrangements for the defence of the coast in the neighbourhood of Bacton. Unfortunately it was necessary to considerably weaken the force at headquarters, as other places on the coast were clamouring for defence, and we were obliged to detach ten guns and three searchlights for duty at other points. The weather also rendered the movement of guns somewhat difficult, as much rain fell, and some of the positions therefore became very difficult of access. On the night of September 2nd we received notice, at 8.15, that a raid was to be expected. *It came,* the first Zeppelin crossing the coast at 10 p.m., from which time until after 4 a.m. we had a pretty "busy time."

This raid was typical of the many that occurred. The actual log of the headquarters of the Mobile

Brigade, and also my remarks written at the time as to the particular points noted, are reproduced below. Being as they are the actual record of what was referred to above as a "busy time," they may prove of interest to those who have hitherto only had the opportunity of studying the development of a Zeppelin raid from what may be termed the "outside."

Log of the Headquarter Section of the Royal Naval Mobile Anti-Aircraft Brigade on the Night of September 2nd and 3rd, 1916.

Force at Headquarters:

Two 75-mm. guns in position north of Bacton.
One 3-pounder gun south of Mundesley.
One 3-pounder at Watch House.
One searchlight north of Mundesley.
One searchlight, Walcot Gap.

In Command:

Comdr. A. Rawlinson, C.M.G., R.N.V.R.

8.15 p.m.—Extra vigilance from G.H.Q., H.F.

8.45 p.m.—Field-Marshal's warning, District 39, by dispatch-rider from military.

8.50 p.m.—Bacton gun detachment left camp. Walcot Gap searchlight detachment left camp.

8.55 p.m.—Mundesley gun detachment left camp. Mundesley searchlight detachment left camp. G.H.Q., H.F., from Horse Guards, London, asked for information on weather conditions; answered by Commander Rawlinson.

9 p.m.—Bacton 3-pounder gun reported in position ready for action.

9.10 p.m.—Walcot Gap searchlight reported in position ready for action.

9.15 p.m.—Field-Marshal's order, "Take air raid action," District 39, from G.H.Q., H.F.

9.20 p.m.—Mundesley 3-pounder gun reported in position ready for action.

Note.—No telephone to Mundesley searchlight, position having been changed on account of wet weather. Connection ordered to be made by cyclist.

9.50 p.m.—Five bombs heard south of camp, distant about 10 miles. Bacton 3-pounder gun reports ditto.

9.55 p.m.—Mundesley gun reports three bombs W.N.W., distant about 10 miles.

10.5 p.m.—Two bombs heard north of camp, distant about 5 miles.

10.10 p.m.—Bacton gun reports having heard approaching aircraft (Zeppelin) for three minutes, sound continuing.

10.20 p.m.—Four bombs S.E. of camp 3 to 4 miles.

10.24 p.m.—Four bombs ditto, ditto.

10.27 p.m.—Two bombs ditto, ditto.

10.25 p.m.—Heard aircraft (Zeppelin) approaching from sea. Weather thick, light rain and low clouds.

10.30 p.m.—Zeppelin overhead, crossing coast from N.E., invisible in clouds. Altitude 5,000 to 6,000 feet; speed 35 to 45 miles per hour. Tried both searchlights; could not pierce clouds. Did not open fire. At 10.40 p.m. airship's engines went out of hearing towards S.W.

10.40 p.m.—Switched off lights.

11.10 to 11.14 p.m.—Twenty-three bombs heard inland in a southerly direction, distant about 5 to 7 miles.

11.20 p.m.—Two bombs ditto, ditto.

11.25 p.m.—Thirteen bombs ditto, ditto.

11.27 to 11.35 p.m.—Eight bombs ditto, ditto.

11.35 p.m.—Nine bombs *in sea*, bearing approximately E.; thirty-five seconds between flashes and reports.

11.35 to 11.40 p.m.—Twenty-five bombs in sea to eastward. Thirty-five to forty seconds "flash to sound." These reports appeared to be in two places, with interval of 1 to 2 miles, moving to the S.E. Some *may* have been guns afloat returning fire of Zeppelins. All vessels at anchor 2 to 4 miles out—*i.e.*, six or eight steam trawlers—put out their lights.

11.48 p.m.—Eight bombs in sea.

11.55 p.m.—Two bombs in sea. Fifty seconds "flash to sound."

12 (midnight).—Twelve bombs in sea. Fifty-six seconds "flash to sound."

12.30 a.m.—Three reports, bearing W., distant 15 miles.

1 a.m.—Heard sound of aircraft approaching from N.N.W.

1.5 a.m.—Mundesley gun reports five bombs to N.N.W., distant 4 miles. Sighted Zeppelin bearing W.N.W. from camp, steering E. by S. Weather very bad, only momentary glimpses of aircraft through low clouds, and at such times visible to naked eye without searchlight. No wind. Searchlights were both switched on, but although beams passed over aircraft at least twice, through rifts in the clouds, it was impossible to hold the target in the beam. No. 1 gun did not bear (dead angle); fired five rounds from No. 2 gun at from 5,000 feet altitude and 4,000 yards range when first seen till the target finally disappeared from view. The target was rising all the while it was under fire.

1.12 a.m.—Mundesley gun reports firing two rounds at aircraft momentarily seen at 4,000 feet altitude, passing coast S. of the gun. Aircraft then circled north and dropped five bombs, which fell

within 60 to 100 yards of gun on the cliff, but in the sea at the cliff base.

1.30 a.m.—Two bombs in sea 3 miles out.

1.40 a.m.—Two bombs in sea 5 miles out.

1.45 a.m.—Aircraft heard approaching from S.W. Weather thick, clouds low. Crossed coast over Bacton 3-pounder gun, 1 mile south of headquarters. The airship was momentarily visible to the naked eye through rifts in clouds at intervals at from 6,000 to 8,000 feet altitude. The 75-mm. section fired eleven rounds from No. 1 gun, seven rounds from No. 2 gun, range 4,000 to 6,500 yards, altitude 6,000 to 8,000 feet, gradually rising. Very few of the bursts could be observed owing to clouds, which also rendered the searchlights of no value. This target was visible to the Mundesley gun, but out of range of it. It was visible momentarily several times to the 75-mm. section, but, owing to clouds, the Bacton gun, near whose position it passed the coast, was only able to fire one round at 8,000 feet altitude. Ten bombs were dropped before passing the coast, some falling at Ridlington Common, less than one mile from Bacton 3-pounder gun position and close to Bacton Naval Aerodrome, where flares had been burning, and whose aeroplanes were "up."

3 a.m.—Sandringham detachment rang up to say Zeppelin passing south of their position, steering eastward.

3.5 a.m.—Wind S.E. and freshening.

3.5 to 3.15 a.m.—Nine bombs inland to westward.

3.20 a.m.—Three bombs N.W. inland.

3.30 a.m.—News received with great satisfaction from G.H.Q., H.F., that Zeppelin has been brought down near London.

3.40 a.m.—Three bombs N.W. inland. Saw flash but heard no report.

3.50 a.m.—Two ditto, ditto.

3.55 a.m.—Message from Westwick Camp, south of North Walsham: "Zeppelin passing overhead, steering N.E."

3.58 a.m.—Aircraft heard approaching from S.E.

4.5 a.m.—Airship passed overhead and out to sea, invisible in clouds which searchlights were unable to pierce. This airship was pursued out to sea by an aeroplane, and was flying very considerably faster than any of the others.

4.10 a.m.—Reported same to G.H.Q., H.F.

4.20 a.m.—S.E. wind died away.

4.35 a.m.—Message from Sandringham reporting twelve rounds fired at 3.45 a.m. Hit claimed. Zeppelin steered north.

4.36 a.m.—Field-Marshal's warning, "All clear."

5.20 a.m.—All detached guns and lights back in camp.

Remarks on Anti-Aircraft Operations on Night of September 2nd and 3rd, 1916.

1. The night was very dark and in the early evening dense with low clouds (1,000 feet) and fine rain; as night wore on, the sky cleared somewhat, leaving gaps in clouds. Aircraft were visible when between these clouds, or through transparent clouds, with the naked eye, up to at least 6,000 yards along the line of sight. The effect of searchlights, under these conditions, was to illumine the target if in a clear gap, but to render it absolutely invisible if the beam struck any cloud, even one which otherwise would have been transparent to the naked eye. The searchlights could not hold the aircraft in the beam, nor could anything be seen at all *from the vicinity* of the searchlights, on account of the "glare" they created in the damp atmosphere.

2. The tendency of the airships to seek the cover

of clouds when passing the coast was very noticeable.

3. Flares at the aerodromes had distinct attractions for them.

4. They appeared to be able to considerably accelerate their speed when pursued by aeroplanes.

5. The average altitude at which they approached the coast appeared to be 5,000 to 6,000 feet, and about 2,000 feet higher when returning.

6. There appeared to be firing at sea, which had the effect of turning some airships from their original course when about to "make" the coast.

7. The last airship had passed over the coast on its homeward passage before the first signs of dawn.

8. The airships evidently continue to "make" the Happisburgh Lightship on approaching the coast, and take their bearings from that point. They also make the lightship again to take their bearings for their homeward passage. The stretch of coast opposite the lightship—*i.e.*, from Trimingham to Happisburgh (about 7 miles)—is a most favourable position from whence to engage them, a point just north of Bacton being the centre, either side of which they usually cross the coast both on their inward and outward passage.

9. *Number of Bombs.*—The number of bombs heard *and logged* from this place during the night was *170,* at varying intervals and from all points of the compass.

10. *Number of Aircraft.*—On the inward passage *three* crossed the coast, apparently in line, at about 20-mile intervals, the centre one between Mundesley and Bacton, at about 10 to 10.30 p.m. A *fourth* was dropping bombs at sea 10 to 15 miles out off Bacton at 11.35 p.m., moving S.W. Four airships were therefore located as making the coast in this vicinity on their inward passage. *Three* made the lightship for their homeward passage, passing

within range of our guns. One at 1.5 a.m. approached from N.N.W. and turned east over the coast south of Mundesley to make the lightship. The second, at 1.45 a.m., approached from S.W. on a direct course for the lightship. The third, at 4.5 a.m., came from S.W., also steering direct for the lightship. This airship was moving very much faster than the others.

11. *Details of Firing.*—The airships in each case appeared to "rise" when under fire. Firing was carried out under extremely difficult conditions, it being rarely possible to observe the bursts or to effect "corrections" on account of clouds.

It is impossible to state whether any target was hit, for the same reasons.

A. RAWLINSON (*Commander*),
Commanding R.N.A.A. Mobile Brigade.

BACTON, 3.9.16.

In reading over the above report of the details of an exciting night, which I remember so clearly even now, seven years since it took place, I note that, in my remarks on the raid, I omitted to mention the point that I *know* was principally in my mind at the time.

This point was brought home to me by the difficulties of gunfire that night, and from that time onwards became my constant study. Its careful consideration, however, bore good fruit, and we soon had an opportunity of "trying out" the practical value of the solution of our difficulties, which appeared to be the only practicable one which recommended itself, and which, when tried, produced instant and somewhat astonishing results.

The point that was in my mind was the condition

of "impotence" to which we were reduced when these Zeppelins hid in the clouds on passing the coast, although our beautiful guns lay within range of their target, ready to fire, and our skilful gunners were "itching" to bring our murderous enemies down. We did not discover till later "how" they were able to keep their course when enveloped in the clouds, but that interesting story will be told later on. We were, however, determined they should *not* come sailing over our guns *with impunity*, whether we could see them or not, and therefore laid our plans and made our preparations in the light of our past experience, to make things less easy for them in future.

CHAPTER VIII

MORE RAIDS ON THE COAST: THE IMPROVEMENT OF THE ATTACK AND NEW DEVICES FOR DEFENCE

THE first matter of interest, after the raid of September 2nd and 3rd, was the receipt of Lieutenant Mackenzie Ashton's report as to the operations of his detachment at Sandringham that night. It appeared that from 10.30 to 11.30 p.m. three Zeppelins were cruising around the neighbourhood of his position, no doubt seeking the "royal residence" as their objective, which, under the cloudy conditions then existing, they evidently found it extremely difficult to identify. After dropping about half a dozen bombs in haphazard fashion, they then moved off to the southward. At 2.45 a.m., however, one returned and recommenced the search, dropping a few more bombs and then moving off to the south-west. At 3.25 a.m. the police at King's Lynn telephoned to Lieutenant Ashton: "Zeppelin just leaving King's Lynn, steering direct for Sandringham."

This customer evidently knew where he was, and had taken his bearings very carefully, for he passed right over the house, providentially without being able to identify it. He doubtless expected that the searchlight would be switched on, and that he

would by that means be advised when he had reached his objective. He was, however, mistaken in that supposition, as, in accordance with my orders, he was allowed to pass right over and clear of the house before any move was made or searchlight shown. Once past and clear of the house, however—at 3.45 a.m.—the searchlight was switched on and rapid fire at once opened at a range of 2,000 yards only, and at an altitude of 6,000 feet. Lieutenant Ashton's report claims that the second round "*hit*" the airship, which he considered was in any case certainly damaged by the burst of the shell.

In spite of every endeavour, however, I have always been unable to obtain any definite proof of this "hit," though the subsequent actions of the airship point to the probability of some damage having been done to it. On fire being opened the target rose instantly and made off on its homeward course, at the same moment dropping five bombs together, which all fell within a radius of 50 yards. These seriously damaged a group of cottages and their occupants, which were actually within 2,000 yards of the gun in action and well within the triangle of our three posts. They in the dark were doubtless mistaken by the enemy for Sandringham House.

I visited the detachment next day and went into the details of the action on the spot. In my opinion this was the easiest chance any of our gunners ever obtained of bringing down a Zeppelin, as the weather at the moment was clear, the

range easy, and everything in readiness for accurate and rapid fire with the target fully visible. These facts, as may be imagined, I did not fail to suitably point out to the chief petty officer who was at the time in charge of the gun, and who doubtless very well remembers the incident to this day. And I still consider he very fully deserved the terrible "slating" he received.

I then proceeded to Sandringham House, where I had the honour of an interview with Her Majesty Queen Alexandra and Her Royal Highness Princess Victoria, who were both extremely gracious in that simple and unaffected manner which is so strikingly characteristic of our Royal Family.

Her Majesty was very interested in all I told her as to the enemy's movements, but dreadfully anxious as to the injuries of the inhabitants of the damaged houses in the village, all of whom were personally known to her. It was, however, practically impossible to convince the Queen that our enemies were really in search of Sandringham House, as she could not bring herself to believe that they were capable of seeking to "blow her up." She laughed heartily at any suggestion that *she* might be "nervous" of anything they might try to do to *herself*, all her anxiety being concentrated on what suffering might be inflicted upon her poor villagers, for whose safety she showed the liveliest concern.

On my return to my headquarters at Bacton, our time was devoted to endeavouring to devise some means whereby we might make our force a greater

danger to the enemy, who on their side were certainly making considerable progress in increasing the efficiency of their attacks.

I will endeavour to relate as simply as possible the problems with which we were at that time confronted, and the results which ensued from the long and anxious study which was devoted to their consideration. No doubt the same ideas were thought out by many much more able minds than ours, and probably approximately the same conclusions were reached by all. It will, however, possibly be of interest to many to consider for themselves our difficulties and the lines which were followed in seeking for their eventual solution.

It was evident that our enemies were at this time seeking safety for their attack, principally by rendering their airships as far as possible "invisible" by taking advantage of the protection of clouds when within range of our guns. The main problem, therefore, which presented itself to the guns of the defence was, "How were we to effectively *hit* an object which we could not *see?*" In thinking over that, at first sight, impossible proposition, the first very natural question we had to ask ourselves was, "If we cannot see it, how do we know it is there?" The answer is childishly simple—namely, that though we can't *see* it, yet we can *hear* it. Therefore, as we cannot aim by using our *eyes,* we shall be obliged to shoot—if we are to shoot at all—by using our *ears* to aim with.

The first step towards the solution of our difficulties was thus accomplished, in that we at any

rate knew what the problem actually was that was presented to us. The next step was to think out by what means we were going to become able to use our ears to such good purpose as to *hit* an aerial target which we could *hear* but could not *see*. This problem took us right back to the absolutely elementary natural gifts with which mankind has been endowed. The questions we then had to ask ourselves were, "If we *hear* anything, how do we know *where* it is?" and "Why does one, on hearing a sound, naturally look in the direction from whence that sound comes?"

The answer, of course, is that man, having been endowed with *two* ears, has, on hearing any sound, a natural inclination to turn his head so that the sound he hears shall be heard *equally* in *both ears*. That having been accomplished he then finds himself directly facing the direction from which the sound comes.

That is, of course, extremely simple—*when you know it;* it likewise indicates the only principle upon which it is possible to use one's ears to aim with, and, having got that far, we knew we must be following the only line of reasoning which could possibly lead us to a successful conclusion. There still remained, however, a terribly long way to go before theory, however correct, could be turned into successful practice. To return now to the wonderful conformation of the human body and to consider the basis upon which is founded man's power of locating sound. It became necessary to discover if any means existed by which our natural

powers of hearing could be increased, and if so what those means were.

As the determination of the direction of sound depends upon its being heard by both ears equally, it follows that the base of the triangle (of which the sound itself is the apex) consists of the distance between man's two ears. That is, an extremely short base for what in our work was always a very long triangle. It followed, therefore, that if we increased the length of the base, we should be enabled correspondingly to increase the angle at the apex, which would necessarily have the effect of rendering much more accurate the location of the sound.

The device which resulted from this theory was very suitable, and proved extremely effective. It was constructed in the following manner: A pole was obtained and pivoted so that it swung freely in the horizontal plane. Two megaphones (or rather, gramophone trumpets) were then fixed, one at each end of the pole, pointing in the same direction as each other but at right angles to the pole. An indicating arm was then fixed, also at right angles to the pole, at its centre—that is, at the pivot on which the pole revolved. A compass-card was also fixed on the upright carrying the pivot and truly oriented—that is, correctly placed, showing the true North. Over this card the indicating arm attached to the swinging pole travelled, and thus indicated the "bearing" (or point of the compass) to which the pole was at right angles.

A "stethoscope" (the instrument through which

the doctor listens to our hearts, etc.) was then attached to each megaphone, and the tubes from them "led" up to the pivot. It only then remained to fix a man's head to the pole, insert the ends of the stethoscope pipes in his ears, and to tell him to "listen," and to turn his head *and the pole with it* in the direction of the sound which he heard!

The practical effect of this manœuvre was that the man found he could not only hear sounds at an immense distance, but was also able to turn directly towards them with the greatest confidence. At the same time the indicator on the compass-card recorded the exact "bearing" of the sound to which he was listening, and the angle could then be immediately telephoned to headquarters.

As many such posts were eventually established, "bearings" of the sound were received from many different points the moment an airship was heard. The result was that by "laying off" the various "bearings" given from several stations on the map at headquarters, the position of the sound was easily and definitely established without the airship itself ever having been visible. Its course could also by this means be followed on the map with certainty, in accordance with the alterations of the bearings reported from the various stations from time to time. Thus was laid the foundation of the successful form of defence which was eventually adopted against aircraft at night.

The study of this problem—the logical solution of which was reached by the various simple stages

described above—was of such absorbing interest to me that it was always before me, even in my dreams. I also followed it one stage further, for, on "trying out" various "ratings" with this novel form of "listening machine," an extraordinary discrepancy manifested itself in the accuracy with which different individuals located the same sound. This brought us face to face with the question, "Who will be the man upon whose powers of *hearing* we may most confidently rely and by what means shall we recognize him?"

The answer is so absurdly simple that one wonders it did not immediately suggest itself the moment it became a question of "powers of hearing," for beyond any possibility of doubt no man who can *see* can ever hope to compete in "power of hearing" with those who *cannot* see, and in the realm of "hearing" the *blind* must always reign supreme.

I have reason to believe that when I asked if I might be supplied with a few "blind" men for experimental purposes, without giving any explanation of the reason for my request, certain observations were made which cast uncomplimentary reflections on my sanity. Being absorbed myself in my own line of thought, it had not occurred to me that my request would be considered "unusual" by those to whom my difficulties were unknown; explanations, however, followed and men were obtained who, having been *born* blind, had been entirely dependent on their "powers of hearing" all their lives.

Of all the numberless afflictions to which the human race is heir, there can be none of which the tragedy can compare with that of blindness, and those who cannot appreciate the pathetic helplessness of the blind must indeed themselves have been born without either sentiment or soul. Having myself led what might perhaps be termed a somewhat varied existence, from which the element of personal risk has never for long been absent, I can honestly say I prize the gift of sight beyond life itself, and that the risk of blindness, with its attendant state of dependence on others, has always been the risk which I have most dreaded and feared. Boundless, therefore, is the sympathy and pity which I feel for those so afflicted, and beautiful indeed to me was the thought that here at last was work which these poor helpless people could not only do, but which they could do *better than anyone else*. I pictured to myself the expression which would dawn across their poor sightless faces when they first realized that the time had at last come when it was for them, who had been so often led by others, to take the lead themselves, and to now *hear* for others who so long had *seen* for them.

I could well imagine of what priceless value would be to them the feeling that their everlasting dependence had for the moment ceased, and that work lay before them in which *they alone* could ever hope to excel, and that, best of all, such work would be done in defence of their country and in the hour of its greatest need.

This did, indeed, happen, and blind men were so employed, though it was never my good fortune to actually see them. I can only hope that those who were so greatly privileged as to be present on these occasions were capable of appreciating the exquisite beauty and pathos of that wonderful scene in which it was the *blind men* who showed the way, and *the men that saw* who followed!

Subsequent to the raid of September 2nd and 3rd, we had reason to believe that special efforts were being made by the enemy's agents, to locate the positions on the coast which had been prepared for occupation by our guns and searchlights on the occasion of a raid. It therefore became very desirable that any such statement, as the enemy might be able to obtain with regard to our positions, should be as widely at variance from the actual facts as it might be possible to induce them to accept in the light of reliable information. On consultation with General Headquarters, they at once adopted this view and authorized me to take any steps which might appear to be likely to mislead the enemy.

With this object in view, as soon as information was received that preparations were being made for another raid, I suddenly issued orders that the headquarters and the whole brigade should move to higher ground, some 20 miles inland from the coast. The ostensible object of this move was that a new line could there be occupied on sandy ground, where we should be much less liable to be enveloped in the mist and fog which so frequently

hampered our operations on the coast itself. Our entire camp was therefore "shifted" about a week before the next raid was expected.

There was every reason to believe this move was duly reported by the German spies, and no doubt existed that the new line of positions, which were being carefully prepared, would also be duly communicated to the enemy.

It was our custom to have a parade, which was known as "quarters," every evening before sundown. All was then prepared for the immediate dispatch of the guns and searchlights to their stations in event of an alarm during the night. As the time when a raid might be expected approached, I took the guns on several occasions *to* their new stations in order to accustom them to take up their new positions at night, and at the same time took care that our movements were in no way concealed from any spies who might be observing us.

On the night of September 24th the weather appeared to be very suitable for a raid; other information was also in my possession pointing to such a probability. On the completion of "quarters," therefore, when all was reported correct and ready for action, I announced that the guns would occupy the new line that night, but that we should start at once as I was anxious to inspect the guns in their new positions myself before dark. All being ready, I then led the way out of camp in my fast car. The manœuvre was a perfectly usual one, the only difference being that on this

occasion my own most reliable "machine-gun" was concealed in my car.

After going about a mile down the road to the westward of our camp towards the new line, I suddenly turned down a by-lane to the south and increased the pace, followed by the whole column. A mile further on the word was passed back down the column for all guns and lights to proceed independently at full speed to reoccupy their original positions on the coast 20 miles away, each party being ordered to report its arrival to our original headquarters at Bacton. This they were to do over their own telephones, which had been left "in position" and were being examined and tested at that very moment by a party which had been detached from camp in the afternoon ostensibly to "bring in the old wires."

These orders had no sooner been given than my car swung sharp to the left up a side lane, leaving the rest of the column to find their own way to the coast. As we turned, the "machine-gun" was uncased, and by the time the tail of the column had passed the turn, we were back there again, ready to catch a car which we knew to be following us, with which we were particularly anxious to have an interview! It was a very fortunate chance for those gentlemen that at that moment they had concluded it was no use following us any further. It was certain they could not have seen the leading car "fall out" of the column, as the dust raised by the guns must have rendered that quite impossible. All we saw of them, however, was the dust of their car some

distance away, travelling at high speed up a side-road to the westward. Our suspicions were thus confirmed, and as I had then no doubt a raid was to be expected that night, it was evidently useless to pursue them, but of infinitely greater importance to reach the coast and prepare for action without delay.

No time was wasted on the road, and the 20 miles of narrow Norfolk lanes which lay between us and the coast were covered in thirty-five minutes. On reaching our headquarters, we found the telephone from the lightship in the act of reporting the first Zeppelin's arrival at that rendezvous. The weather that night was thick and cloudy, though there was no wind; now, therefore, was the time to try the soundness of the theory already explained, and ascertain whether we could succeed in *aiming with our ears*. All the necessary preparations had been made, and I had been given full authority to carry out any such operations, so that we had high hopes that the enemy were now going to *learn something* which might very probably come in the form of an unpleasant surprise to them.

Most unfortunately I have not at my disposal a copy of my report of the operations that night, and must therefore rely upon my memory, in which, however, the principal incidents remain very clear. The chief thing I remember is that there were a lot of Zeppelins, seven at least, which all assembled off the lightship at dusk. It was not till past 10 p.m., however, that, then having all assembled, they approached the coast in line. As

the clouds were very low, they all kept either *in* them or *above* them, and were therefore quite invisible from the ground. Our listening stations were at once busy, and it may be imagined that, with so many "sounds" coming out of the clouds from so many different directions, the identification of the position of *each* one became a matter of considerable difficulty.

One Zeppelin came right over our headquarters, where were stationed two 75-mm. auto-canons, and we had the pleasure of saluting it, or rather the cloud which it was in, with twenty rounds of high explosive, set to burst at altitudes varying from 4,000 to 7,000 feet, undoubtedly fired in the *direction* in which the airship was at that moment. There was, however, no result.

Two minutes later we were able to identify another enemy approaching one of our guns stationed on the edge of the cliff about 2 miles to the north of headquarters. I spoke to the officer in charge of the gun myself, and explained to him exactly the course our instruments indicated that the airship was following. He was then given a "bearing" on which to lay his gun, and an "angle of elevation" at which it had been calculated that his shells would most certainly cross the course of the airship as it approached the coast. At the same time he was instructed that I would give him, over the telephone from headquarters, the order to fire at exactly the right moment. He was then to fire ten rounds in rapid succession, and his fuses were to be set to burst at from 4,500 to 5,000 feet

altitude. The instant the bearings of the sound given by the listening stations informed me that the Zeppelin's course was about to cross the line upon which the gun was laid, as the target came within easy range before crossing the coast, I gave the order to "*Fire.*" Ten rounds were promptly fired in thirty seconds. We could hear the shells burst in the clouds, but saw nothing. A moment later, however, there was a roar from a succession of bursting bombs, about ten of which burst practically together, on the beach at the foot of the cliff where the gun was. Our listening posts then informed us that the airship had turned and gone straight out to sea again.

I reported what had happened instantly to General Headquarters at the Horse Guards, and was informed that that particular airship went straight back to Germany, and took no further part in the attack that night. We also received from them very hearty congratulations on the result of our experiment.

So far, so good.

This, however, was by no means the end of that first successful effort, for, subsequently, on examining the bomb craters on the beach below the gun, we had the unhoped for satisfaction of discovering there the remains of a German machine-gun, close beside the place where the bombs had fallen. This afforded proof positive that the enemy had indeed had an unpleasant surprise! There could be no doubt at all that he must have been very considerably frightened before he not only let go a

bunch of bombs all at once, but also heaved his machine-guns overboard in his effort to increase the speed at which he could rise out of danger, subsequently taking himself straight off home, or in official words "declining the engagement."

It was exceptionally sweet and comforting to reflect how, all the way home, he must have been striving to guess by what possible means we had been able to fire at him so accurately. The whole affair, indeed, was extremely satisfactory from our point of view, though, in the light of later engagements, I am quite convinced that that night we were exceptionally lucky. However that may be, it was evident that the first indispensable action which it always was necessary to take in order to injure the enemy was to LET OFF THE GUNS; so that, if there was any luck about, we might at any rate give ourselves a chance of benefiting by it.

If you miss a target which you cannot see, there is nothing very surprising about that result, and a large element of chance must, in any case, enter into the operation. The only fact which is quite beyond dispute is that you can *never* hit him if you *don't shoot*. This lesson was well learned on this occasion, and, having been duly impressed on all concerned, became of great value to us later on.

CHAPTER IX

WINTER ON THE COAST: THE DEFENCE DEVELOPS—FALL OF A ZEPPELIN INTO THE NORTH SEA

THE raid of September 24th rather stands out from other Zeppelin raids, as so much was learned from it by the defence. The enemy also learned a great deal, and we knew there were, in consequence of its incidents, most acrimonious discussions in Germany as to the wisdom of the safety of the Zeppelins being again hazarded for such a purpose. From this it is easy to deduce that the enemy were no longer so satisfied as to their immunity from danger owing to the inefficiency of the defence—a most desirable position, and one which was most gratifying to the defence forces of all descriptions.

The chief credit of "putting the fear of God into the raiders" is, of course, due to our glorious and gallant Flying Corps. Even without the deadly bullet (with which they at this time only first began to be supplied), they had from the beginning always been ready and anxious to tackle the Zeppelins, although the armament with which they had been equipped was quite inadequate for the purpose. Probably one of the grandest deeds of individual daring of the Great or any other War was young Warnford's action in getting close above his Zeppe-

lin and then letting go his bomb at close quarters, as he had no other weapon with which he could hope to successfully engage it. He knew well that all the probabilities were that his aeroplane would be blown up with the airship, and that the chances of his survival were excessively remote. It is, however, at once the glory and foundation of the strength of the British Empire that such men have always been forthcoming amongst our countrymen in the time of the nation's need. Neither is there the least indication that such is not always *certain to be the case*. The German Zeppelin crews, however (brave men though they undoubtedly were), no longer considered the bombing of London as a "joy-ride," and it was a considerable time before they came again.

The most interesting information we obtained, with regard to the Zeppelins, from the raid of September 24th was a knowledge of the method, which they had so successfully employed to enable them to keep a correct course whilst their airships themselves remained hidden in the clouds. It is extremely improbable that this device would ever have been discovered by us, if it had not been for the species of insane panic which appeared occasionally to seize some members of the Zeppelin crews when our high-explosive shells burst in the immediate vicinity of their airships. It may at once be granted, that to be in a bomb-laden Zeppelin when high-explosive shells are bursting near by, can hardly in any case be a very desirable position. More particularly would that be so when, not in

the least knowing how the fire was aimed, they imagined that some kind of novel automatic device was being used, by which means they would be infallibly hit and be most effectually "blown to pieces." Under those circumstances the not unnatural desire to save their lives caused the tendency to panic, of which we have already noted several instances when shells burst near them. The effect was to cause them to drop instantly a considerable quantity of bombs, or to heave anything "heavable"—*i.e.*, machine-guns, etc.—overboard at once, in order to give their airship the power to rise more quickly out of the danger zone. It was to this urgent desire for safety that we owed our discovery.

After a Zeppelin had been under an unexpected and fairly accurate fire, from which it only escaped by an instant and vertical rise, an extraordinary and entirely unexpected object was found on the ground below. This had been dropped from the airship in her haste to increase her "lift"—that is, her power of vertical ascent. This most peculiar and unknown object was a cylinder of sheet aluminium, shaped like a huge cigar, with a fin at one end corresponding to the tail of a fish. Inside this cylinder was found a very nasty mess which shortly before had been a live German. It then became evident that this man's duty must have been to lie in this cylinder, which was then let down some thousand feet or more below the Zeppelin, from which it was suspended by a wire. The cylinder was furnished with a window, through which its

unhappy occupant observed whatever he could see of the earth below. He was also furnished with a telephone, through which he was expected to communicate all his observations to his commander above. The result of this system was that the accurate navigation of the airships became possible even whilst they remained themselves enveloped in the clouds. This, up to the time of the above discovery, had seemed to us a task so impossible that its successful achievement had remained incomprehensible.

Like so many other things, however, which appear impossible, but which, nevertheless, are achieved, the solution was really quite simple. At the same time it seems difficult for anyone to conceive a much more undesirable position than that occupied by the "hero" in the cylinder. To be shut up in a small box and then lowered away below an airship at the end of a wire, there to remain suspended in space for an indefinite period, must indeed be a hard trial of any man's nerves. These men, however, remained many hours in that most unenviable position, knowing that the correct navigation of the airship above—that is, the lives of the entire crew—depended absolutely upon the accuracy of the observations they transmitted. When to all this was added the knowledge that certain of the more nervous members of the crew might be expected at any moment to start sawing with a knife at the fragile wire, which constituted the only and very dubious link connecting them with any faint prospect of continued existence, it

must always appear marvellous that any men were ever found to take on such a job *at all*.

As illustrating the rather natural reluctance which the Zeppelin crews commenced to evince for London air raid duty, as soon as they discovered that the British aeroplanes now had the means at their disposal of setting fire to the gas, the following discovery also was somewhat grimly instructive.

On examining such bodies of the crew as remained "unburnt" after the fall of the third or fourth Zeppelin which "came down in flames," some small "phials" were discovered, with a notice to the effect that they offered an unfailing preventive from the agonizing death which results from the process of being "burnt alive"!

It may be imagined with what satisfaction the German crews must have *first* received this intelligence. Such satisfaction was, however, doubtless *very materially reduced* on learning that the means suggested as infallible for the prevention of being "burnt" was to swallow the contents of the "phials," by which means an "instant death" could be relied on!

Who shall say, after thinking over this method adopted by the Germans to "encourage" their men, that they do not rejoice in a certain "sense of humour," even if it be of an entirely unconscious nature?

With regard to the lessons learned by the defence; in addition to the indications received as to the practicability of "aiming with our ears," the value of another theory, which had been much

criticized, was also most conclusively proved. We had been frequently and severely criticized by coast defence officers for placing our guns, as we had invariably done, on the extreme edge of the cliffs, and if possible even on a projecting point of the cliffs. It was very rightly argued that all such positions were dangerous, in that the absolute edge of any cliff is always insecure at any time. This insecurity is, of course, immensely increased when the cliff's edge is subjected to the concussion caused by the firing of heavy guns. In wet weather, also, such a position is frequently most difficult to approach with heavy motor-guns and waggons, especially by night.

For all these various and excellent reasons my selection of positions had been severely criticized. My answer had always been that in war chances must be taken, and it becomes rather a question of the forming of a correct estimate as to the *relative value* of the various chances which has to be considered. I always personally considered the most dangerous chance, to which it was necessary to expose the men, was the risk of their annihilation by the enemy's bombs, as these were always sure to be launched at the guns, in all probability with an ever-increasing accuracy of aim.

A Zeppelin's bomb, falling within 50 yards of a gun, will almost certainly *kill the whole crew*. At 100 yards the casualties would be less, largely depending on the nature of the soil upon which the bomb fell; the softer being the condition of the surface, the deeper the bomb will become embedded

before bursting, and the less will be the damage it will do. If, therefore, a gun be placed on the extreme edge of a cliff, the danger zone of the bombs which may fall near it is immediately reduced by one half. The explanation of this is, of course, that one half of the danger zone will be situated *at the foot of the cliff,* and that such bombs as may drop there, can cause no possible injury to those who are above. Also, the sharper the point of cliff upon which it may be possible to place a gun, the safer that position will be, as the danger zone which exists *only at the top* of the cliff will be reduced in proportion to the narrowness of the point upon which it is possible to place the gun. Further still, as the softer the ground the less will be the damage which can be caused by bombs, difficulties of transport become quite secondary considerations. It is, therefore, in my opinion, well worth while to accept the risk of the failure of the cliff's edge to stand the concussion of gunfire, as well as its difficulties of access, in order to obtain the vital advantages which such a position affords.

On the night of September 24th the soundness of these theories was conclusively proved. Beyond all doubt, had the gun, which successfully scared the Zeppelin and sent it straight back to Germany, been placed only 50 yards back from the face of the cliff, the whole gun's crew would have been *instantly killed.* As it was, however, they were very happy and contented with the result; and (whatever may have been the criticisms passed amongst the permanent coast defence officers and

cliff-edge experts as to our selection of gun-positions) whenever I afterwards examined any line of country and selected and marked out the gun-positions, my men were only too pleased to occupy those I had chosen, when the enemy were about to attack—and invariably did so with quite remarkable confidence.

From the raid of September 24th the enemy also learned much. The salient fact of which they then became convinced, and which was to them of most vital importance, was that, in view of the efficiency of the new incendiary bullet with which our aviators had then been armed, their airships could only insure their safety, from fatal attack by our aeroplanes, by remaining at altitudes to which those "heavier than air" machines were unable to rise. They therefore ceased for the moment to deliver Zeppelin raids, and undertook exhaustive modification of their airships, with a view to their future operations being conducted at vastly increased altitudes. Of the results of these modifications we were not to have practical experience for nearly a year, though in the interim we were occasionally subjected to rather half-hearted attacks by airships of the older types.

It was no wonder that the enemy was discouraged by the meagre results of the raid of September 24th, for out of the seven Zeppelins which we knew to have actually crossed the coast only three reached London. One, as we know, was turned back by our successful effort at "aiming with our ears," another never came beyond the lightship, and the

remainder suffered from other casualties of various descriptions. The three which reached London dropped sixty-seven bombs there, killing twenty-three and injuring sixty-six persons, and doing structural damage to the extent of £65,000. One of the three was brought down by our gallant aviators, and the damage done to their aerial fleet on this occasion was out of all comparison greater than the damage inflicted upon us by the enemy. More important still was the *moral* effect, the whole defence being greatly encouraged, and the crews of the enemy's air-fleet proportionally *dis*couraged, by the great advances made in efficiency by the defence in proportion to those which had been made by the attack.

In the meanwhile the remainder of the French guns had been delivered to the London fixed defences, and I was instructed to write a "text-book" giving all the details of the construction and mounting of these guns, as well as English drill for the gunners' training. I was also required to make and furnish drawings of the ammunition and fuses, and of the range-finders for high-angle fire, and, in fact, to produce every kind of information such as is contained in our official Army textbooks with relation to British ordnance. This was a long and very tedious task, and, on examining the book now, it becomes a matter of wonder to me how on earth it can ever have been possible to complete it at that time, for it consists of twenty-five very large and closely printed pages of information, as well as fourteen large sheets of illustrations, drawings, and

plans, showing not only the details of the action of the guns, but also of the sighting systems, ammunition, and fuses.

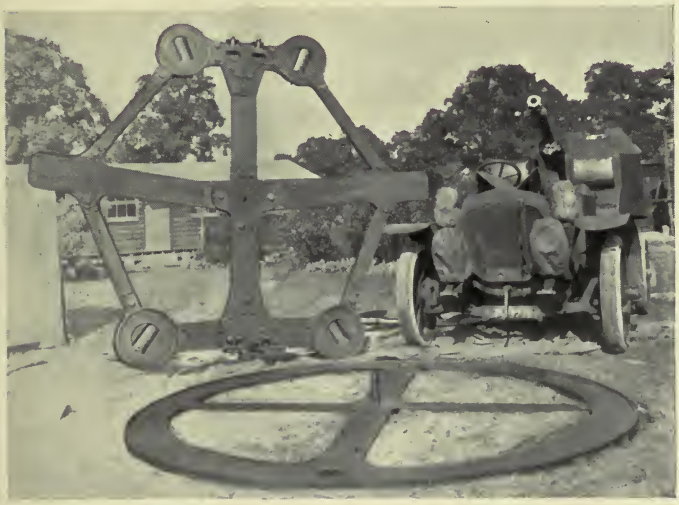
Another matter which claimed attention was the desirability of devising some method by which the auto-canon could be "swung" in a complete circle, so as to be able to follow the target in any and every direction, without deranging the aim of the gunners. This was very necessary in order that the "dead angle" (at which the gun could not be fired) might be eliminated and the field of fire of each gun in that manner enlarged from 240 degrees to 360 degrees, so increasing the efficiency of the guns by one half. A suitable portable "turntable" was ultimately devised by us at Bacton for our own guns. This was subsequently tried by the experts in London and at Shoeburyness, and ultimately adopted by our authorities for all similar guns in England, and by the French for their own similar guns in France.

As the winter came on we were very fortunate in receiving many invitations to shoot their game with them, from the most sporting and hospitable inhabitants of that most excellent shooting district. This we not only thoroughly enjoyed, but the "game" also furnished a most valuable addition to the "menu" in camp, the liberality of our neighbours in this respect to our men in camp being most deeply appreciated.

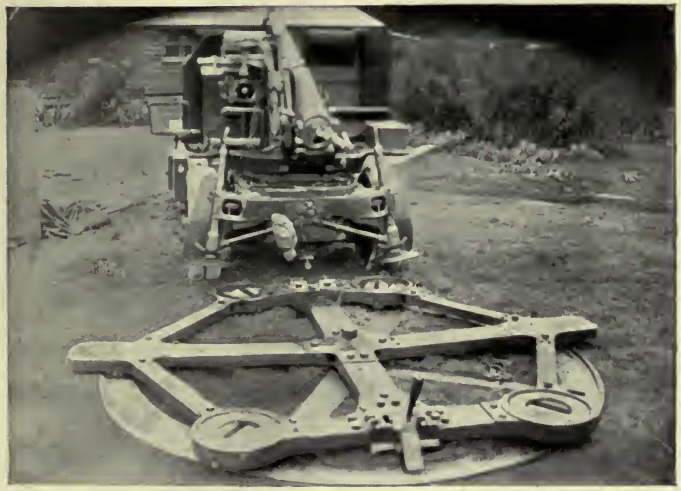
Our detachment at Sandringham, in the meanwhile, were pretty well off, as they possessed a collection of talent which enabled them to organize

THE PORTABLE "TURNTABLE" FOR FRENCH AUTO-CANON

Designed by Commander Rawlinson at Coventry Ordnance Works.



No. 1.—The turntable before being mounted on its pivot.



No. 2.—The turntable in position, ready to receive the gun.

a "variety entertainment" in the school-house which formed their quarters. This was a great success, and the inhabitants for many miles round flocked to see the show. Her Majesty Queen Alexandra did the men the great honour of attending in person and remained throughout the whole performance, personally congratulating the artists at its conclusion.

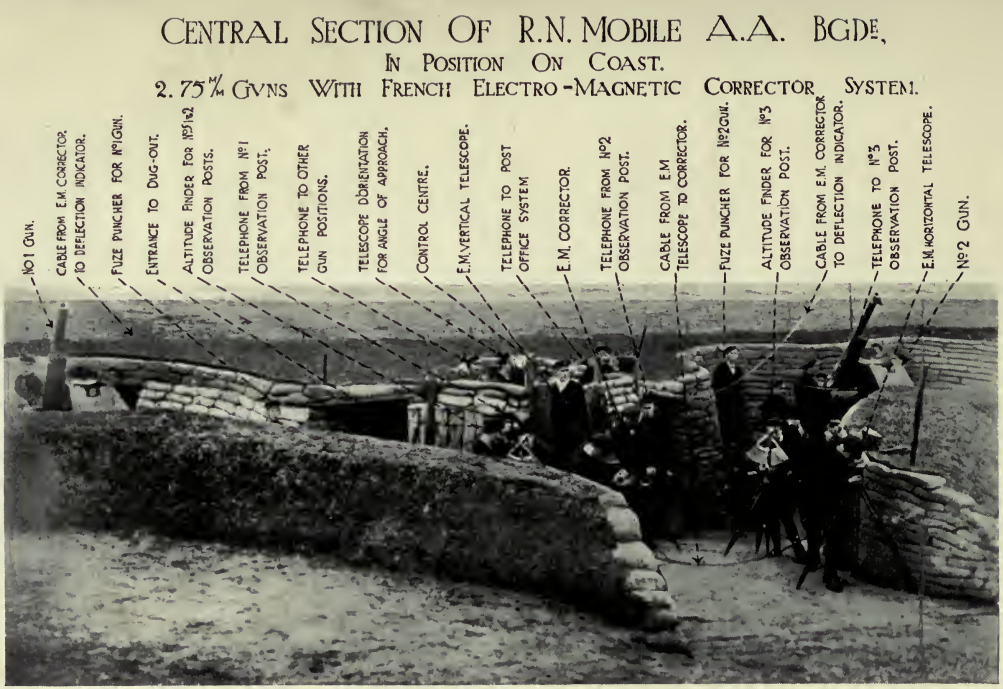
This most gracious act of Her Majesty's fired the headquarters batteries with the ambition to do something of a similar kind, and after very considerable preparation an entertainment was finally given by them which included the acting of a very popular sketch and many musical efforts on the part of the officers and men. People came to this show from all the surrounding country, and it had a surprising success, which bore excellent testimony to the popularity of the brigade and to the opinion held in the county as to the efficiency with which the anti-aircraft defence was conducted.

During the autumn we had carried out an experiment by constructing a novel form of gun-pit on the coast at headquarters. This was specially designed by myself, to accommodate two auto-canons, and to afford the maximum of cover to the men working the guns, as well as special accommodation for the working of all our somewhat elaborate height-fighting, range-finding, and special aiming instruments. It also contained a roomy and weatherproof "dugout," which was of great value to us during the many long winter nights which we were obliged to spend at our gun-stations.

On November 22nd we, for the first time, were attacked by an enemy aeroplane during the daytime. This was evidently an experimental attack, which, however, was destined to be the forerunner of the elaborate system of aeroplane attacks afterwards organized by the Germans. We received warning of the aeroplane's approach to the coast on this occasion at 2.45 p.m., and at 3.15 p.m. the first of our guns engaged him. He tried several times to cross the coast at various different places, but was each time driven off, and finally dropped his bombs in the sea, returning to Germany at 4.15 p.m. without having succeeded in dropping any of them on English land.

One more Zeppelin raid occurred before the end of the year, which furnished an opportunity for a strikingly bold and successful action by the gallant airmen quartered at the aerodrome close to our headquarters at Bacton.

It was a bitterly cold night, with several inches of snow on the ground, and we were turned out about 11.30 p.m. The Zeppelins came over the coast elsewhere, and none of our guns were in action. The enemy never reached London, but, on deciding to retreat, crossed the coast well to the south of the right flank of our position, intending, no doubt, to follow the coast some distance out at sea till they could lay their course for home from the usual lightship. In this, however, they showed a lack of true appreciation of the enterprise and skill of our airmen, which cost them dear. At about 4 a.m. our instruments advised us of the



The double gun-pit and dugout on edge of cliff, designed and constructed by Commander Rawlinson, who is seen in the control station in centre.

approach of a Zeppelin from the S.W. At that time three planes from the Bacton Aerodrome had already been "up" for some hours, and were no doubt cruising at a commanding altitude, awaiting the enemy on his homeward passage.

All we were able to hear was that, as the airship crossed the coast to the south of our position on its homeward road, there was a great acceleration of its engines, followed by a very considerable machine-gun fire. Then followed a pause of about ten minutes, the action being subsequently renewed farther out to sea and considerably farther to the south of our position. At that time it was so cold, and our men were all so stiff and numbed by exposure, that I had formed them all up with their hands on each other's shoulders, making them then run round in a circle, so that they might be kept warm by the exercise and be in a condition to effectually work the guns should the enemy come within range. Whilst we were all engaged in this very effective but somewhat childish manœuvre, there came a sudden shout from our "lookout," and we all gazed to the southward, and the next moment went up a "yell" that might have been heard 5 miles away, for—*this is what we saw:*

In the far distance, at least 10 miles out to sea, and at an altitude of 7,000 or 8,000 feet, a small blue-looking flame had appeared in the sky. As we watched it, it rapidly increased in size and turned much yellower, falling slantingly and with increasing speed as the fire grew, till at last it

appeared a cloud of flame falling perpendicularly into the sea, where it was instantly extinguished.

That was the only time I ever personally saw a Zeppelin destroyed before my eyes. I know of no sight which ever gave me such immense satisfaction, for no one could appreciate its true meaning better than I could, or know so well that the loss of those few German lives might be the means of saving thousands of innocent British women and children from death or mutilation in the future.

The story of the fight I heard at first hand the same morning. It appeared that three of our planes were "up," and that each in succession arrived within striking distance of the Zeppelin as it crossed the coast, or soon afterwards. The youngest of the aviators arrived first, and in spite of a hot fire from the German machine-guns, he flew right up close to the airship. At that tragic moment his gun "jammed," leaving him no alternative but to circle away again whilst he endeavoured to free the "jam." Immediately afterwards the second aviator arrived and came under fire, emptying his whole stock of ammunition into the airship's envelope, without effect. He also then circled away.

The third plane, piloted by Lieutenant Cadbury, had had much farther to come and did not reach the Zeppelin till it was already some distance out to sea. Cadbury, however, engaged it immediately he could effectually do so, emptying a drum of ammunition into it, with no more success than his predecessors. Then, fitting his last "drum" to

his gun, he sailed right up within a few yards of it, and, firing the last shots, all carefully aimed *at the same spot,* he had the supreme satisfaction of seeing the escaping gas at last take fire, from which moment, of course, the airship's fate was sealed. Many and most hearty were the congratulations on his achievement which were received by the successful pilot on his descent, and he subsequently received a well-deserved and more tangible mark of approval from the authorities. His comrades also were not forgotten when they landed, as though they had not achieved success, they had all attacked with equal bravery and enterprise. After this successful night we were not destined to see any more of the German Zeppelins until October 19th, 1917, when the grand final attack by their airship fleet was delivered on London, which most sensational event will be fully described in due course.

The Mobile Brigade spent Christmas in its positions in Norfolk; a few days later orders were received to move south and to occupy the coast at the mouth of the Thames extending from Shoeburyness to the mouth of the Blackwater River, as it was rightly considered that the method of aerial attack was about to be changed by the enemy from Zeppelins to aeroplanes, and that the mobile guns could therefore be of better service in more southern positions.

CHAPTER X

THE MOBILE BRIGADE AT THE MOUTH OF THE THAMES, 1917 : FOULNESS ISLAND

On receipt of orders that we were to move from the Norfolk coast, I at once visited our new district. After a careful examination of the whole neighbourhood, I reported that Burnham-on-Crouch would be the most suitable spot for our headquarters and that we could extend in all directions from there. It was then decided that we should hand over our eight smaller guns (3-pounders) to the lighter mobile force which would still be employed to cover the overland route to London from the Zeppelin sheds in Jutland. We therefore marched south with only our four 75-mm. French auto-canons and one 3-inch British gun, as we were instructed to leave the other 3-inch mobile gun in a position on the shores of the Wash in Norfolk.

We marched out of Bacton early in January, and, after halting for lunch at Ipswich, reached Burnham-on-Crouch the same night, going for the moment into billets in the town. The officers were accommodated at the Corinthian Yacht Club, which at that season of the year was practically empty. There we were very comfortably lodged, for which most welcome accommodation our grateful thanks

are due to the members, who on all occasions greeted us most hospitably.

Our line was established close to the sea-wall along the inner edge of the mud flats, of which that most dismal coast-line is entirely composed. Our right flank consisted of a section of two 75-mm. auto-canons, whose position was on the very point of the north bank at the mouth of the Crouch River. Our centre was a 3-inch gun with its searchlight, stationed at a most interesting old farm on the very edge of the marsh 4 miles north of the mouth of the Crouch. Our left consisted of a second section of two 75-mm. auto-canons, stationed at another old farm, their gun-position being at an old ruined chapel at St. Peter's, the extreme point of the southern bank of the Blackwater River. Our entire line at this time only extended for a distance of 10 miles.

Reliable information was, of course, forthcoming as to the lines upon which the enemy was working in order to render his future air raids more effective. We therefore were well aware that in future we were to expect well-organized raids by "formations" (squadrons) of specially constructed bombing planes, which were already (at Christmas-time) in a very forward state of preparation. The stations from which the greatest number of these planes would "take the air" would, we knew, be situated in Belgium. Their direct course, therefore, to London would cross the coast somewhere about the line upon which our mobile guns were now established. The excellent and easily identified land-

marks offered at night by the rivers between which we were posted could not fail to be taken advantage of by the enemy's planes for their guidance on first "making" the land. We concluded, therefore, that our position was a very desirable one, in which we might hope to have the opportunity of rendering good service to the defence, and no other consideration of any sort was of the least consequence to the gallant fellows whom at that time I had the honour to command.

The early months of 1917 were excessively cold and damp. Having since those days personally experienced conditions of Arctic severity in other parts of the world—where the thermometer frequently registered more than 20 degrees below zero —I can honestly say that *nowhere* have I been so chilled to my very bones as I was on those "damp, damp" flats during those "damp" long winter nights. The reason for this is, of course, that when the tide goes out an expanse, at least 2 miles broad, of wet sand is left exposed. Over this "damp" sand the east wind (which reaches London considerably increased in temperature by its passage over the land) blows with terrific keenness, gathering to itself as it passes over them the freezing humidity of the sands, with the result that its effect on those whose duty keeps them long exposed to it without shelter is absolutely paralyzing.

The whole East Coast of England is constantly liable to winter fogs, but of all the East Coast districts the peninsula between the Crouch and Blackwater Rivers easily bears away the palm in

this respect. It will be understood, therefore, that I soon became busily occupied in writing reports to the effect that it would be impossible to find a more unsuitable coast-line on which to place guns and searchlights than the one which we were then occupying. I also made urgent representations that by retiring less than 10 miles inland we should be able to take advantage of much higher ground. At the same time our guns and searchlights would be brought nearer together, occupying the peninsula at its narrowest point, and covering both the rivers just as effectually as on the extreme coast where we were then stationed. This proposition was immediately agreed to, and we fell back at once to a position extending from the Crouch a little west of Burnham to Stansgate Abbey, only 6 miles distant to the north, on the southern bank of the Blackwater River.

In this position we spent the first four months of 1917. During those months, although we turned out pretty frequently, no enemy approached our positions. In the month of February we received orders to arrange a position farther south for our remaining 3-inch British gun and its searchlight, which were about to rejoin our headquarters from their station on the Wash. It therefore became necessary to explore Foulness Island, which lies south of the Crouch and forms the coast between the mouth of that river and the entrance to the Thames at Shoeburyness.

Of all the damnably desolate and deserted spots in the United Kingdom, this island probably best

deserves that description. In the first place, at high tide it cannot be reached except by water; secondly, during the time of our occupation the water, which was the only means of communication, was one large mine-field. It therefore was necessary to proceed there in a Government vessel, as no other craft were then allowed to navigate those waters. I was fortunate in obtaining a "passage" in the naval coastal motor-boat which was on duty on the Crouch, and was finally landed on a mud bank early one morning, and informed that the boat would come and anchor at the same spot in the late afternoon to pick me up. In the meanwhile the island lay before me, and I was quite free to examine it.

This was not so easy as at first sight might appear, for, although certain parts of it are under a somewhat elementary species of cultivation, the soil is of the heaviest. As my crippled limbs made very "bad weather of it" when I tried to walk through the deep soil, I failed for a time to see how I was going to cover the ground, the island being a good 10 miles long with an average width of at least 5 miles. There were, however, certain inhabitants, a few isolated farm-houses, and an excellent imitation of what an isolated English village may "elsewhere" have been—say in the Middle Ages.

I therefore stumbled in the direction of the only building which could be seen, which turned out to be the most important farm on the island. Here the inhabitants gazed at me with astonishment, with which was mixed a considerable element of sus-

picion, as they were unable to conceive how I could possibly have arrived there except in a German airship! It must be remembered that some time before a Zeppelin really had come down in that county, not on the island itself, but not far away on the mainland. On that occasion the local constable was asked the way to the police station, in excellent English, by the commander of the Zeppelin, who, having destroyed his airship, was very naturally particularly anxious to surrender with his whole crew before the populace ascertained who or what they were.

The constable, with great cordiality, showed them the way himself. On their arrival, having ascertained the nature of the party he was conducting, he most ingenuously claimed to have captured them all, entirely without assistance. This sensational exploit on the part of the heroic police officer, had formed, no doubt, the subject of much discussion in the local taprooms during the winter evenings, with the result that that individual had earned undying fame throughout the whole district by his really sensational feat of capturing single-handed an enemy officer and nineteen men, all of whom were well armed. This he had obviously succeeded in effecting by the exceptional power of his personality, considerably assisted, no doubt, by the effect produced by his uniform, for he had no weapons of any other kind at his disposal.

When, therefore, I approached this isolated farm, I found that each individual had some idea in his head that here was a chance presenting itself of his

emulating the heroic policeman's feat and that I was "the goods" providentially provided as the means securing his special benefit and advancement. The "passes" and papers, with which I was liberally provided, were looked upon by the islanders with the deepest suspicion, and it was not until my patience at last became exhausted and I really began to "let fly" and to make free use of an ample and very varied vocabulary that they finally became convinced that I *must really* be an Englishman.

That settled, the reason of my visit to the island was, after some considerable difficulty and discussion, at last satisfactorily explained to its inhabitants. It appeared that, as the island had rarely ever been visited by anyone, even in peace-time, it had passed their comprehension that anyone could have come there voluntarily. They had therefore concluded that I *must* be a *German spy* and that my aeroplane was probably craftily concealed near by. When at last they were satisfied that they had been mistaken in their conclusions, I asked, Had they got a horse? The unanimous answer was at once given in chorus by all present: "Ay, there be owd Bob." I thanked them heartily and suggested that, as my time was short, "owd Bob" should be immediately produced.

In a few minutes a gigantic "carthorse" appeared, the ground trembling beneath his ponderous tread. I was assured that he could easily and unaided draw a plough which no pair of horses in the island could pull. Having received this comforting assurance, I was then hoisted up a terrible

height till finally I found myself "perched" on his back, where I felt as if astride of a perambulating Zeppelin, with a horrible sensation that I should split up the middle.

Finally, however, without any undue haste and with a strong local escort, we started in state to survey the island. I have ridden on various occasions over almost every country in the world, on every conceivable kind of animal from an elephant to an ox, but that one ride will always remain in my recollection as the most tedious and uncomfortable which I have ever undertaken. The work, however, was done, and "owd Bob" eventually deposited me, in the afternoon, on the mud flat where the naval patrol boat was awaiting me, having carried out his part of the duty in a highly sober and satisfactory manner, if without any undue haste or agility.

On my return to headquarters I instructed the adjutant to visit the island next day in a car, as I had learned that during two hours at extreme low water it was possible to drive to it across the sands from Shoeburyness. He reported to me the next evening that my information was correct, that a road was marked on the sands and shown on the ordnance map, and that the passage could therefore easily be made. We had, however, by no means finished our experiences of this most aptly named island.

Our Mobile Brigade was now reduced by the military authorities to a Mobile Battery. This, of course, was on account of our strength, as we had

only 200 men. The working of the official mind is really a most interesting study, and the above fact is an excellent illustration of the particular official mentality to which reference is made. Our strength, of course, had in no way altered, and it had sufficed to adequately operate fourteen mobile guns and five searchlights for many months. That, however, was entirely owing to the interchangeable qualities of the naval personnel, which alone had rendered it possible to do the work efficiently. According to the strengths laid down in the Military Regulations for Establishment, considerably more than double that number of men would have been considered necessary in the Army for even fewer guns.

This fact was a permanent source of irritation to the official mind, which was already greatly concerned that it should have under its orders at all, personnel who actually wore an unmilitary uniform and were all subject to *naval* regulations for administrative purposes. When, however, in addition to these singularities, they had proved themselves both willing to undertake, and capable of performing, a task to which double their number of soldiers *should* have been allotted, it was felt to be really "too much," and that such irregularities must cease forthwith. Eight of our fourteen guns, therefore, had been handed over, though our numbers still remained *the same;* and by the simple means of having the same number of men for less than half the work, our strength was made more nearly to approach the accepted military standard. With the reduction of the force to the designation

of a battery, the official mind therefore became more at ease, and I was therefore urged again and again to endeavour to prevail upon both officers and men to consent to their transfer to the Army. In that case they could all be herded into the common "pen" and would no longer differ in any way from the rest. I put this proposition before the officers and men on several occasions, and certainly never did anything in any way to discourage the idea.

Our little force, however, were very proud of their unit, as indeed they had every right to be, and not one single one of them would agree to being transferred to the Army under any circumstances whatever. I, of course, understood their feelings very well—but the authorities did not. The result was that it was perhaps thought that I was in some way adversely influencing the men's decisions. One day in early spring, my friend and superior officer, Captain Stansfeld, C.M.G., R.N., came down to our headquarters from the Admiralty. He then told me he had orders to put the question personally to each individual man. This was done, but the result was precisely the same; and from that day our *early disbandment* became a certainty.

In the meanwhile our gun, which was to take post on Foulness Island, arrived, and it became necessary that it should proceed to that island across the sands. A light waggon was therefore selected, the chassis of which had been constructed by Delaunay Belleville and had originally carried an armoured car. This waggon was both light and powerful, and I sallied forth first to test the track with it

before adventuring the heavy gun on the treacherous sands. The adjutant, who had already inspected the road, came with me, and we drove some 20 miles round to the point where at low water it was possible to drive on to the sands.

Here we awaited the fall of the tide, studying carefully in the meanwhile the marks which had been laid out by the ordnance surveyor, and which indicated a road across the sands known as the Brown Way. They all appeared very clear and unmistakable, so that when the tide was low enough we boldly struck out over the sands. The track left the point north of Shoeburyness and ran over the sand about 1 mile out from the sea-wall, and afterwards generally parallel to the coast, for from 4 to 5 miles. At that point, a right-angled turn had to be made to the left, to reach the sea-wall by following a spit of somewhat hard sand which was situated there, but which *looked* exactly the same as the treacherous ground on either side of it. As, however, the turn was marked by a post, and the man was in the car who had already compared the marks with the map, we went gaily along in comfort and safety.

As we approached the post our pilot instructed us, "Here is where we turn," and, "Turn carefully close to the post." I was driving myself, and went so close to the post as almost to touch it, in order to make quite certain we should take no unnecessary risks, and . . . in a moment our wheels sank to the axles, and the whole car began rapidly to settle down in a quicksand!

Our pilot's instructions to turn close round the

post had been absolutely correct, and had been most accurately carried out; the only trouble was that he had given us the word to turn at the WRONG POST! . . .

Our position was then of the worst, and we made every possible endeavour to save the car by spreading all the floor-boards and cushions on the sand to increase the surface as much as possible. This was slow and tedious work, as it was necessary to constantly move one's feet, which sank in fast, or we should have been in danger of being engulfed ourselves as well as the car. Whilst thus occupied, happening to glance up, I saw the white line of water, which heralds the incoming tide, rapidly approaching. I was quite familiar with the phenomenal speed at which the incoming tide covers these mud flats, and knew also that long before the sands are covered by the tide they become so moist that they are impossible to walk over. It was therefore evidently quite hopeless to get back the way we had come, and it became necessary to make at once for the sea-wall directly from where we were. The wall was about 1 mile off, and to reach it we should have to cross sand even more treacherous than that in which we were then struggling.

Could it be done? It was just possible it *might*. . . . All, however, depended on the depth to which our feet were going to sink into the damp sand, and how long our "stamina" was going to hold out. Anyone who has ever tried to walk through "quicksands" will probably know what

it is like; the majority of those who have tried, however, are probably STILL THERE. That being so, imagine, if you please, having to *run* "over," or rather "through," about a mile of them, with the tide close behind you, and the "going" getting *worse* all the way. I was fortunate enough to be the first to see the "turn of the tide." Instantly realizing our danger, the oath I "let out" was such a "rasper" it left none of my men, who all knew me well, in the least doubt that there was serious need to hurry. My first "exclamation" (let us call it) was followed by the order, "To hell with the car!" "Make for the shore, and pray God we may get there!" And away we went. Our young men very soon got well ahead of me, as I was pretty badly handicapped by my sadly crippled limbs. The adjutant, a hefty young man of about thirty years of age, also left me at the start. If, however, I was a bit crippled, at any rate I had very little flesh on my bones and HE HAD MUCH!

I soon found that I was catching him again, and on eventually passing him, experienced the proud feeling of being no longer *last*. It was lucky indeed for us that some of the inhabitants, knowing the possibilities of their infernal sands, were on the lookout for us on the usually deserted sea-wall, and had brought some of "owd Bob's" relations down, in case there might be trouble with the gun or cars. If they had not come some way out into the sands to meet us, I much doubt whether *I* should ever have got ashore, and I'm quite *sure* my stout friend

wouldn't. As it was, I felt that I should have liked to embrace either the islander or his horse, or both, when they at last reached me, and it must indeed have been a "close call" before any such idea would occur to one. I had, however, the great satisfaction of having beaten the adjutant by a good 50 yards, and when he was finally pulled on to a horse he was purple in the face and speechless. That is the last time I have visited Foulness Island, and I most heartily hope it may remain so.

The next day one of our "artists" produced a drawing, which was presented to me, and which I kept for a long time, but which is, unfortunately, not now forthcoming. This depicted our "Delaunay" car floating on the waves, with the White Ensign flying, and the proud motto underneath, "H.M.S. Delaunay at Sea." "The yachting season has now begun at Burnham-on-Crouch."

The portraits were excellent, and the drawing also, and formed a most realistic picture, as well as one more illustration of the amazing diversity of first-class talent which was to be found in the ranks of the Mobile Brigade.

Within a few days of this somewhat sensational experience, I received an intimation from the Admiralty that a communication had been received by them from the Field-Marshal Commander-in-Chief, to the effect that "if I was prepared to transfer to the Army, he was prepared to appoint me to a command in the military anti-aircraft defences of London, with military rank and seniority equivalent to that I held under the

Admiralty." I was also informed that the London defences were to be divided into three sub-commands—north, east, and west. It was the West Sub-Command which was to be offered to me, and that command was to contain all the French guns with which I was so thoroughly familiar. I was also assured that any of my officers who were willing to transfer to the Army, and whom I was prepared to recommend, would be transferred in their existing ranks, and would remain under my orders in my new command.

It will be understood by all, that in war-time every man's duty is to do what he *can*, and he is lucky indeed if work falls to his lot which he is well qualified to perform. For this reason, in view of the peculiar difficulties presented by the supply and maintenance of our French ordnance, I accepted this offer at once, although I had otherwise no desire to rejoin the Army, more particularly for employment on the "*Home*" Front.

On the second day after receiving the above intimation, I had my last parade and said good-bye to my friends and comrades of the Royal Naval Anti-Aircraft Mobile Brigade. I am very desirous of putting on record that I have never anywhere seen a finer or more capable lot of men. And I wish to thank them, each and every one, for the first-class work they did, and, above all, for the excellent spirit in which they did it.

My adjutant and one other excellent officer, Sub-Lieutenant McGrath, consented to transfer to the Army with me, and were of great assistance to me

in my new sphere of action. We paraded on the morning that I left, and I addressed the men, but it was a sad moment indeed when in the afternoon I started in my car for London and found the men all collected in the main street of Burnham to give me one last cheer as I departed. That unexpected action on their part was deeply appreciated by me, and I felt, and shall always feel, very grateful to them all.

PART II

THE DEFENCE AGAINST AEROPLANES

CHAPTER I

THE FIXED MILITARY DEFENCES : THEIR ORGANIZATION AND ARMAMENT

At the beginning of May, 1917, I was required to report to General Headquarters, Home Forces, at the Horse Guards, for the purpose of being transferred to the Army and of taking up the military command to which I was to be appointed.

I was, of course, already fairly familiar with the fixed military defences generally. There were, however, very many details of their organization and system of defence of which I was entirely ignorant. The only officer in the fixed defences whom I had already met was the Anti-Aircraft Defence Commander, Colonel Simon, R.E., who was known as the A.A.D.C., and was in charge of the whole of the fixed defences at that time. He thus became my immediate commander.

On reporting to General Headquarters at the Horse Guards, my friends on the staff there, with whom I had been on such excellent terms during my independent command of the R.N. Mobile Brigade, informed me of the details of the military defence organization. It was at once evident that I should no longer report to, and receive instructions from, the Headquarters Staff; but that, as a sub-commander in the fixed defences, I should of

course be entirely under the orders of the A.A.D.C. and therefore should no longer be entitled to communicate direct with the Headquarters Staff, or to receive instructions except through the Defence Commander.

This was sad news indeed, as in all the very strenuous times through which we had passed, and in the often very difficult positions which resulted from the fact of commanding an Admiralty force under military executive orders, everything had gone smoothly and easily and without the least fuss or bother of any sort. In fact, I rejoice to have here an opportunity of most humbly recording that the Headquarters Staff of General Headquarters, Home Forces, at that time—from the illustrious Commander-in-Chief, Lord French, and that most genial and competent of Generals, Sir Frederick Shaw (afterwards Commander-in-Chief in Ireland, who was then Chief of the Headquarters Staff), downwards—were the most sympathetic and intelligent staff of officers it could ever be any man's privilege to take his orders from.

However, *Autres temps, autres mœurs* (Other times, other ways "), and development of the organization on strictly regulation military lines was now to be the order of the day. The somewhat casual methods, therefore, by which things *had* been done, in the lamentable state of unpreparedness in which the first raids had found the London defences, were now looked upon with great disfavour as being evidence of military inefficiency.

This reorganization was, no doubt, very neces-

sary. For, as the development of the defence proceeded, the number of officers and men, and of armament and searchlights, became very much greater. The system upon which attacks were met became also vastly more complicated, so that it was indispensable that all procedure should conform to the regulations and customs of ordinary military service.

These, we all know, are pretty tightly bound up with "red tape," which at times, no doubt, interferes with and prevents the immediate employment of many improvements which are in the nature of "innovations." Whilst, however, that most lamentable fact must be accepted, it is necessary at the same time to bear in mind that it is by the system of absolute uniformity alone that the possibility of a rapid increase of strength (of personnel and armament) can be insured. If guns are to be supplied, ammunition provided, instruments of all kinds brought into use, and *men drilled* in the shortest possible space of time, to operate all these effectively, it becomes essential that all shall be exactly the same, so that men, guns, ammunition, etc., may all be interchangeable, and every system of drill and operations absolutely identical.

This was the spirit in which the London *military* defences were organized, and it was beyond all doubt the only system by which such an elaborate and difficult undertaking could have any chance of ultimate success. Especially was this the case in view of the difficulties which existed in the provision of both officers and men. Here was no case, as in

the Mobile Brigade, R.N.V.R., of a *corps d'élite*, but men had to be taken from wherever they could be obtained, the majority from those unfit for service in the field on account of physical incapacity, and others from the large number of men suffering from wounds and other disabilities as the result of service at the Front.

These all required special training for their duties, and as time went on, and more and more men were required at the Front, again and again men were drawn from the London defences for service in the field, whose services earlier on had been refused. This necessity, in the end, rendered the responsibility for the efficiency of the defence a very anxious one indeed. In any case, whilst fully appreciating the position, it did not take long to realize that times were to be now very different, and many, many times did I regret the loss of the glorious men of the Mobile Brigade, who had been scattered to the ends of the earth by the disbandment of that unit immediately after my transfer to the Army.

Exactly what had been the organization of the fixed military defences, previous to my transfer, I do not know; but the arrangements had then been recently modified, and instead of there being a number of local units and headquarters in various parts of the London defence area, the whole force was now divided into three districts. These districts were termed "sub-commands," and covered the north, east, and west of London. These three "sub-commands" were each to be commanded by a Lieut.-Colonel acting under the orders of the

Anti-Aircraft Defence Commander at the Horse Guards, that officer at that time taking his instructions direct from General Headquarters, Home Forces, under the direct command of Field-Marshal Lord French, the Commander-in-Chief.

During the very strenuous time which followed my appointment, I, of course, knew very little of the details of the organization of the other sub-commands, and indeed it was as much as I could do to master those of my own particular unit. All three, however, were run on similar lines, and precisely similar systems of orders and signals were observed throughout the whole defence area. This uniformity was assured by constant inspections by the A.A.D.C. and by the holding of a weekly conference of the sub-commanders under his presidency at the Horse Guards. The force of R.N.V.R. which had previously occupied certain of the central fixed stations was retained, and remained under the command of my friend Captain Stansfeld, C.M.G., R.N., who also assisted at the weekly conferences, and whose system of operations and signals in every way conformed with those in use by the military forces.

When I took over command, the Western Sub-Command consisted of nineteen gun-stations and thirty-six searchlight stations. These extended from about 2 miles beyond Watford on the north to about 3 miles south of Bromley on the south, and from the Long Walk at Windsor on the west to Grove Park on the east. The Sub-Command Headquarters was established in the Metropolitan

Waterworks enclosure on Putney Heath, from which an elaborate system of telephones radiated to all parts of the district.

The personnel, provided for the manning of these stations, consisted roughly of 32 officers and 600 men. Each gun-station was under charge of an officer, and manned by a sergeant, a corporal, and from sixteen to eighteen men, according to the particular type of height-finding and other instruments with which it was equipped. The searchlight stations were each under charge of a non-commissioned officer, with from six to eight men, according to the various types of engines by which the electric current was supplied for the searchlights. This force was divided into four companies—two consisting of Garrison Artillery gunners, and two of Royal Engineers who manned the searchlight stations. Each company was commanded by a Captain assisted by a company officer, who were both stationed at the Sub-Command Headquarters, and responsible for the administration and training of their men. Finally, at Sub-Command Headquarters was the sub-commander, responsible for the training and operations of the whole force, and assisted by a Major, second-in-command, an adjutant, and an officer of the Headquarters Staff, as well as an officer acting as Quartermaster in charge of matters of supply—*i.e.*, rations, clothing, etc.

The scheme followed in the location of the gun and searchlight stations was as follows: A few central stations such as Hyde Park, Paddington

Recreation Ground, Parliament Hill, and Deptford, remained in charge of the R.N.V.R. Beyond them was a ring of inner guns, such as Dulwich, Wandsworth, Norbiton, Richmond, Hounslow, Hanwell, Acton, Horsenden, and Kenton. Beyond them again lay the outer ring extending from Watford, through Hayes, Windsor, Staines, Hampton, Morden, Croydon, and Bromley, to Grove Park. Most gun-stations were served by two searchlight stations which were known as "fighting lights," whilst in addition the outer ring of gun-stations also had other searchlight stations attached to them, which were known as "advanced lights." These were placed "far out," in order to be in a position to give the earliest notice of the enemy's approach.

The telephone system adopted was that the searchlight stations each communicated with the gun-station to which they were attached, and the gun-stations then communicated with headquarters, though it was, of course, possible to switch the connection straight "through" to headquarters, or *vice versa*, at any time if required. It was necessary, however, in the case of the gun-stations, to have "double lines" everywhere, for in action it was indispensable that a line should always be "free" to transmit orders "outwards" *from* headquarters, without interfering with the free flow of information simultaneously coming "inwards" *to* headquarters.

Each gun-station was also connected with at least two "observation posts." These were situated in opposite directions at considerable distances from

the guns, in order to "observe" the bursts of the shells and to "spot"—that is, to advise the gun as to the position of the bursts in relation to the target, which cannot be truly observed from the gun-position itself. These observation posts incidentally became of considerable value as sources of information during raids. The sub-command headquarters was also connected direct with the headquarters of the North and East Sub-Commands, and with the Central or R.N.V.R. Sub-Command, whilst a direct double line also ran to the Anti-Aircraft Defence Headquarters at the Horse Guards.

The above short description will be sufficient to show that the actual telephone installation was of itself elaborate. It can therefore be understood that the training of the telephonists required close attention and constant supervision, as, upon the proper and efficient discharge of their duties during a raid, the entire operations of the defence depended. Further reference will be made later to this important point, and the manner in which it all worked out during the protracted aeroplane raids which were subsequently delivered will be explained.

The armament of the West Sub-Command at this time consisted of twelve fixed 75-mm. French guns, four "mobile" 75-mm. French auto-canons from the old Mobile Brigade, R.N.V.R., and three 3-inch 20-cwt. British guns. The fixed French guns were mounted upon mountings which had been made by the Coventry Ordnance Company, from designs which had been obtained from Paris.

The "mobile" auto-canons remained upon their automobile chassis, but the latter were mounted upon the turn-tables which had been designed at Bacton, by means of which the "dead angle" was eliminated. The 3-inch 20-cwt. British guns were mounted on British standard "high-angle" mountings, and were much "higher velocity" guns than the French 75's. By that term is meant that the projectile was discharged at a much higher "muzzle velocity," and that therefore the "time of flight" was much less, and the probability of error proportionately diminished.

The searchlights were of no less than five different makes. They were also of different sizes, and the electric current was produced by different engines. These engines required different periods of time in which to "start up," and suffered each from its own peculiar trouble during the sustained "running" which now became necessary during raids. The "beam"—that is, the actual shaft of light—varied in the different models, so that an intimate knowledge of them all was necessary to control effectively their action so as to obtain the best results.

On "taking over" I was informed that in the late reorganization of the defences several (I think at least three) units, which had previously been independent, had now been consolidated into one to form the West Sub-Command. It was further intimated to me that they had none of them previously been very satisfactory, and it was hoped that I should succeed in rendering them efficient in

future. I could see at once that a pretty "stiff proposition" lay before me, and I could only hope that I might be able to make something of it, though that much to be desired end was evidently considered somewhat unlikely. I had, however, every intention of tackling the job with the utmost energy of which I was capable, and was assured that I should receive cordial support from the defence headquarters. This last all-important point afforded me the greatest satisfaction, as I foresaw every kind of trouble, and no one knew better than I did the elaborate class of attack which was in preparation, and which might now be expected at any moment.

The first necessity was to become familiar with the somewhat complicated system in force for the communication of information. This had apparently originated at a time when communications had been made over the public telephone circuits. By this system different classes of aircraft were referred to by the names of different "flowers," and a variety of other special terms were also in use. This method, whilst somewhat difficult to learn, nevertheless, when in constant use, considerably "quickened up" the communications, and therefore served a useful purpose.

I paid a long visit to the A.A.D.C. at the Horse Guards, who was my immediate chief, and upon whom the whole responsibility for the details of the defence then rested. He explained to me the entire procedure in force at the Horse Guards, and was most kind, and at the same time particularly lucid

in his instructions. It was then settled that I should visit the headquarters of the North Sub-Command, which was in a high state of efficiency, in order to study on the spot the system there in force, before taking over actual command of the West.

The officer in command of the North Sub-Command, Lieut.-Colonel Lloyd, a most efficient and painstaking officer, who had been some time in the defences and knew every detail of the procedure, was at once very kind to me and considerate for my inexperience. Both he and his adjutant showed me every method which experience had suggested for the training of the personnel and for the clear and rapid communication of intelligence of all kinds. I had also the good fortune to be actually present at the headquarters of the North Sub-Command on the occasion of the first day-raid by aeroplane squadrons in formation.

This took place on June 13th at about 4 or 5 p.m. The attack was delivered by fourteen aeroplanes in formation, and reached the eastern portions of the Metropolis only. The "formation" approached the defences from the north-east, penetrated to the City, and retreated on a more southerly course. Some 70 bombs were dropped, 130 people were killed, and 246 injured, whilst structural damage was done to the extent of £120,000. This occasion, of course, afforded me an invaluable opportunity of studying the defence system in action, by which I profited immensely. I regret that the notes which I made on that occasion are not available, but I remember very clearly that the principal impression

left on my mind was the extreme value of self-possession on the part of those responsible for the control of the defence. On that occasion I had an opportunity of studying most striking examples of that quality, both on the part of the commander and his staff, which I have never forgotten.

A further point which I took to heart was the value of continuous training. The men I saw at work that day had done the same tasks over and over and over again in practice, until they were so familiar with their duties that the fact that they were dealing with an actual and almost wholly unexpected raid in the day-time made not the least difference to them. All duties were carried out, both at the stations and in the "operations room" at the sub-command headquarters, exactly as if the "actual raid" had been a "practice drill." Of course, no possible evidence could be forthcoming which could furnish more effective proof than this of the competence of the commander and the efficiency of the training of his officers and men.

After this most valuable experience, I proceeded to the West Sub-Command headquarters at Putney and took over command, with the firm intention of profiting by all I had seen and of sparing no efforts to bring my newly organized force up to the standard of that which I had seen at work, and, if possible, to render it even more efficient.

CHAPTER II

THE WEST SUB-COMMAND : TRAINING DIFFICULTIES

On arrival at the group of wooden huts which did duty as the headquarters of the West Sub-Command in the middle of Putney Heath, it was at once apparent that there would be a great deal to do before the new organization could be rendered effective. The new unit, which now comprised various others which had previously acted independently of each other, lacked any quality of cohesion. The officers of the staff previously in charge, having been well aware that their appointments were more or less temporary ones, had not been able to create that atmosphere of co-ordination of the various branches which is indispensable for the smooth and efficient working of a widely-spread organization, in which the close co-operation of each station and individual is absolutely necessary to the securing of satisfactory results.

The actual office buildings and the "operations room" of the headquarters stood on the top of the Metropolitan Waterworks reservoirs, which are constructed underground. The huts forming the accommodation for officers and men were outside the waterworks enclosure, and some 150 yards distant from the operations room. All the elaborate telephone connections ran to the "operations room,"

where telephone operators were constantly on duty day and night. The hut provided as quarters for the commanding officer was likewise situated outside the waterworks enclosure, and formed part of the general group of huts. This arrangement did not appear to me to be at all satisfactory.

My first action, therefore, was to pitch a tent close to the "operations room" on the top of the reservoir, and to announce that I should take up my quarters there in close proximity to our telephone exchange. The next step was to concentrate also there the company offices of the four companies of which the unit was composed, in order that instant personal intercommunication might be possible between the various company staffs and between the headquarters staff and the company commanders. On going into this most essential question, I found that two of the companies—one of R.G.A., and the other of R.E.—had their offices and headquarters at Wembley, about 8 miles distant from Putney as the crow flies. An immediate application, therefore, was made to the Horse Guards that the buildings there might be moved to Putney, and the move was promptly carried out.

On examining the details of the administration and training of the companies in the past, it was also evident that certain changes were urgently called for amongst the officers responsible for those duties. Certain recommendations were therefore made to the A.A.D.C. at the Horse Guards, by whom they were promptly carried out. Although probably some dissatisfaction was caused amongst

those whose position was affected, yet considerable progress began quickly to be made, and I had every reason to be entirely satisfied with the cordial support which I received from the headquarters of the defences. The greatest difficulty of all, however, was due to the actual extent of the ground over which the sub-command extended.

The stations were very widely scattered, the extent being roughly a circle with a diameter of 25 miles. The total area, in any case, was about 500 square miles, in which were scattered fifty-five separate stations. One of the first duties which devolved on the commanding officer was, of course, to visit personally all these stations, and to render himself familiar with the various guns and instruments in use at each. It was also of the first importance to make the personal acquaintance of each officer, to inspect the stations themselves, and actually to see the men at work, in order to form an opinion as to the efficiency of their training, as well as of the relative value of the officers themselves.

I remember still my horror when, going into the question of the actual time such inspections might be expected to take, I started to calculate how many miles it would be necessary to cover in order to visit all the stations at an average rate of three per day. When, however, my calculations reached 1,000 miles, and the end still did not appear in sight, I gave it up in despair. The best I could do was to devote every afternoon, which by any possible means could be made available, to this purpose,

Even then, when after eight months' command I finally left the defences, there was, I know, still one infernal searchlight station which I never *did* visit. Some stations it was, of course, necessary to inspect frequently, and nothing was more embarrassing than to note the extraordinary extent to which the efficiency of the various stations varied, in accordance with the capability or otherwise of the officers and N.C.O.'s under whose command they happened to be.

The two officers, Lieutenants McGrath and Finnimore, who had been transferred to the R.G.A. from the R.N.V.R. at the same time as myself, were at this time stationed at gun-stations to learn their new duties. I retained, therefore, at headquarters the adjutant who had been there on my arrival, who knew all the officers personally, as well as all the incidents which had occurred in the defences prior to my arrival. He was a Captain Bickersteth, who before the war had been a busy man in the City, and who, I believe, now again occupies that enviable position. He was of the greatest assistance to me, though I much fear his services were not similarly appreciated at the defence headquarters, as he shortly afterwards received another appointment elsewhere. This, whilst it deprived me of his valuable assistance, enabled me to apply for the appointment of Lieutenant Finnimore, who had been my adjutant in the Mobile Brigade. He was, in fact, the officer who had piloted us so successfully into the quicksand from which we had so providentially escaped.

I was fortunate also in finding one company commander on whom I could thoroughly rely—a Captain Cockell. He had, like myself, commenced his career as a Regular officer, and had also served through the South African War. He was of the greatest assistance to me, as not only was his own particular duty excellently performed, but he was also able to inform me as to the directions in which lay the greatest difficulties of the company commanders. Such information was very difficult to obtain, and was extremely valuable, in any case in those days, when both officers and men were "green" and unversed in military procedure and customs. It was therefore of the greatest assistance to have officers who had seen service and who had been brought up to the military profession, as they were looked up to by the rest, and imparted a proper "tone," and an appreciation of Army customs and discipline, to what would otherwise have been a sadly unmilitary body of men.

There were amongst the officers in the West Sub-Command, several who had served at the Front during the early months of the war, and who had been incapacitated for further service by wounds or other causes. These men were invaluable on account of the example they set to the others, who looked to them for guidance, and who never looked in vain, as on all occasions these men showed that devotion to duty which was learnt by all at the Front, and which so markedly characterized the British officers throughout the war.

Of the artillery rank and file it is difficult to

speak as a whole, for they comprised so many different classes. Some, however, were excellent, and others equally the reverse, many being unable to read, and some even being unable to "hear." In fact, a more curious medley was probably never brought together, and the wonder is that they were ever able to carry out any such elaborate system of defence as that which we were called upon to operate with any degree of success at all.

The personnel of the engineer companies contained a high proportion of very intelligent men. The capacity of their N.C.O.'s, also, was far in advance of the average of those of the R.G.A. The results of this were that in many cases the condition and efficiency of the searchlight stations, which were under the command of N.C.O.'s of the R.E., compared most favourably with the conditions obtaining at many gun-stations manned by the R.G.A. This fact became of great importance during raids, as, in the first place, the searchlight stations vastly outnumbered the gun-stations, and, secondly, the stations of the "advanced lights," being situated "farther out," always obtained the first information of the actual attack. This *first* information was always of the greatest importance as indicating the vital points of "altitude," "direction," and "strength," and many times have I been most thankful for the confidence which it was possible to repose in the intelligent observation and correct transmission of the facts by N.C.O.'s of the R.E. in charge of the "advanced lights."

Every day, and all day, training went on at the

stations, and constant inspections were made until the personnel became so familiar with their duties that each man carried out his particular work with regularity and precision, and both gun and search-light drill became matters of automatic routine. The more important part of the training, however, consisted of the practice of the methods of transmitting information as to the location and movements of aircraft, the object of this being to ensure that headquarters should receive a constant stream of accurate information in respect of the position and movements of any and every enemy aircraft which might enter the district in which the sub-command stations were situated. This information was then dealt with by the staff in a manner which will subsequently be described. In order, however, that this stream of information might be both accurate and regular, constant practice was required both in the sending and receiving of such messages.

With this object, constant "practice raids" were carried out. For the purpose of these practice raids, actual aircraft were occasionally available to fly over the defences, and so furnish the target to be reported. More often, however, "courses" were "set" for imaginary targets, which were duly reported as passing through the posts, and by that means a thorough familiarity with the whole system of sending and receiving such messages was obtained by all concerned. The further the system was followed, as the operators became more and more efficient, the more evident became the value of accuracy, and, above all, of concerted action

by all concerned. The main object was always to ensure that all superfluous and duplicate messages were avoided, and only such information sent as was vitally necessary to indicate the course, speed, and altitude of the targets in the most definite and concise terms in which it was possible for that information to be conveyed.

To turn now to the procedure at headquarters. If practice and accuracy were necessary at the stations, they were even more so in the "operations room" at headquarters, and each "practice raid" and exercise of the stations was equally practice and training for the headquarters staff. In order that the working of the system may be properly understood, it will be necessary to give a description of the "operations room," and of the methods in which the information received from the stations was there dealt with.

The "operations room" at sub-command headquarters was a large apartment, round which were arranged a quantity of telephone boxes. These were divided into categories—namely, those for the receipt of information coming "inwards" to headquarters, and those from which orders and information were sent "outwards" to the stations. Each box communicated with three gun-stations, which in each case were selected as being situated as far as possible from each other, in order that such information as might be coming from one station should not interfere with the transmission of any similar information coming, as was to be expected, simultaneously from the neighbouring stations.

Each gun-station, of course, collected its own messages from its attached searchlight stations and observation posts, which amounted to an average of about five posts connected to each gun-station. In addition to the above connections, there were also lines from the other sub-commands and from the Horse Guards, the total points from which information could be drawn during a raid being in all about one hundred.

Each telephone box was manned by a specially trained operator, whose duty it was, as soon as warning of a raid was received, to repair to his box and to remain there until dismissed. All messages were written down, and collected from the boxes by special orderlies. They were then submitted to the officers whose duty it was to sort them out and to impart only the *latest* information to the commander at the operations table. This table became really the "battlefield," for it consisted of a large map of the whole country extending to the coast, the whole divided into five or six hundred major squares which were all numbered. Each of these squares was again divided into four other squares, which were known as A, M, J, and Y of the number of their major squares; lettered squares were telephoned as Ack, Emma, Jay, and York, and were sub-divided into four parts, numbered 1, 2, 3, and 4.

It was thus possible to indicate by telephone very concisely and clearly the exact position of any object on the map. This system was so carefully impressed upon every officer and man in the defences, and they became so familiar with the

numbers and letters, that all were in the habit both of thinking and of talking of the neighbourhood of London entirely by the squares.

Each gun and searchlight station was also provided with a table fixed in the open in the immediate neighbourhood of the gun or light. On this was a map of the immediate district, marked in corresponding squares to those at headquarters. This map was covered with glass and illuminated at night by an electric light from underneath. The map was truly oriented—that is to say, correctly placed towards the points of the compass—and became the centre round which all the interest of the detachment revolved when operations were in progress.

All information reaching a station was at once carried to the table, and the position of an advancing target established on the squared map. As soon as the target could be confidently located from any station, such station immediately reported the fact, and also the squares through which the target was passing at the moment, coupled with any further information available as to its speed, altitude, and direction, as long as the position of the target continued to be established with certainty. Thus far the whole system was comparatively simple in its working, especially at the various stations. When, however, the information commenced to flow into sub-command headquarters, the matter of its collection and sifting became considerably more complicated. A thorough knowledge of each individual station, and a sound discretion as to accepting its information as reliable, as well

as instant decisions of every kind, then became indispensable to avoid chaos.

This, then, was the system in force, to the practice of which so much time and care was devoted. We next come to the duties of the unfortunate commander; whose responsibility it was to take advantage of the wealth of information at his disposal, and to judiciously put in force the various "operations" at his command, in such a manner as to frustrate the enemy's endeavours to penetrate the ring of defences and to prevent the dropping of his murderous bombs in London.

Before, however, going into the details of the actual command in action, which were entirely directed to the defeat of raids at night, it becomes necessary to record a second raid by "formations" in day-time. In daylight, although all the system for the furnishing of information described above was precisely similar to what would be required at night, the action of the guns, of course, depended on the individual effort and judgment of the officers. Each gun commander, having his target visible before him, was, of course, far better placed than anyone else possibly could be to estimate its height, range, and speed, and therefore to judge of the best moment to open fire and of how long his gun could effectively remain in action.

My actual report of the day raid of July 7th is, unfortunately, not available. I, however, retain a fairly clear recollection of the event, which is as follows:

During the morning, between 11 a.m. and

12 noon, we received notice that a squadron of enemy aeroplanes in "formation" was on its way to London. All guns and observation posts were at once manned, and preparations were made to give them a warm reception. They entered the defences from the north-east, flying in the usual V-shaped formation at an altitude of at least 10,000 feet. Their number was somewhat difficult to estimate with confidence, but was certainly in excess of twenty. On reaching the neighbourhood of Marylebone, on their westward course north of the river, they executed a wide turn to the south and returned on an eastward course south of the river. During this turn the machines became somewhat widely scattered, but though clearly in sight from West Sub-Command at Putney, the formation did not come within range of our stations.

The enemy were, however, heavily fired at by North, Central, and East Sub-Commands, and their turn for home was made much earlier than was the case in the majority of the subsequent raids which were made at night. During this raid seventy-six bombs were dropped, falling roughly in a semicircle comprising Stoke Newington at one extremity, and passing through Marylebone, Camberwell, and the Borough, over which district they passed on their homeward course south of the river. In this raid 46 persons were killed and 123 injured, whilst structural damage was done to the extent of £200,000. These results were not so serious as those caused by the previous day raid in which a smaller number of planes had been engaged; and

altogether the results were not satisfactory to the enemy, who were very seriously and disastrously engaged by our aircraft on their return journey. This occasion was the last upon which they ventured upon an aeroplane attack on London by day, which fact of itself afforded the most practical proof possible of the rapid and satisfactory increase in efficiency on the part of the defence.

We in the defences, however, were well aware in what direction the development of the attack would in future take place, and we continued to strain every nerve to perfect our system and to train our men. Our information was both clear and reliable that the resources of the defence would shortly be tried to the utmost in resisting the coming night attacks. We also knew that these attacks would be carried out by strong squadrons in "formations," which would deliver their attacks in succession in accordance with elaborately prepared plans—at this time being thoroughly rehearsed. Our efforts, therefore, were largely devoted to any improvements which it was possible to effect in our system of defence, such as might at any rate render the success of the attacks more difficult, and the damage resulting from them less severe.

In the meanwhile after the raid of July 7th a distinct pause in the attacks ensued, affording us a much-needed respite in which to perfect our arrangements.

CHAPTER III

EARLY DEVELOPMENTS OF DEFENCE AGAINST AEROPLANES : PROCEDURE DURING A RAID

It will now be necessary to explain the general lines upon which the actual "operations" of the defence were conducted, all the preliminary organization for the transmission of information having, of course, for its object the furnishing only of the foundations upon which the fabric of successful defence might eventually be erected.

As previously noted, the efforts of those responsible for the organization of the defences were already concentrated upon the problem of successfully meeting those elaborately organized night attacks which were known to be in preparation. Under these circumstances, as adequate means had already been adopted to ensure continuous and accurate knowledge of the position and course of any attack, it next became necessary to take the requisite steps to ensure the "barrage" of any such course by high-angle gunfire. Or, in still plainer language, to interpose at any given moment a curtain of bursting shells across the aerial path which the attacking planes might be desirous of following in order to reach their ultimate objectives.

The first idea was to make use of the "squares" for this purpose. With this object in view, calculations were made by which, on a "barrage" being ordered on any side of any named square, all guns within range fired along the "bearing" and at "angles of elevation" and "fuse-settings" which were laid down for them to use for that particular "barrage." These were so calculated that the shells so fired should all burst on the imaginary line which was represented on the map by the side of the named square. Each gun concerned in any particular "barrage" then maintained a rapid fire for a specified period of time, the "bearing" of the gun being slightly altered after each round so that the shells should burst successively along the imaginary line. The gun-stations had been so placed within the West Sub-Command that the squares in the outer ring of the defences were all within range of at least three guns simultaneously, whilst in the inner ring, in almost all cases, four guns or even more could be brought to bear on any given spot.

The above explanations will enable the reader to appreciate the whole system and to realize the responsibility which rested on the commander to make the best use of the means of defence with which he was thus provided. To illustrate the procedure followed, probably the simplest way will be to describe the scene in the "operations room" on the occasion of a raid. This, not with a view to giving prominence to any particular incidents which may have distinguished any special raid, but rather

in order to bring home to the reader the rather remarkable "setting" in which the whole scene was enacted.

The manner in which the first alarm was communicated to the defences from the Horse Guards was in the form of an indication of a certain "colour" in certain districts. The various "colours" intimated the approach or proximity of the enemy, and different "stages" of preparedness were automatically brought into force in the various districts, in accordance with the "colours" communicated for each particular district. Whatever the "colour" might be, however, it was in any case certain that on the communication of any "colour" at all, the enemy was already "in the air," and all the garrison was instantly "turned out" to be in readiness to resist the attack wherever and whenever it might develop. This "first warning" was quite likely to find the commanding officer inspecting a station far from headquarters. This has frequently been my own experience, and, on those occasions, the excitement caused by driving in an international motor-race paled in comparison with that of the frenzied drive which ensued, in the endeavour to reach headquarters before the attack was actually delivered.

I well recall inspecting a searchlight station at Addington, a good 10 miles from my headquarters by a most indifferent road, late one Sunday evening, when, in the middle of my inspection, the alarm came through from the Horse Guards. I had that day unfortunately sent my car to be thoroughly

"gone over" by the A.S.C. mechanics, and was riding a motor-cycle "combination." These "infernal machines," when there is no passenger in the side-car, are the most difficult and unpleasant vehicles in which to make high speed over a bumpy and twisty road. The enemy, however, were on their way, and in a moment I was on mine also. After a few sensational miles, however, I found myself "on my back," with the "combination" on the top of me. This happened twice during my 10-miles journey, and in the end I arrived, safely indeed and in excellent time, but with a wealth of experience of the possibilities of "combinations" of a kind which I was in no way desirous of acquiring.

Let us now adjourn to the "operations room." The signal has just come in that London is "red," meaning that the enemy is close at hand. All gun-stations have been reported "ready for action," and the engines of all searchlights are running, all being prepared to "uncover the lights" at any moment. The telephone boxes now each have their occupant, and the times of all clocks throughout the command have been checked and corrected to the "time" of the Horse Guards. At the big operation table sits the commander, the great table in front of him being covered by the "squared" map. On this are marked the various "barrages" for guns and "emergencies" (areas of concentration) for searchlights, in the use of which the stations have been trained. Officers stand round the table, each with their own special duty to per-

form, and orderlies stand about, ready to collect and to pass on the various messages as they are handed from the telephone boxes. It is pitch-dark outside, but within the room every corner is brilliantly lighted. Over all reigns a tense atmosphere of expectation and well-controlled excitement, as all know that the "maroons" have already been fired, and that the population of London (as far as they may desire to do so) have already sought safety in the various shelters which, by this time, had been provided for them. And thus we await the development of the attack.

On the map in front of the commander stands a telephone, and connected with it is a "head-set" (which infernal contrivance *he* is "supposed" himself to wear throughout the raid). This instrument communicates direct with the A.A.D.C. at the Horse Guards, who by this means issues his orders and communicates the latest information, in the sifted and tested form in which it reaches him. Just above the commander's head hangs a great funnel, through which he can speak to every officer under his command, by the simple process of calling, "All stations," in which case the necessary connections are at once made and he speaks to all his stations simultaneously. Alongside the commander, also, is the communication from the wireless operators whose "aerial" is situated on the observation platform high above. To that spot a speaking-tube is also connected, through which the "lookout" stationed there can answer questions and give information as to whatever may be visible from his elevated post.

The first definite news comes probably from either North or East Sub-Command headquarters, and intimates the time and spot at which the attack first enters the defences. Immediately this news is received it is repeated to all stations, and an officer simultaneously places a coloured counter on the map to indicate the position of this attack. It then becomes that officer's duty to place other counters of a similar colour on the various squares through which that particular attack passes until it finally leaves the defences. At the same time, written messages are handed from the telephone boxes to the commander, indicating the exact time at which the enemy has reached the positions indicated by the counters.

It will be appreciated that in the case of a single attack it is a fairly easy task to order the "barrages" necessary to block the path of the enemy at the proper moment. When, however, attacks are multiplied in number and are delivered in succession, it becomes a very difficult matter indeed. During the more elaborate raids many cases occurred in which four or even five separate and independent enemy squadrons were operating simultaneously over different parts of the defences. Some would be arriving as others were retreating, whilst others at the same time were turning, all following widely divergent courses, having, in many cases, entirely different ultimate objectives.

Under such circumstances, to first obtain and subsequently to retain an accurate grasp of the movements of each squadron, so as to be in a position to foresee the course it was desirous of

following, constituted as high a trial of nerve, coolness, and receptive intelligence as any to which any single individual could well be subjected. This trial was rendered especially severe by the certainty which existed of the heavy and immediate penalty which the citizens of London would be called upon to pay for any error committed by the defence.

Seconds then became of the utmost value, and instant decisions were indispensable; as, should any "barrage" be ordered "too early," the enemy were able to easily avoid it, and if "too late," matters were even worse. In the latter case, not only would the attack have already passed the line of the "barrage," but the guns would be occupied in firing at the wrong spot at the very psychological moment when their fire was most urgently required in another direction to bar the enemy's further advance.

Some further remarks will be necessary here as to the possibilities of aerial "barrages" generally and as to the principles which govern their use. It must be remembered that aeroplanes, at any rate as constructed during the war, had their own peculiar disadvantages as a means of attack. Chief amongst these was the fact that they were unable to "stand still," or even to moderate their speed to any appreciable extent. It was to this particular "disability" that any success which was achieved by the "barrage" system of defence was mainly due.

The method adopted was not the one which would at first sight seem to have been most likely to

succeed—namely, the interposition of a "barrage" *across* the course of the attack. It was found that the usual result obtained by that means of defence was that the "formation" would "break up," in which event a certain proportion of individual planes would certainly succeed in reaching their objectives and in dropping their bombs there. The system actually followed was a much more ingenious and intelligent one, and was based upon accurate knowledge of the conditions under which the enemy "formations" operated. It was possible to count with confidence upon two very natural tendencies which would assert themselves in the minds of the attackers as they first came under the fire of the defences. The first of these would be the tendency to divert their course *away* from any area of bursting shells, and the second would be an equally natural desire to retain their "formation" and to *keep together*.

On the above assumptions, coupled with the necessity which the attack was known to be under of "keeping its speed," the following principle of defence by aerial "barrage" was finally adopted. As soon as the course to be followed by an attack could be approximately estimated, a "barrage" would be set up *on its flank*, the line in which the shells would burst being so arranged as *to incline across* the path which the "formation" was then following. The effect of this would be that the "formation," being unable to moderate its speed of flight, would swerve *away* from the "field of fire." This deviation from the original course having

been established, a further "barrage" would immediately be set up on the flank of the new course of the attack, and its direction would by that means be turned still farther *away* from its objective in the heart of the defences. This operation would be carried out continuously along the path of each attack, the courses being by this means repeatedly deflected from their original direction until the attacks were turned completely round. The enemy, then, when they had finally left the unpleasant neighbourhood of the "barrages," would find themselves flying upon their homeward course, with a clear sky in front of them and a very hell of bursting shells and other imminent dangers behind them. Under these circumstances their usual and not unnatural procedure was to drop their bombs at once, wherever they happened at the moment to be, and subsequently to continue their course direct for home. On arrival at their base they doubtless described how they had successfully dropped their bombs on London! but actually they had done very little harm to the City or its inhabitants, and the "barrage" system in this manner and on many occasions amply justified its adoption.

As this system was gradually evolved and perfected in the light of experience, the original plan of using the squares as "barrages" was found to be unsatisfactory. It was shown that the attacks followed more or less definite courses to reach certain objectives. These courses depended principally upon the different prominent landmarks

which were visible at night, and upon which the enemy depended for their knowledge of their actual position. Amongst their landmarks the River Thames was always the most reliable, as its devious course was clearly shown upon the map carried by each enemy pilot. It became necessary, therefore, to devise certain "barrages" the positions of which were in no way dependent upon the squares, but were rather calculated with a view to setting up the "line of bursts" at certain definite and important points, and at such particular angles to the usual courses of the attacks as would best serve to turn them *away* from the City.

To the discovery of the necessity of this modification was due the establishment of a quantity of "named barrages." These were known by endless "fancy names" such as "The Ace of Spades," "Mary Jane," "No Trumps," "Cold Feet," etc., and they gradually grew in number until the "operations" map, upon which all were marked in coloured ink, began to assume very much the "camouflaged" appearance of our auto-canons of the Mobile Brigade. The study of this map became of such importance, as the defence arrangements became more elaborate, that every detail of its horrible complications remains for ever graven on my memory, so that I *see it still* in my dreams on the somewhat rare occasions when I may have enjoyed a specially generous dinner.

The most difficult, and at the same time the most important, detail, upon which the efficiency of the "barrages" depended, was the correct estimation

of the "altitude" at which the attacks were delivered. It will be appreciated that, as the enemy squadrons might be flying at any altitude from about 3,000 feet to 14,000 feet it was impossible that any gunfire could be concentrated effectively over *all* that great interval of height. The "barrages" were therefore divided into three "categories"—namely, "low," "high," and "very high." Each of these "categories" covered a vertical height of 3,000 feet, and in consequence it became of the utmost importance to ascertain which was the correct "category" to make use of in relation to each attack.

All gun-stations were provided with height-finding machines, but, though these machines were of varying types, the principle employed was in all cases the same. Two height-finding posts were established, one at each end of a carefully measured base. Direct telephonic connection was established between the two ends of the base, and the angle of elevation of the target was observed from each end of the base simultaneously. The height-finding machine then gave the correct altitude of any target which might be observed at any angle from each end of the measured base, and the whole matter was apparently an extremely simple one. No doubt this system *was* both simple and reliable if *one* target only was "in the air," and the observation was taken *in daylight*, as mistakes were then hardly likely to occur.

The important attacks, however, were made in "formations" by a quantity of aeroplanes, and in

these cases it became a matter of impossibility to ensure that the posts at each end of the base were observing the *same* plane. This difficulty, which was already a sufficiently serious complication in itself, became, however, in reality of no importance at all in view of the fact that the raids were delivered *at night*. For, as at night no one could see any target *at all*, it was quite unnecessary to trouble about the errors that would undoubtedly have been committed had the multitude of targets been visible. The practical result, therefore, was that the entire height-finding equipment and staff were of no value at all to the defence in the particular conditions under which these attacks were delivered.

On several occasions at the commencement of raids we did, indeed, receive altitudes supplied to us from the A.A.D.C. at the Horse Guards as having been ascertained in the other commands. In each case, however, they were accompanied by a warning that the accuracy of the information was not reliable, and in no single instance can I remember to have received any altitude *at all* as ascertained at night by any of the height-finding stations in the West Sub-Command. Although the above are the actual facts, it must not be inferred that the intention here is to ridicule the possible usefulness of height-finders. It is, in fact, easily conceivable that even at night they might on certain occasions be able to fulfil their functions with absolute accuracy. In order to render this most desirable result possible, it is, however, necessary to presume the existence of certain indispens-

able conditions. The first and all important of these conditions being that a single enemy aircraft should be held for a sufficient space of time "in the beam" of a searchlight to enable it to be accurately and *simultaneously* observed by *both* the posts at the extremities of the base of the *same* height-finding machine. These conditions, however, did not occur during my period of command, at any rate in the district for which I was personally responsible.

Recourse was therefore had to other means of endeavouring to establish the altitude of the attacks. One of the most promising of these was the fitting of the sub-command headquarters with a wireless receiving set. Aeroplanes were also provided at certain likely spots on the coast, from which it was hoped they might be able to "rise" and to "fly in company" with the attacking squadrons. They would, in that case, have been able to communicate the altitude at which the attack was taking place, and so to have enormously facilitated the extremely difficult task of the defence. During raids, therefore, my ears were always listening for any communication from our wireless staff, but though every other conceivable, and even inconceivable, species of information was furnished to me by every kind and sort of individual at those very critical moments, no communication of any sort, to my knowledge, ever reached me by "wireless."

If, however, the defence was confronted by an extremely arduous task, which appeared to become more and more difficult of solution as the efficiency of the attacks increased, the enterprise and initia-

tive of those responsible was in no way adversely affected. It became, indeed, a question of much hard thinking by highly intelligent and experienced men, with the object of devising means by which the progress made in the efficiency of defence should at least be equal to that made in the development of the attack.

The earlier night attacks by aeroplanes in "formation" demonstrated that it was reasonably possible that, even if the safety of London could not be actually assured by the "barrages," the amount of damage which the enemy might succeed in inflicting could, nevertheless, be very materially reduced by that means. More important still was the fact that attacks could now no longer be delivered with impunity, but that in addition to such casualties as resulted from the gunfire of the defences, it became increasingly evident that the raiding forces were also liable to suffer severely at the hands of our own aeroplanes, both during the actual delivery of the attack and on their homeward journey.

The two problems, of which the satisfactory solution had now become our most pressing need, were, therefore—first, to endeavour to keep the attacking squadrons at uniform and definite altitude; and, secondly, to provide the necessary squadrons of our own aeroplanes to enable them to be successfully attacked in the air both during the attack and on their homeward journey.

CHAPTER IV

THE EARLIER NIGHT RAIDS BY AEROPLANES IN FORMATIONS: PROGRESS OF THE DEFENCE

SUBSEQUENT to the day raid of July 7th a pause ensued in the attacks. This was understood to be due to the preparation and training of the new enemy air squadrons, which were in future to operate the new "Gotha" type of bombing aeroplane specially designed for the purpose of raids on London. These machines had already been employed in the day raid of July 7th, and, from the experience then gained, improvements were made which were first put to the test of "night flying" in a somewhat elaborate attack which was delivered during the night of September 4th-5th.

On that occasion the attacking force was divided into a number of separate formations, which for the first time attacked "in succession." The object of this arrangement was, doubtless, in the first place, to confuse the defence, in which object, however, the enemy were happily disappointed. Secondly, it was evidently considered that "successive" attacks had a better opportunity of reaching their objectives, through the "following" squadrons being in a position to profit by the experience of the leaders whose reception they would be able to observe.

This was very probably the case, although, owing

to the rapid elaboration of the "barrage" system, no course could be followed by the attack for which "barrages" had not been prepared beforehand by the defence. There is, however, no doubt that the multiplication of the attacks rendered the task of defence very much more difficult, owing to the complication and variety of the reports received from many different quarters simultaneously, and the impossibility of identifying in every case the particular enemy squadron to which each message referred.

On the night of September 4th-5th, twenty-six different individual machines or groups were identified, and the bombs dropped consisted entirely of "high-explosive" ones, no incendiary bombs being used on that occasion. Fourteen people were killed and thirty-seven injured, the structural damage amounting to £30,000. In view of the numbers of the large and special machines employed, it can therefore be concluded that the defence on this occasion proved itself a very great deal more effective than would have been the case a short time previously.

Two further night raids were delivered on September 24th and 25th, which were carried out by smaller numbers. These appeared to have been organized more with the intention of testing the value of incendiary bombs in the attack than for any other purpose. In both these raids the proportion of incendiary bombs dropped was much greater than in any previous attack, as, in the raid of the 25th, the number of incendiary bombs amounted to three times the number of high-explosive bombs.

On neither occasion, however, was any serious damage done, fourteen people being killed and thirty-seven injured on the 24th, and six killed and seventeen injured on the 25th, whilst the damage done was estimated at £24,000 and £16,000 respectively. From these figures it may be gathered that the type of incendiary bomb then used by the enemy was not highly effective, and in consequence, during the next four subsequent raids, high-explosive bombs only were dropped on London.

Although steady progress was being made in the defence organization, yet the task of those responsible was not at this time, nor, indeed, at any other time, a particularly enviable one. For whilst the complications increased, the time allowed for preparations between the raids, and for the study of the more important problems as our experience grew, became shorter and shorter. We now found ourselves confronted by strong, well-drilled squadrons of Gotha bombing planes which were capable of carrying heavy loads of bombs and of flying with their full loads at great altitudes. These planes carried a crew of three as a minimum, though in the case of the leading plane of each squadron, which carried the squadron commander, the complement was more usually four. Each plane was armed with machine-guns with which to resist the attacks of our own aircraft. This form of defence was at last being acknowledged to be the only truly efficient one, and aeroplanes were being provided in ever-increasing numbers to meet the attacks more adequately.

The Gotha machine was proving itself to be

very reliable in the air, and the casualties amongst them from mechanical troubles were remarkably few. This was the more noticeable in view of the long distances over which they were called upon to carry their heavy loads at night. It therefore became more than ever necessary to devise some effective means by which the altitude, at which it was possible for the attacks to be delivered, might be controlled by the defence. The severity of the "barrage" fire could then be increased in proportion to any reduction which might be effected in the vertical area through which it might remain possible for the attacking squadrons to pass.

The problem of the reduction of the vertical area open to the attack was under constant consideration, and eventually the system of what were known as the "nets" was brought into use. This system, although it eventually became of great assistance to the defence, presented many difficulties when first tried, and much experimental work was necessary before it was successfully developed. There can be no doubt, however, that the *moral* effect of any such device upon the attack was very considerable, and produced the result so long and urgently sought for, by obliging the attacking squadrons to fly at a definite and uniform height.

The fact of any aerial obstacle being offered to the passage of the attacking planes, of which, of course, they immediately became aware, had the very natural effect of causing them all to fly at the greatest altitude of which the design and power of their machines allowed. The squadrons being all of the same design, the defence was therefore able

to count upon the altitude of the attack, and the "barrage" fire was therefore concentrated at that altitude, and became infinitely more effective. It was fortunate indeed that the introduction of this system coincided with the advance in efficiency which the enemy had effected in their attacking squadrons by the introduction of the Gotha machines, which otherwise would have undoubtedly inflicted much more serious damage.

Of the nets themselves I do not propose to give any account other than to say that they were *not* nets *at all*, but were certain contrivances which were raised into the air by means of balloons. The balloons were, of course, visible to the enemy, but there is reason to believe he was unaware of exactly what device they were used for, and (should that still be the case) it is infinitely preferable that its details should not be disclosed. The defence was, however, able to assume with certainty that the attack would face any "barrage" fire, above the level of the balloons, rather than the unknown dangers which they well knew awaited them at lower altitudes, and by this means one more seemingly impossible object was achieved and the defence enormously strengthened.

At this very critical time an acrimonious controversy was in progress as to the ammunition which was to be used in the French 75-mm. guns which were under my command. The difficulty was the same old question as to official approval and test of design. I am anxious to state that never, neither at that moment nor at any time since, has the least doubt existed in my mind as

to the absolute correctness of the official view that, *theoretically,* elaborate official trials should be carried out of all classes of ammunition authorized for use by our forces. I maintained, however, then, and shall always continue to do so, that the urgent requirements of war must take precedence of official routine, and that, however desirable such official trials may be at other times, the time of crisis in war is by no means a suitable moment to insist upon their being carried out.

The question arose in the following manner, and it is so tragically illustrative of the narrowness of the official mind, and of the astounding strength of the shackles of tape, which have been before referred to, that it can hardly fail to be of interest to the general public. It will be remembered that, as described in Part I., no high-explosive projectiles with "time" fuses were available for naval ordnance. The Army was in no better case in this respect. The French 75-mm. ammunition, however, lent itself to certain simple modifications of its standard fuses, which resulted in the production of an extremely effective high-explosive projectile using the French time-fuse so modified. This modification I had been authorized by Sir Percy Scott to use, and had used, in the 75-mm. French guns under my command in the Mobile Brigade. The same system had also been used regularly at the Front by many friends of mine in the French anti-aircraft sections with conspicuous success. These facts were well known to the high technical authorities of the French Army, who, appreciating the immediate value of such ammuni-

tion, and the impossibility of any official tests taking place without the loss of much invaluable time, were content to shut their official eyes to the use of these fuses in consideration of their destructive effect on the enemy.

When, however, the French guns became part of the military defences of London, a question was at once raised by the military authorities here as to why the French guns should fire high-explosive projectiles with "time" fuses, when our own guns were not able to do so. Having been called upon to explain the position, I related the facts exactly as they were, begging that the practice might be allowed to continue, so that our defence might retain the advantage of the use of high-explosive ammunition, at any rate at that most critical juncture. Certain of our authorities here, however, insisted that the French should be officially asked to guarantee the safety of the time-fuse for their high-explosive projectiles. This, of course, they were unable to do, although they were quite prepared to "wink at" its use in their own anti-aircraft work. On receipt of a communication to the above effect from the French, the use of high explosive for anti-aircraft work was promptly forbidden in our French guns, which were, in consequence, reduced to the same state of comparative impotence as the remainder of our ordnance, and the official mind was at last at rest, as *no official responsibility had been incurred.* The *moral* stigma, however, remains, that our strength was reduced in the hour of need, rather than that an officially irregular action should be permitted,

although, from the larger point of view of our country's welfare, such action was clearly most desirable.

The immediate result of this decision was that our French guns were obliged to fire "shrapnel" projectiles in the serious raids that were then imminent, and that in consequence, as was certain to be the case, many lives were lost and much damage done by the fall of the empty and unbroken shell-cases, which were of more danger to the inhabitants of London than the shrapnel bullets which they had contained ever were to the enemy.

On the fourth night after the raid of September 25th—that is, on the 29th—came the first of a succession of three raids on successive nights. These raids were the most serious we had yet experienced, and call for special description both on account of the scope of the attack and the general success with which they were met by the defence, although our resources in ammunition and personnel were sadly tried by the ordeal.

At 10.4 p.m. on September 29th the warning was received at the West Sub-Command headquarters at Putney that the enemy were on their way to London, and at 11 p.m. the first message was received with regard to their movements within the sub-command district. From that time until midnight a constant stream of information as to the movements of the various attacking squadrons was received, and our guns remained constantly "in action" from Grove Park to Hanwell and from Croydon to Horsenden (near Harrow). Fifteen separate barrages were fired, in addition to various

independent engagements; our searchlights were also in constant operation in all directions, and 1,370 rounds were fired, in barrages alone, by the guns of the West Sub-Command.

I have my report of this raid before me, and it is of special interest as being the first of the more elaborately organized night raids by aeroplane squadrons, which were the result of long preparations by the enemy. These were pressed with the greatest pertinacity, in the hope of impairing the *morale* of our countrymen, and of preparing the way for the discussion of terms of peace which might be favourable to Germany. It was, as must indeed always be the case, impossible to accurately estimate the total number of aeroplanes employed in the attack, as no means exists of identifying the actual number of machines which reaches the defences in any individual formation. My report, however, definitely states that "the attack was delivered by three separate squadrons, all of which approached the defences in succession, independently of each other, and north of the Thames." These attacks were met by a succession of "barrages," and "all attempts at formation by the enemy planes were lost, and they appeared to be scattered widely over all parts of the town."

Roughly, the general "turn" to commence the retreat was made when over or in sight of the unmistakable stretch of the river between Hammersmith and Putney, and the general course then became directly eastwards and south of the river. By that time, however, the formations were so broken up that

individual planes or small groups were being independently engaged by gun-stations widely distant from the general course of the attack. Searchlights were used in many places to good purpose, and appeared not only to materially assist accurate gunfire in independent engagements, but also to have the effect of bewildering the enemy. Several most determined efforts were made during this raid to "bomb the lights," and in particular the searchlight on Barnes Common was attacked with special pertinacity, certain casualties ensuing amongst the civilian element, which rendered this locality *less popular* for the evening strolls of the younger members of the community. This matter of deliberate attack on the lights was of great interest, and proved conclusively that the enemy appreciated the fact that when they were "held in the beam" of a searchlight they not only became a *visible* target for the guns, but also were revealed to our own defending aeroplanes. These, they knew well, were watching to engage them on their return journey, and they had already had sufficient experience of the danger of these "air" attacks during their retreat to render them exceptionally anxious to remain invisible.

The "general remarks" at the end of my report may be of interest, and are as follows:

"As a general observation I have to report that the details of the system of defence were efficiently carried out by all ranks, under new and somewhat strenuous conditions.

"A good rate of fire was kept up by the guns,

the average rate being fifteen rounds per minute throughout on 'barrage-fire.' The guns were well served and were thoroughly efficient both throughout and after the action.

"The enemy aircraft were on three separate occasions 'found' and 'illuminated' by search-lights—namely, at Horsenden, Hampton, and Barnes—and no difficulty was experienced in 'holding them in the beam.'

"There were no serious casualties to 'material,' and all guns were 'ready for action' throughout the attack."

The general result of this engagement may be considered eminently satisfactory. Personally, however, I was a prey to the acutest anxiety, as I had reason to believe that the attack would be immediately repeated, and the exhausted state of my magazines was *horrible to contemplate*. Our stores of French ammunition, at no time excessive, were stored at Woolwich, and it will therefore be appreciated that the task of replenishing my widely scattered gun-stations, so that they might be in a position to meet an even more serious attack the *next night*, was as difficult as it was urgent and indispensable. My day was therefore spent in using every effort to obtain the supply of the necessary quantity of motor-lorries to proceed to Woolwich, there to collect the ammunition and to subsequently immediately distribute it amongst the gun-stations in the various districts.

This vital manœuvre was not yet complete when at 6.42 p.m. the next day we received the warning that the enemy were again on their way to London.

CHAPTER V

MORE RAIDS: DIFFICULTIES OF DEFENCE, AND THE "LAST RAID BY ZEPPELINS"

THE raid of September 30th was an even more elaborate attack than that of the previous night, and lasted exactly *twice as long*. In order to appreciate adequately the work done by the defence during this raid, the following points must be borne in mind:

First, the establishments of personnel in the defences had been then cut down to the very smallest number of men which would suffice to work the guns.

Secondly, these men were necessarily of indifferent physique, such as did not permit of their employment at the Front.

Thirdly, they were hurriedly and recently trained, and were, for the most part, quite unfamiliar with military discipline.

Fourthly, there were no reserves, and it was therefore necessary to keep every man, however exhausted, *at his post at all costs*.

Fifthly, the greater part of the previous night had already been spent "in action," and, as nothing could be more urgent than the necessity for preparation for a further attack, there had been

no rest for any member of the defence force for at least twenty-four hours.

Lastly, and most important, the system of defence which these men were called upon to carry out was of a most elaborate nature, and its successful operation therefore depended absolutely upon the efficient co-operation of many widely scattered individual posts, the failure of any one of which would seriously impair the efficiency of the whole system.

If these facts are borne in mind, and also the fact that our empty magazines had not yet in all cases at that time been replenished after the heavy fire which had been kept up during the preceding night, it may perhaps be realized that it was with deep anxiety, and a certain diffidence as to our powers, that I, on this occasion, received the "warning" that the enemy were again on their way to attack us. This anxiety was still further increased by the receipt of the warning a full three hours before the time at which these attacks had usually been delivered, so that a final inspection of the preparations became impossible.

If any reader should, on reading the above, feel inclined to remark that those were "strenuous times," he will be quite justified by the facts. The description, however, would not be correct without the addition of several adjectives which I hesitate to write, but which keep constantly "dancing round the end of my pen."

So now for the fight.

The first attack was made by three squadrons on

a broad front, advancing on London from the east at about 7.30 p.m. The southern of the three attacked first, on a north-westerly course, coming from the direction of Chatham and passing between Woolwich and Greenwich, their objective being evidently the West and West-Central Districts, upon which they proceeded to concentrate.

The central squadron was some ten minutes later in delivering its attack upon the same district, their advance following a line just north of the river. The northern squadron arrived ten minutes later still, also concentrating upon the West End, but from the direction of Islington.

These attacks were well and effectively met by a succession of "barrages," from the moment of their coming within range of the guns of the defences, with the result that the regular formations of the attacking squadrons were most effectually broken up and their planes became widely scattered, though the general advance was continued till in sight of the Putney to Hammersmith reach of the river. Here a general and independent "turn" was made to the southward at about 8.10 p.m., and these groups then retreated south of the river on a general south-easterly course, though many small groups and individual machines swung very far wide of the general course both during the advance and the retreat. This attack was in full retreat at 8.15 p.m.

The Second Attack was signalled as approaching from the east at 8.16 p.m., again consisting of three squadrons, but on this occasion their attacks

were delivered simultaneously, two north and one south of the river. They also were met by a succession of "barrages," which successfully frustrated the development of their attack to the westward, and the bulk of them were also in full retreat by 8.35 p.m.

At 8.37 p.m. the approach of a Third Attack was signalled, again in three squadrons, but on a front rather wider than in the two previous attacks. This attack was also effectively met by "barrages." My note adds the gratifying information that "this attack was not pressed home with the same energy as the previous ones, and that a general retreat was in progress at 8.50 p.m. over all parts of the defences." The inference was, of course, unavoidable that the leaders had informed their supports (by wireless) of the class of reception which awaited them, which also must have been emphasized by the magnificent display of bursting shells and searchlight beams, doubtless visible for many miles to the approaching squadrons.

I note without surprise that my "remarks" in my report on this raid were unusually *short*, and that I intimated that a detailed list of the "firing" would be forwarded *later*. It was, in fact, a terribly anxious and trying ordeal, as the responsibility was great, and the general action in the district for which I was responsible lasted over two hours without intermission. During the whole of that time the closest attention was needed in the "command" of the gunfire and in the "direction" of the searchlight work, as well as instant decisions in the many

cases of technical difficulty which arose at the various gun-stations owing to the long continuance of "rapid fire."

A few of the latter may be found of interest by those who are unaware of the difficulties of maintaining so heavy a fire over such an extended period.

Several of our guns on this occasion fired over 500 rounds apiece during the two hours the "action" lasted. In many instances the guns were red-hot, and "fire" had to be temporarily "ceased" to allow them to cool, in spite of the constant streams of water which were poured over them. Everything breakable in the gun-stations quickly succumbed to the constant concussion; the men, in many instances, were temporarily "blinded" by the flashes of the guns, and "deafened" by the incessant concussions, until they became entirely bewildered and practically useless. Burnt hands from the hot guns also were the rule rather than the exception throughout, and the guns' crews were everywhere thoroughly exhausted by their well-sustained exertions. Several instances also occurred of rounds "jaming" in the hot guns; plaintive messages were then brought to me to the effect that "So-and-So" reports "round jammed in gun, and what shall he do?" My answer was instantly given, and was always the same, albeit one which is in no way authorized by the regulations—namely, "Jam another round in behind it and *fire it out.*" Needless to say, on such occasions the gun's crew were instructed to

"take precautions," which means to *keep out of the way,* as the danger of that "heroic" method of "clearing the bore" of a gun is considerable.

Late in the action a peculiar incident occurred, which gave rise to considerable controversy. The Wandsworth gun, having fired well over 500 rounds, announced that they had no further ammunition available.

I knew, however, that in their magazine were stored certain French "incendiary" shells which were intended for use against Zeppelins. These shells are of peculiar construction, but I was perfectly familiar with their peculiarities, the principle of which consists in the emission of a cloud of burning gas during a definite portion of their flight. As this shortage of ammunition occurred in a vitally important gun-station at the culminating point of the last attack, I took the very considerable responsibility of ordering ten rounds of "incendiary" to be fired, with fuses "set" in a manner to insure the gas being all burnt before the projectile could reach the ground.

This order was immediately carried out, and in a few moments magnificent clouds of burning gas were to be seen hurtling through the sky, with the result that the London newspapers next morning announced, with a bloodthirsty "glee" which they made no attempt to conceal, that towards the end of the attack enemy aeroplanes were observed "*falling in flames*" in several directions! I note that in my report I refer to this incident as follows:

"The fact that the attack at once ceased and the retreat began is not thought to be *entirely* due to the use of that form of ammunition having been adopted."

It was perhaps unfortunate that one of these ten shells should have come to rest in the parlour of the Mansion House! where, being still red-hot, it caused considerable excitement and inconvenience, the handling of red-hot shells forming no part of the elaborate training of the Lord Mayor's otherwise irreproachably competent attendants!

With regard to this incident, however, it is no doubt the case that these flaming projectiles in the sky were by no means without their moral effect upon the attackers, who had probably never seen them previously, and whose already somewhat pronounced inclinations to "turn for home" were doubtless considerably strengthened by the vicinity of these unknown but extremely undesirable aerial fellow-travellers.

In considering this raid generally, it was undoubtedly a much more severe test of the efficiency of the defence than any to which we had previously been subjected; and, even if certain weaknesses became apparent in the course of such a strenuous action, that can hardly occasion surprise. I remember my own sentiment was most emphatically one of infinite relief at the fact that, having been tried so highly, my men had done so well; and I did not hesitate to tell them so at once in suitable terms.

In these piping times of "peace" and "im-

pecuniosity" we should probably consider the forty-eight hours' work just described, as having earned some rest for the workers. In war, however, it is not so. In fact, the reverse usually appears to be the case, for the more tired men may be, the more urgent are frequently the demands which must be made upon them. In this case, all hands were busily employed all next day in making good the damage, replenishing the magazines, binding up burnt hands, etc., so that when at 7.7 the next evening, October 1st, a "warning" was again received that the enemy were "at hand," our military vocabularies were sorely tried in our efforts adequately to describe our feelings.

The attack on this occasion was again even more elaborate than its predecessor, the units employed being probably smaller, and the general "linking" of the small units into "formations" being probably "looser." The practical result produced by this was a constant stream of small units, or even individual machines, which advanced in succession from the east, with the West End of London as their general objective, though acting in each case quite independently of each other. This succession of attacks continued without intermission from 7.45 p.m. until 10 p.m., by which time the last planes had turned and were in retreat, being, however, still scattered over all parts of the defences, though the greater number retreated south of the river.

During the latter part of this continuous "action" of two hours and fifteen minutes the

course of individual machines became impossible to identify. Mercifully, however, that night there was a considerable amount of "ground mist" over the valley of the Thames; this evidently interfered with the correctness with which the enemy were generally able to determine their position, and the erratic courses followed by the various units differed materially from the regularity of direction which had hitherto been invariably maintained in previous attacks.

The course of one particular detachment which came under my observation offered certain points of special interest as indicating the selection of a new and particularly vulnerable objective. At 8.28 p.m. (whilst the main attacks were developing on the West End) I received a report that at least three separate aircraft were approaching Watford gun-station. The gun was immediately ordered to open fire "on sound" and the light to "search." Two enemy aircraft were "held in the beam" and fired at for some time, during which they and at least one other were circling round, evidently endeavouring to fix their position.

These planes were flying at a high altitude and remained in the neighbourhood of Watford for upwards of twenty minutes. As the fire of the guns and the beams of the searchlights of the main defences, then all "in action," must have been clearly visible all the time to this detachment, it was evident that they must have been searching for a separate and definite objective lying to the north of the main defences. This could hardly be other

than the Aerodrome and the Aircraft Factories at Hendon. This fact offered a valuable indication of the appreciation by the enemy of the great advantage they would have obtained by the destruction of those works, which were then producing that form of armament of whose powers the Germans were evidently most in dread. These facts were duly reported and commented upon, but there is no doubt that we had every reason to be thankful on that occasion for the protection afforded by that peculiar form of "London fog" of which on so many other occasions we have entirely failed to appreciate the possible value!

The damage caused by these three raids bore even less comparison to the expenditure incurred by the attack than had been the case on any previous occasion, the killed numbering eleven, two, and eleven, and the wounded sixty-five, fourteen, and thirteen, on the three nights respectively, and the structural damages amounting to £21,000, £7,000, and £45,000. In view of the numerous and special forces employed by the enemy, these figures were rightly considered as very creditable to the defence force, to whom the success resulting from their strenuous efforts was certainly very gratifying.

During the development and organization by the enemy of these night attacks by their aeroplane squadrons, we had been well aware that modifications were simultaneously being carried out in their Zeppelin fleet. These had for their principal object such an increase of "buoyancy" as would enable these airships to fly at altitudes which could not be

reached by aeroplanes, so that they might by these means obtain that immunity from attack by incendiary bullets which past experience had shown to be indispensable to their successful employment. We were also aware that the undersides of the airships were now coated with a certain black paint which rendered them invisible from the direction of a searchlight, even when full in its beam; although, as in the case of a mirror, the reflection of the searchlight could be clearly seen on the hull of the airship from the corresponding angle in the opposite direction, where, of course, it could be of no value to the defence.

In consequence of these improvements, we felt certain we should soon receive a visit from the Zeppelin fleet so modified. It was without surprise, therefore, that on the night of October 19th we received information at 8 p.m. that Zeppelins had once more crossed the coast, and were again on their way to London after an absence of over twelve months. At 8.25 p.m. enemy airships were reported from 50 to 90 miles distant to the north-east of London. The first definite information, which was received from stations within the West Sub-Command, was a report from Watford gun-station at 9.10 p.m. of "bombs" some 15 miles to the north. This was confirmed by other stations, but no sounds of aircraft could afterwards be heard. A long, tedious, and most anxious wait ensued, without any further information of any kind being received until 10.10 p.m., when Watford again reported "bombs" to the north.

At 10.16 p.m. all lights north of the Thames

were ordered to "patrol"—that is, to "search." This order came direct to me from the Anti-Aircraft Defence Commander at the Horse Guards, and was immediately carried out, but without producing any satisfactory result.

At 10.29 p.m. I spoke myself to the A.A.D.C. at the Horse Guards, and explained to him the idea which was then forming in my mind as to the object of this very unusual procedure on the part of the enemy. I then promptly received instructions to "cover all lights in succession from the westward," which was instantly done, and another long wait then ensued.

The point, to which I drew the A.A.D.C.'s special attention, was the *rapidly increasing* force of the wind. This at sundown had been a very gentle air from the north-west, but had been gradually "freshening," and was at 10.25 p.m. blowing at upwards of 10 miles an hour on the surface, and probably much "harder" at high altitudes. This point appeared to me to be of the utmost importance, as it was obviously the intention of the enemy to assemble their fleet in the neighbourhood of Watford, then to "float down wind" over London at a high altitude with their engines stopped; in which case we should neither be able to "see" them to shoot with our "eyes," nor to "hear" them to shoot with our "ears," and should therefore be left with our *intelligence only*, with which to defend our charge, and with evidently very little "time" in which to make use of it.

Of all the raids of which I have had experience,

this was far the most dangerous and at the same time unquestionably the most difficult to meet. On that night, however, London was once more defended by "Powers" which were beyond the control of the defence, whose only duty lay in taking instant and intelligent advantage of any and every opportunity which might occur to assist their efforts to defeat the enemy's murderous projects.

The one advantage, which the defence possessed over the attack, was that, being on the ground, they were in a position to know the "speed of the wind"; this, the enemy, at their great altitude, had mercifully no means of judging. This advantage we should retain, only as long as we kept *all our lights covered*. The moment our searchlights were "unmasked," the enemy would at once be able to judge the speed at which their ships were moving over the ground, by the change in the "bearing" of the various lights, with whose position they were, of course, perfectly familiar, and the small but vital advantage which the defence possessed would be instantly lost.

I therefore called *"all stations,"* and, having called over all the officers by name, made sure of their personal presence at their telephones. I then briefly explained the position, as I conceived it to be, and gave the most definite and explicit orders that no light should be uncovered, under any consideration whatever, unless and until a special order to do so was received from headquarters. That essential precaution having been taken, no other was possible, and one could only await the turn of

events, all the while most anxiously watching the instrument which recorded the "speed of the wind," which, most mercifully, still continued "freshening" every moment.

At 11.11 p.m. Watford reported "sounds of aircraft to the north." This lasted barely three minutes, after which no further sound was heard. As the sounds, which had just been heard, had been those of a single airship only, and we knew that the whole fleet of at least five, and more probably seven, ships were there; those sounds had been most probably caused by a late arrival manœuvring for position with relation to the others. The fleet was therefore probably at last complete, and was presumably about to start on its "float" over London.

In the meanwhile our faithful and invaluable ally the wind still continued to "freshen" with most persistent and truly gratifying regularity; and the minutes slowly passed without a sound being heard from the air above, whilst London lay in pitch-darkness and absolute silence below. To us, who guessed rather than knew what was happening, and were in a position to appreciate correctly the awful danger to which the city lay exposed, each moment increased an anxiety no words can describe, as we waited in silence for the "roar" which we momentarily expected and so horribly dreaded to hear.

Ten more interminable minutes passed in absolute darkness and silence, and still no sign was given from the sky, but at 11.24 p.m. "bombs" were reported from the neighbourhood of Kenton,

south-east of Harrow, and fairly on the direct line from Watford to the heart of the city.

I thought then, and think still, that this was an attempt to induce us to *uncover our lights,* and so to *give the show away;* but, if so, the enemy must have been sadly disappointed at the result, as not a glimmer of light was shown, and no sign of any kind came from below which could serve to guide them on their sinister and murderous course. Four minutes later another single explosion was heard, bearing "north-east by east" from my headquarters at Putney, and about 4 miles distant, so that the crucial moment had *then at last arrived,* and the whole Zeppelin fleet, fully loaded with bombs, were in the position they had striven so long to attain, and the heart of London then lay below them, at their mercy indeed, but shrouded in an impenetrable darkness. This was the *last resource* of the defence, whose "intelligence" now remained their only available weapon. It will be for the public, who now learn for the first time the actual facts, to judge whether that *last weapon* was that night well and skilfully used in defence of the heart of our great empire in the hour of its need.

There can be no doubt that this single bomb was also discharged with the object of inducing the lights to *uncover;* as the accuracy of its aim was so astounding that, had its discharge been based on any definite knowledge of their actual position, it is certain that every bomb in the Zeppelin fleet would have been discharged simultaneously at that critical moment. *One only* was

dropped, however, and mercifully the darkness and silence below still remained impenetrable and unbroken. The succeeding minutes were charged with such an anguish of anxiety, and the horror of the awful tragedy which appeared likely to be enacted at any moment was so great, as to cause me an absolute spasm of nervous agony. This I found it almost impossible to control, and it threatened every moment to render me physically "sick" from apprehension.

The good north-west wind, however, still stood our friend, as indeed was the case all that night and the next day, for it steadily gained in strength as the minutes dragged slowly by until six minutes later another bomb was dropped in the neighbourhood of Grove Park far to the south-east, and our agonizing anxiety was over, for in the freshening gale no airships could ever hope to return *against* the wind, and London was saved from a catastrophe of which the possible extent can never be accurately estimated.

The narrowness of our escape may be better understood when it is known that the one large "bomb" actually dropped at 11.28 p.m. was the one that fell at Piccadilly Circus, which demolished the premises of Messrs. Swan and Edgar at the corner of the Circus. From this fact may be appreciated what would have been the effect had the many *tons* of bombs, which were at that moment suspended in approximately the same position above that central district, been *all dropped* at the same time as the single one. Be

it remembered, also, that such was undoubtedly the enemy's intention, which would instantly have been carried into effect had they by any means become, even in the slightest degree, suspicious that they had then reached their actual position.

As illustrative of the possibilities, the actual damage which was done on this occasion by the three single bombs (which were the *only* ones dropped that night in the Metropolitan district) was—killed forty-three, injured forty-nine, structural damage £50,000; whilst the very lowest estimate possible, of the number of bombs which were at that moment "floating" over the town, would be at least 100, and the actual number was probably nearer 200.

It only remains for us all to be duly thankful for our wonderful escape that night, and to see to it, as far as may lie in the power of *each* and *all of us*, that London shall NEVER AGAIN be left exposed to the danger of such an APPALLING DISASTER.

CHAPTER VI

REFLECTIONS ON THE LAST RAID OF THE ZEPPELINS : FURTHER GENERAL DEVELOPMENT OF THE DEFENCES

THE Zeppelin raid of October 19th, 1917, will always mark an epoch in the history of warfare in the air. The first and most important result which ensued was that an end was effectually put to the attack of these islands by "lighter than air" airships during the war. This most gratifying result, however, is, in reality, most deceptive, as in actual fact the most outstanding feature of the raid was that conclusive proof was afforded that, on that occasion at any rate, the defence were powerless to offer any effective resistance to the attack, which successfully achieved its main object. That is to say, the enemy were able to place their fleet in a commanding position over London, in spite of every effort on the part of the defence to prevent their doing so.

Here, indeed, is matter for serious thought and considerable apprehension. It is futile to assume that, because the "act of God" in the matter of the "freshening wind" saved the town and brought about the subsequent destruction of the enemy's fleet, the defence, as then conducted, was in any

way responsible for that merciful result; the actual fact being that the defence was powerless to offer any resistance at all to an attack delivered in silence from so high an altitude. The enemy's failure can therefore only be justly attributed to the intrinsic disadvantages to which any "night attack" at high altitudes must always be subject, owing to the difficulty which exists, when landmarks are invisible, in correctly estimating the varying force of the wind at those altitudes.

The observations carried out by the Zeppelin commanders, as long as the daylight lasted, no doubt most accurately gauged the force of the wind *at that time,* and had its speed remained the same they would undoubtedly have been able to correctly estimate their position when "floating" over London, with disastrous results to that city. Whilst, therefore, we have cause to be everlastingly thankful that such was not the case, it would be idle to refuse to recognize that it is to the steady increase of the wind, after sundown on that occasion, that our escape alone was due. It is, therefore, our urgent duty to consider by what means such attacks may be successfully met in future, when the variations of wind may not again so providentially intervene to ensure our safety.

This most important matter will be again considered when we come to the general deductions to be drawn from lessons learned during the air raids. At this point, however, it will be of more interest to follow the tragic retreat of the attacking airships, which will always furnish a most striking lesson as

to the limitations from which these craft must inevitably suffer when carrying out similar operations.

Throughout the eventful night of October 19th the wind continued to increase in force and at the same time "backed" to the north. The effect of this was to render it impossible for the Zeppelins to return to their base in Jutland in the face of the ever-increasing gale. They were therefore driven to cross France in the endeavour to reach Southern Germany or even the shelter of neutral Switzerland.

The exact number which took part in the raid is extremely difficult to establish—the total, however, was *at least* seven and possibly nine. Of these *none* reached Germany in safety. Definite news as to the fate of four of them was received as follows :

No. 1. Brought down by French anti-aircraft guns at 7 a.m. near the German frontier at Luneville.

No. 2. Forced to land at 9.20 a.m. near Bourbonne-les-Bains, in Western France, by pursuing aeroplanes.

No. 3. Came down and was destroyed by fire near Gap in the Department of the High Alps—South-Western France.

No. 4. Was brought down and destroyed by fire in the same neighbourhood at 2 p.m.

Many rumours were current as to the fate of the remaining airships; there is, however, no doubt that *three* at any rate were carried out over the Mediterranean, when their fuel was exhausted, and were lost with all hands.

The raid, therefore, which at one time appeared likely to end in such disaster to London, actually

ended in the annihilation of the German air fleet and the total cessation of raids on this country by Zeppelin airships.

About this time, and as the result of experience, the general scheme of the control of the air defence was most intelligently altered. A new organization was brought into being in the shape of a "London Air Defence Area," known as L.A.D.A. This was placed under the command of a Major-General, who controlled the aircraft, in addition to, and in conjunction with, the guns, searchlights, and other resources which were then at the disposal of the defence.

A truly happy selection was made in the appointment of Major-General E. B. Ashmore, C.B., C.M.G., to this most difficult and responsible post. This most versatile and competent officer was equally well known as an air pilot and as an artillery commander, as well as in other fields which are, perhaps, of a more popular, if of a less official, character. It is, perhaps, allowable to state that in each and all of them he had proved himself well able to hold his own, and that he brought to bear on the discharge of his very various and novel duties the invaluable advantage of a personality which commanded the respect and ensured the loyal co-operation of all classes of his subordinates.

From this time onwards all the resources at our disposal began at last to be co-ordinated, both with respect to constant intercommunication during their training and mutual assistance in action. The indispensability of a strong force of aeroplanes for

defence now also began to be recognized, and their co-operation with the guns and lights was ensured by the unity of command and responsibility which was now, for the first time, established throughout the whole defence area. The effect of this reorganization was undoubtedly a considerable increase in the general efficiency of the whole defence.

At the same time other developments were occurring which were by no means so favourable. Chief of these was the increasing demand for men at the Front, and again and again men were drawn from the London defences who could ill be spared and whose places could only be filled by others who were quite untrained and of inferior quality. As, however, it was evident that if the war was to be won it could only be won in the field, the requirements of the defence of London were quite properly subordinated to the necessities of our troops at the Front, who very rightly were given the first claim on such man-power as remained available.

On November 1st another night raid by aeroplanes was delivered. At this time the "nets" had been much improved and were now able to be raised to a more considerable altitude. Certain "casualties" had occurred amongst the enemy squadrons which had what we may perhaps call a certain "deterrent effect" upon their general *morale,* and the attack was not upon this occasion pressed home with its usual vigour to the north of the river. The only bombs dropped fell in the neighbourhood of Woolwich, Greenwich, Millwall, and Deptford—though individual machines reached

as far west as Tooting. The killed on this occasion numbered six, and the injured seven, whilst the structural damage was about £7,500.

The value of air raid shelters and public warnings was now, of course, generally recognized, and to these precautions and to the action of the public generally in taking advantage of them, much of the success of the defence must doubtless be attributed. At the same time, considerable modifications were being carried out in the armament, and the French guns, now confined to shrapnel ammunition, were rapidly being replaced by 18-pounder British guns. These, although having neither the range nor the accuracy of the 75-mm. French guns, were yet equally serviceable for the "barrage" fire, which was the only form of gunnery defence possible under the circumstances. The danger to the general public from the falling of the French shrapnel shell-cases was thus eliminated, and although the "fragmentation" of the British 18-pounder common shells was far from ideal, yet the fragments which now fell were no longer the dangerous missiles which the French shell-cases had been.

Our aeroplane defence forces were also increasing fast, and their effective organization, and its co-ordination with the remainder of the defences, was now in the most competent and experienced hands of the L.A.D.A. Commander, with the result that the progress of the defence organization was not only still keeping pace with the advances made in the development of the attack, but was, for the first

time, now surpassing it in efficiency. The enemy, under these circumstances, again paused in their attacks, doubtless for the purpose of considering in what manner they could best meet the improvements which had been effected in the defence.

From September 24th up to the raid of November 1st we had been attacked seven times, or an average of rather oftener than once a week. We now, however, were allowed an invaluable respite of five weeks. This time was spent in hard training and preparation, under the general direction of the London Air Defence Area Commander, General Ashmore, and great progress was made generally throughout the forces under his command.

On December 6th the next raid took place. This was carried out by a succession of groups attacking over a broad front and advancing up the Thames both north and south of the river.

The southern portion reached the eastern outskirts of the defences about 4.30 a.m., and entered the district under my command in the neighbourhood of Bromley at 4.39 a.m. These southern groups were a little in advance of the others, but found their progress to the north obstructed by a succession of "barrages" and concentrations of searchlights, which prevented their crossing the river until 4.50 a.m., when they were finally able to turn north in the neighbourhood of Dulwich.

In the meanwhile the remainder were attacking north of the river, and the various groups spread generally over the W. and S.W. districts until 6 a.m., by which hour all planes were in retreat.

The eventual retreat was carried out south of the river, but the groups were exceptionally widely scattered, being engaged simultaneously by stations as far apart as Croydon and Harrow.

The bombs dropped were eighty-seven high explosive and eleven incendiary, and the districts affected were Chelsea, Brixton, Battersea, Stepney, Whitechapel, Clerkenwell, Strand, Gray's Inn Road, Shoreditch, Lambeth, Knightsbridge, Peckham, and Sydenham. The structural damage amounted to £95,000, and fifty-two fires were caused by the incendiary bombs, although two people only were killed and six injured.

Several points of interest were noted as the result of this raid, which were in all cases very gratifying to the defence.

Of these, undoubtedly the most important was the extremely small loss of life which resulted from a continuous attack in force during a period of one and a half hours. This was doubtless attributable chiefly to the measures taken to protect the public. Another most noticeable fact was the successful "breaking up" of all enemy formations by the gunfire of the defences. In order that the value of this may be appreciated, it must be remembered that our own gallant airmen were waiting to "take their toll" of the enemy during their retreat, and that the "breaking up" of the enemy formations was a necessary preliminary to enable our glorious fighting pilots to "mop them up," and no doubt need be entertained that full advantage was, as usual, taken by them of their opportunity.

More interesting still was the reintroduction of incendiary bombs into the armament of the attack. This resulted in the starting of fifty-two fires from the dropping of eleven incendiary bombs, and afforded convincing proof that these "infernal machines" had now been rendered much more effective than they had previously been. The fact of the southern attack having been unable to cross the river until reaching Dulwich was also a matter for satisfaction, as showing the efficiency of the "barrage" fire, and there is no doubt that very many of the widely scattered machines which were reported in all directions never succeeded in penetrating the defences AT ALL.

Generally the result may be considered as extremely satisfactory. It was specially noted also that this attack was delivered at an unusually high altitude, the first notification I received of the height of the attacking squadrons being 8,000 feet, at which figure I have little doubt that their actual altitude was considerably under-estimated. This supposition, however, enabled gunfire to be concentrated *above* the reported altitude, and so contributed effectually to the "breaking up" of the enemy's "formations," and afforded further proof of the efficiency of the various devices (especially of the "nets") which were now being brought into more general use, with the object of keeping the attack within definite limits of height.

All these and many other matters were discussed and considered at the subsequent conferences, and full advantage was taken of the experience gained,

whilst at the same time training was pressed forward with the greatest possible energy; so that when the next raid came on December 18th, we were even better prepared to meet it than we had ever been on any previous occasion.

CHAPTER VII

THE LATER RAIDS BY AEROPLANES

At 6.16 p.m. on December 18th warning was received that the enemy were once more on their way to London, and at 6.40 p.m. further information was received that a very large number of machines were then approaching this coast from the eastward. My subsequent report of this raid states that—"The attack developed on the London defences, and was carried out by five separate divisions, each consisting of numerous groups of aeroplanes advancing in succession on a broad front on both sides of the river."

These five divisions attacked in succession, the first report from stations within the West Sub-Command being received from Grove Park at 7.3 p.m., stating that the leading squadrons were then advancing on that station from the south-east, their altitude being "presumed" to be 12,000 feet. This attack was met by barrages and concentrations of searchlights at upwards of 12,000 feet, and was in full retreat by 7.20 p.m.

At 7.14 p.m. the succeeding division was engaged by the East Sub-Command, and intimation was received from the Anti-Aircraft Defence Commander that their altitude was given as 14,000 feet.

All the southern guns of the West Sub-Command were heavily and successfully engaged, and the enemy's intention of penetrating to the north of the river was frustrated, the only bombs reported within the West Sub-Command being in the neighbourhood of Wandsworth at 7.27 p.m. The second attack also was in general retreat, south of the river, between 7.30 and 7.35 p.m.

The *third* attack developed on the same lines at 7.30 p.m., and was also met by heavy fire, the formations being entirely broken up and widely scattered, a portion being reported as on an easterly course over Hanwell at 7.37; and the retreat of this division also became general by 7.50 p.m.

The *fourth* attack advanced from the north at 7.56 p.m., and was reported over the West End at 8.10 p.m., at that time travelling in a south-westerly direction, but widely scattered. These planes also had retreated to the south-east by 8.20 p.m.

The *fifth* attack was carried out at a much slower speed than the previous ones, and advanced from the north-east at 8.40 p.m., turning south when over the West End, where it was heavily engaged from 9.3 to 9.8 p.m. and entirely broken up. The retreat of this division was also in progress at 9.18 p.m., but was carried out in a north-easterly direction, doubtless in the endeavour to avoid engagement with our own planes during its retreat.

This engagement lasted continuously for two hours and a quarter, during the whole of which time firing was practically continuous, and the location of the various groups became excessively

difficult owing to their numbers and widely varying courses and speeds. The enemy squadrons, however, all kept at approximately the same altitude throughout, thus considerably facilitating the task of the defence—an important fact which was duly noted. The value of the "nets" was thus clearly demonstrated, for, having risen to a great height to pass over these dangerous obstacles, the enemy were evidently impressed with the necessity of "keeping their height," to ensure their being able to *repass over* them in their retreat.

The number of enemy planes employed in this raid was impossible to estimate, but it was undoubtedly considerably greater than the number employed in any previous attack. The bombs dropped numbered twenty-six incendiary and thirty-three high explosive; thirteen fires were caused; ten people killed and forty-nine injured; whilst the structural damage amounted to £225,000. The districts affected were widely scattered, the principal damage being in Clerkenwell, Pentonville Road, Bermondsey, King's Cross, Kentish Town, Belgravia, Pimlico, Inner Temple, Aldersgate Street, Holborn, West Smithfield, Westminster Bridge Road, and Southwark.

Taken generally, the results of this very elaborate and persistent "attack in force" must be considered satisfactory, especially when it is borne in mind that the very last man of a physique which rendered it possible for him to be employed at the Front, with any hope of his proving useful there, had been lately drawn from the defences, and that the

substitutes provided were not only untrained, but were also of a quality which nothing but the direst necessity could have rendered it worth while to endeavour to train *at all*. I myself well remember the infinite relief which I experienced when the attack was at last over, and I thankfully realized that it had proved possible to operate our elaborate system, throughout such a persistent and prolonged action, without any really serious breakdown of the organization.

The following somewhat hesitating paragraph at the end of my report gives to-day an excellent illustration of my feelings at the time:

"Generally, in view of the inexperience, want of training, and indifferent physique of the personnel, they can be said to have acquitted themselves fairly well."

After this raid there was again a considerable "pause" in the attacks. This may, of course, have been largely due to weather conditions, but there is no doubt that much discussion was taking place at this time in the enemy's camp as to the real value obtained by these raids, and as to whether the forces employed could not be more profitably used in other directions. However that may be, nearly six weeks elapsed before we were again called upon to resist an attack.

During this valuable interval, the reorganization of the whole of the defence forces was urgently proceeded with by our most energetic and competent commander, General Ashmore. The men

drawn for service at the Front were replaced as well as possible, officers and stations were inspected, promotions made, and arduous training continued. At the same time, conferences between the various branches of the defence forces were frequent, and intercommunication between them continuous, with the result that when, on January 28th, the next attack was delivered, still further important progress in efficiency had been made.

Certain events happened at this time which are of no general interest, but which had considerable effect upon my own future.

I had long had an ardent desire to once more get a little nearer to the enemy than was possible in the London defences before either I became too old or the war came to an end.

Having served for three years and six months continually in anti-aircraft defence work, I felt entitled, when an opportunity occurred to do so, to send in an application to be relieved of my command, with the object of taking up service of a more congenial and active nature. When therefore a favourable occasion presented itself early in January, 1918, I sent in my application. This, however, made no difference to the ordinary course of duty—until such time as the authorities should give their decision in the matter.

In the meanwhile, on January 28th, at 7.55 p.m., we received notice that a further raid in force was imminent. This attack duly developed, and was adequately met by gunfire and searchlight concentrations. The general altitude maintained by the

enemy was upwards of 12,000 feet, but several unusual methods were adopted by the attack, which were noted with due care by the defence and were of great interest.

The general attack took place as usual on both sides of the river and from the eastward. The northern portion, however, attacked *first* on this occasion, turning south when over the West End, and passing *through* the planes of the southern division, as the latter were advancing from the south-west. This had the effect of rendering "location by sound" extremely uncertain, as amongst so many contradictory reports, as to the direction of flight of planes, from the same locality, accurate identification became impossible.

A new system was, on this occasion, adopted by the attack, with the further object of rendering the movements of their planes less easy to follow. The procedure was that engines were frequently stopped and the planes then "glided" in silence, at the same time "circling" round several times before restarting their engines to regain their height and to continue their course. The effect of these manœuvres was, without doubt, to render the task of the defence very much more difficult, until the identification of the course of their planes, in fact, became very largely guesswork.

There was also a very noticeable *decrease* in the volume of sound emitted by the engines; this showed that efforts had been made to "silence" them. This was borne out by the generally reduced speed at which the planes flew, which was doubtless

due to the loss of power resulting from the "silencing" of their engines. As it is impossible to believe that the enemy would sacrifice any of the invaluable power which might do so much to ensure their safety in any air engagement during their retreat, it must be assumed that they were now fitted with "silencers" and "cut-outs," by which means their engines could be "silenced" at will and their full power regained on opening the "cut-outs."

These facts were duly appreciated and noted. The most valuable information which could be deduced therefrom, however, was that the tactics of the defence were proving very unpleasant to the enemy, and that all and every means were being adopted which could render the operation of the "barrage" fire more difficult and uncertain.

Thanks to the co-ordination of all the defence resources, there had now been established a well-defined central area beyond which our own planes could only come at their own risk, so that the danger of damaging our own brave airmen by gun-fire was "officially" eliminated. There is, however, no doubt that in actual action our gallant flying men took no heed of any such risk, but followed their enemy wherever and whenever they were able to catch sight of him, and, risk or no risk, hunted him down if given the slightest opportunity of doing so.

The raid on this occasion lasted from 10.27 p.m. to 12.30 a.m., but the damage done was comparatively slight.

The attack, however, was repeated on the following night, January 29th, when a similar raid was delivered, with much the same results. On this occasion I was able to fix, by actual observation, the speed at which the enemy were then flying, and formed it to be an average speed of 40 miles per hour only. The planes were visible on many occasions against the moon, but their silence was again most noticeable in comparison with our previous experiences.

This was the only occasion on which I was able to identify one of our own gallant fighting planes following and attacking a great Gotha bombing plane over the defences, where, of course, he had himself no "official" right to be. But what cared he? as, thank God! the spirit of Nelson ever lives amongst our fighting men, and wherever the enemy was, that was the one place where he desired to be, and the regulations might be considered afterwards *if* he ever succeeded in landing safely.

The particulars of these observations may be of interest, as they were taken and noted on the spot, and I have them before me as I write:

"Two planes were visible at the same moment against the moon, the smaller closely following (pursuing) the larger, quite *double* its size."

Presuming the larger to be an 80-feet Gotha, and the smaller a Bristol Fighting Scout, the angles and distances are then noted, and their position established from the fact that the 80-feet Gotha at that time "subtended" half the moon. These angles were afterwards worked out and forwarded to head-

quarters by me, in order that, if possible, the hero might be identified, who, fearing nothing on earth nor in the sky, braved even the military regulations to follow through the bursting shells an enemy outnumbering him as three to one, with twice his armament and double his size. All honour to him and to many others like him, on whom rests our country's real defence in future, and in whose courage and resource lies our real strength—if they be but given, *before it is too late,* the armament and training which are the necessary adjuncts to their success.

On looking through my remarks with respect to details of my command during this raid, written at the time, I note they were eleven in number, and extract the following as illustrative of the general situation at various stations:

"1. Much inconvenience was caused by the public congregating on the footpath outside the gun-station whilst the gun was in action. Request that authority to close the path during raids may be applied for.

"5. A 'deaf' ammunition number supplied two rounds of wrong ammunition at a critical moment before his mistake was discovered.

"6. Casualty to No. 7 of the gun's crew, who *'placed his hand in the breech of the gun instead of the shell.'* Bones broken. Mentally deficient!

"11. It is noted that the telephones alongside the guns are not fitted with a 'cut-out' switch, so that, when the gun is in action, communications from the other gun-stations coupled to the same telephone box at headquarters become 'inaudible.'"

The above are not quoted in any spirit of

criticism, but are simply statements of actual facts. Under the circumstances, it should be, I think, a matter for general congratulation that the results of these two raids, taken together, amounted only to—killed 41, injured 146, and general damage £172,000.

Early in February I received an official notification that my request to be relieved of my command had been acceded to, and on the 16th I had the satisfaction of handing over my command to my successor.

After three years and six months of continuous and anxious duty and responsibility, it may be imagined that the relief was great, and that that night I was, for the first time, able to go out and enjoy a pleasant evening without a car in constant attendance and a telephone, figuratively speaking, *at my ear* the *whole time*. My satisfaction, however, was infinitely greater when, on returning to my house at Putney, I noted the absence of the telephone from my bedside, which it had continuously "disfigured" for such a lengthy period.

I am quite powerless to describe my feelings of boundless delight when, having just got into bed that night, feeling at last free from all care and anxiety, the GUNS BEGAN TO FIRE, and—joy of all the joys on earth!—I WAS NO LONGER RESPONSIBLE. The deaf, the blind, and the mentally deficient could now commit every kind of possible and impossible enormity, but I could GO TO SLEEP.

Who shall say that I had not earned the right to do so, after watching so long and anxiously whilst

others slept? The feeling of relief, however, was quite indescribable; so much so, indeed, that it was almost worth all the previous long-drawn-out anxiety to gain that one night of irresponsible freedom and REST.

I remember well that the heavier the fire became, the more I appreciated my liberty, and the more comfortable felt my bed; and, above all, there WAS NO REPORT TO WRITE IN THE MORNING.

Three more raids actually took place after the happy moment of my release—namely, on February 17th, March 7th, and May 19th—but the damage done was in no case serious, and the enemy finally decided that their air forces could be more profitably employed in other directions.

Within a very short time after handing over my command I was myself on my way to Mesopotamia and Persia, where much more interesting and congenial work awaited me, an account of which is to be found in "Adventures in the Near East," published by Mr. Andrew Melrose in June, 1923.

CHAPTER VIII

LESSONS IN AIR DEFENCE LEARNT FROM THE AIR RAIDS : HOW THEY MAY BE PROFITABLY EMPLOYED IN THE ORGANIZATION OF THE DEFENCES IN FUTURE

THE short and very incomplete account which has been given of the various stages of air defence organization, which were improvised as the air raids developed during the war, is important chiefly on account of the lessons which may be learnt from the difficulties which such organization then presented. This importance will be still further appreciated when it is realized that the history of the evolution of the London air defence is the only *practical* experience of any such operation which exists, and of which we are therefore able to take advantage for our guidance in the establishment of an adequate defence organization in the future.

It must be obvious to all that the opinions of those officers who were "privileged" during the war to share in the responsibility of evolving some kind of defence where none previously existed must at least be worthy of some consideration. This is the more indisputable as there are no other precedents which we can consider and profit by. Whatever, therefore, may be the advances which have

been, or may still be, effected in air warfare, the events of the only air campaign which has hitherto been undertaken against these islands must of necessity form the basis upon which alone any intelligent conception of similar operations in the future can justifiably be founded.

It is for the above reason that I venture with great diffidence to put forward the deductions drawn from my personal observation during the raids, and from a subsequent close study of those events, and the opinions which I have formed from my own practical experience with regard to the requirements of our future air defences.

There can be no question either of the urgency or of the importance of the subject, nor, unfortunately, can the entirely inadequate state of our present air defence be doubted. The question to be considered is rather "In what manner may our present 'lamentable impotence' be most effectually remedied with the least possible delay?"

This brings us at once face to face with the most important points which I wish to urge, and which I advance with a confidence born of practical experience, in spite of the amount of adverse criticism with which they will, no doubt, be met.

The two main points which I am anxious to bring forward are:

First: Neither London nor any other district can be successfully defended against air attacks except by means of adequate forces IN THE AIR.

Second: The defence of any district against AIR attack should not only be carried out *in the air,* but

this operation should be undertaken at a considerable distance from the district which it is required to defend.

I will now venture to advance the arguments which I conceive to be in favour of the above points, in the hope that they may be judged to be well founded, and may at any rate bring about a more general realization of the truly lamentable position in which the air defence of this country finds itself, to our everlasting shame, at the present moment (August 14th, 1923).

In the first days of the air raids they were carried out at comparatively low elevations. At such elevations it *may* be possible to hamper the operations of aircraft by gunfire. This is by no means practically proved, but the supposition is at least "permissible." As, however, the altitude of the attack is increased, the inefficiency of gunfire is augmented out of all proportion to the degree of difficulty aircraft may experience in increasing their altitude. The main reason for this undoubted fact is that the "time of flight" of any projectile fired at an aerial target *from the ground* constitutes the "margin of safety" of the target. However accurate may be the fire and aim even in broad daylight, altitude alone constitutes such an effectual bar to its success that its practical efficiency against targets at high altitudes must be considered as negligible.

Even were this not the case, the altitude at which modern aircraft can fly is now so great that gunfire, even if carried out with guns of enormously in-

creased "muzzle velocity," must be considered as an ineffective weapon for purposes of defence against modern attack delivered through the air.

We come now to the consideration of the advantages of searchlights.

The main advantage of the use of searchlights lies in their illumination of the targets for the guns. If gunfire is shown to be an ineffective "weapon of defence," the searchlight loses the most important reason for its employment. It must, of course, be recognized that, *at times* and *on rare occasions*, a searchlight *may* illumine *an enemy*, and so enable a defending aircraft to locate and to successfully attack him. But this is a "two-edged sword" which may equally act in the inverse sense, as the defending aircraft is equally likely to be illuminated, to the advantage of the attackers.

The only *real certainty* with respect to the use of fixed searchlights *on the ground* is that their position will *certainly* become known to the enemy, and so will serve as a means of accurately indicating to him his exact position, which he might otherwise find it difficult to estimate correctly.

The most overwhelming evidence of this very important fact will doubtless be recalled by all who have read the preceding chapters, and is afforded by the incidents of the last raid of the Zeppelins on the night of October 19th, 1917.

In the general consideration of the subject, therefore, one is forced to the inevitable conclusion that, for purposes of defence, searchlights are more likely to become a source of weakness and to increase the

vulnerability of the defences than they are to afford any practical advantage to the defending forces. Under those circumstances, being confident that the above arguments are both technically and practically "sound," I suggest that at the present time, when expense appears to have become of even more importance than adequate defence, any and all such men and moneys as are now being devoted to gun and searchlight defence should forthwith be utilized for the increase of our air forces, upon the efficiency of which the successful defence of this country in future must most certainly and infallibly depend.

With respect to the *second* point under consideration, it becomes necessary to study the natural evolution of military operations of all kinds, and to deduce therefrom the natural tendencies to be expected in the development of the air operations of the future, by an intelligent study of the history of the progress of all offensive and defensive warfare in the past.

In olden days, and in primitive military operations, when it was desired to defend any particular locality, a "wall" was built round it, and certain heroes mounted upon the wall for the purpose of defending it with clubs and other primitive weapons against certain other super-heroes who endeavoured to climb the wall under incredibly disadvantageous conditions. Since those long bygone days weapons of both offence and defence have steadily increased in efficiency, though, as has been proved again and again, no matter what may have been the excep-

tional quality of the super-heroes of the past, their counterpart is easily to be found amongst the manhood of our present generation to-day.

With the increase, however, of the range and efficiency of the weapons employed, the extent of the area of the arena in which any military operation can effectively be carried out has steadily and regularly increased. To such an extent has this been the case that fortresses, which even one hundred years ago were considered as the very last word in effective fortification, reached a diameter of a few miles only; whilst many instances occur to me where, in modern war, a line of works and entrenchments of upwards of 50 miles in extent is hardly considered as an adequate defence for the *same position*. This has been the logical development which has followed the increase in efficiency of modern weapons of war—*exclusive* of *air forces*. These facts lead us directly to the conclusion that our AIR defence should be so organized as to offer an adequate resistance to any air attack long before any such attack shall be able to reach the neighbourhood of any really vitally vulnerable objective, such as the city of London.

Let us now make use of what intelligence we may have been endowed with, to consider what are likely to be the results of the introduction of air warfare in the campaigns of the future. No logical mind can for a moment refuse to recognize that all the advances made in other weapons of offence bear *no relation whatever* to the enormous increase in

the "scope of offensive operations" which has been effected by the possibilities of organized attacks through the air. Distances, hitherto rightly considered as prohibiting any possibility of successful attack, have entirely lost their military value, and we in England to-day lie at the mercy of any effectively organized AIR attack in force which may be delivered from bases which, even during the Great War, were considered as being beyond the limits of the practical field open to any attacking forces.

These facts are so incontrovertible that unless we desire to emulate the asinine antics of the ostrich, and to bury our heads in our traditions of naval defence whilst our weak spot, like his, remains IN THE AIR, we must at once recognize our present position and prepare most urgently, with what ordinary "horse sense" we may be able to muster, to consider that position AS IT IS TO-DAY.

In days gone by the British Navy defended the kingdom, and was, as it still is to-day, the finest organization of POWER throughout the world. This, both on account of the lines of far-sighted policy on which it has always been equipped and armed, and of the unequalled quality of the personnel, steeped in the imperishable traditions in which they have been trained, and fired with a spirit which has ever been, and will ever remain, unequalled "in action."

Let us be duly thankful that this is, and always has been, the case. But at the same time let us beware of our national failings—that is, of our

conservatism and of our reluctance to accept new conditions which may be at variance with our historical traditions. In this national conservatism and hesitation lies the only possibility of any enemy being ever able to defeat us. The progress of military development is now so quick that we are no longer entitled to rely upon the INDOMITABLE SPIRIT OF OUR MEN to retrieve us in future from positions of weakness, as has so often been the case in past campaigns. Our duty clearly lies in keeping "abreast of the times" and in ensuring that our strength in any new form of warfare is never allowed to fall below that of other nations.

I have no idea how this somewhat revolutionary statement may be generally received, but I make it in all honesty, as I'VE SEEN our men doing that very thing, and I KNOW.

Whether the future defenders of these islands may be dressed in the glorious and time-honoured naval "rig" which has descended to us from our forefathers, or in the khaki service dress which the late war has sanctified, or in the still newer shade which now distinguishes our modern air forces, we may thank God that the "stuff" inside remains THE SAME. That, however, is no reason why it should not be given every chance and supplied with the very latest requirements of modern war.

There is no need to blow trumpets about the efficiency in war of the man-power of the British Empire, as all the world knows it. But there is great need to see to it that our resources are

adequately co-ordinated, and that adequate provision is made for the development of the *newer* arms which must infallibly dominate both offensive and defensive operations in the future. This is a duty which rests on each and all of us, and it is necessary for all to recognize that, as the responsibility for the first line of the defence of these islands gradually changes from the SEA to the AIR, adequate provision shall be made to enable us to maintain our legitimate position in the comity of nations. This position, so indispensable to our national prosperity, can only be gained by the permanent maintenance of forces of the new AIR arm which shall correspond, in relation to the similar forces of other nations, with the proportion which in the past was considered necessary to ensure our "command of the SEA."

In this, as in all other phases of life, it is, of course, necessary to consider the *cost* and to adapt our expenditure to the resources at our disposal. In a question of such vital national importance as the defence of the country it must, however, be accepted that the question of national security must come *first*, and that the consideration of the expense must become of secondary importance. We are also justified in assuming that, as the first-line defence leaves the Sea and "soars" into the Air, it should be possible to correspondingly reduce the expenditure on the former, in order to provide for the increase of expense in the latter field of operations.

Here we begin to raise questions of a highly

technical and controversial nature, which bring our great departments into direct conflict with each other. Each (acting, of course, in perfect good faith) feels bound to resist with all their strength any reductions which may be contemplated in the particular sphere in which they have passed their working lives, and with whose traditions they have become imbued. Their feelings are perfectly natural, their great experience unquestioned, and their honesty of purpose beyond dispute.

In the meanwhile, however, progress has and is being made on all sides of us, and we no longer occupy to-day the position which *should* be ours, and which *has* been ours for generations past. However friendly we may be with our various neighbours, the fact remains that we are to-day in a position in which we have *no right to be*, and into which the nation should never have been allowed to fall. In AIR POWER (the lightning form of the offensive operations of the future) we are now INFERIOR to other nations, and in consequence our voice, when raised in questions of national importance to us, no longer commands the attention which we have the right to expect.

A most interesting "White Paper" has lately been published on the subject of "the co-ordination of the defences." This enumerates the decisions arrived at by His Majesty's Government upon the recommendations of the Committee of Imperial Defence, and signed by them on July 21st, 1923. The first two of the eleven decisions are of so vital a nature that the remainder become of merely

secondary importance. The first two are as follows:

No. 1. It is undesirable and impracticable to supersede the Ministerial heads of the three fighting services by making them subordinates of a Minister of Defence; the alternative plan for an amalgamation of the three service departments is equally impracticable.

No. 2. On the other hand, the existing system of co-ordination by the Committee of Imperial Defence is not sufficient to secure full initiative and responsibility for defence as a whole, and requires to be defined and strengthened.

It will at once be noted that No. 2 officially admits that the existing system is unsatisfactory; in that the full advantage of the national resources for defence is not obtained, owing to a lack of co-ordination, initiative, and direct responsibility.

It is impossible not to appreciate the immense importance of this admission by the Government of the day, after their exhaustive official enquiry with all the facts under review.

We also learn with extreme interest, from the above paragraph, the directions in which our system of defence is deficient and calls for re-organization. The subsequent decisions are then quoted, evidently as the method by which it is the Government's intention to effect the reorganization of which they admit the necessity.

Having most carefully studied the nine subsequent decisions, we are left astounded at their futility, and with the firm conviction that no

practical alteration or improvement can possibly be effected thereby. It must be evident to all who study the whole question of the co-ordination of the national resources, that the only practical means of ensuring an effective result in that direction is by a radical reconstruction of the present system by which the responsibility for the defence is divided between a number of heads of Government departments.

Even if, as is the case at present, the various heads of departments form a defence committee, they, as a body, have no *executive* power. The value of the opinions they each hold must also of necessity be discounted by the personal responsibility which devolves on them individually as heads of their respective departments. The general responsibility for the vital question of national defence, when shared, becomes, in effect, no responsibility at all. The unavoidable result of these decisions must therefore be that the country will continue in exactly the same undesirable and inefficient position that is so aptly described in the Government decision No. 2 quoted above.

To turn now to decision No. 1, which in reality represents the root of the difficulty.

Here the cause of all the trouble is clearly and concisely set forth in the opening words: "It is undesirable and impracticable that the Ministerial heads of the three fighting services should be *subordinated* to a Minister of Defence."

It will appear to any independent person of average intelligence who holds no brief for any particular department, but, being a citizen of the

Empire, is most particularly interested in its defence, that, *on the contrary,* it *is* both eminently *desirable* and *practicable* that the three fighting services should be individually subordinated to the general defence. Such subordination is also perfectly natural and proper, as although *individually* each service is supreme in its own domain on sea, on land, or in the air, yet *collectively* they *are* the defence, and as such can only hope to reach that high standard of efficiency, for which the proper co-ordination of their resources is essential, by a UNITY OF CONTROL.

The above deductions appear so clear as hardly to admit of argument, for otherwise the WHOLE would not be greater than the PART, which, as the greatest of all logicians many centuries ago decided, *was, is,* and *must ever be* ABSURD.

We have now to consider by what means this "absurdity" can be best and soonest eliminated from the organization of our resources, upon which the national safety in future must depend.

The question is the same in every respect as that which was found so difficult in war-time, but of which the essential solution was, beyond doubt, the factor which WON THE WAR.

This solution is UNITY OF CONTROL.

During the war the collective strength of the Allies was materially reduced owing to the lack of co-ordination of their resources. To this cause was due the fact that the efforts of the armies were, in many cases, unable to produce their full effect until unity of control was at last established.

We have in our own national defence organization to-day an exact reproduction of that dangerous source of failure in the search for the maximum of general efficiency.

Our great services of defence and offence are, of course, allies working for the common good, as were the allied armies in the field. For exactly the same reasons, however, the advantage of the best effort of which they are capable can never be secured until they are each and all subordinated to a single supreme control and single responsibility.

This control and responsibility can never in its "executive" sense be that of the Cabinet, who are necessarily politicians elected by their constituents, although they are nevertheless eventually responsible to the nation.

No. 6 of the minor decisions of the Cabinet, referred to above, lays down that the Committee of Imperial Defence shall in future consist of—

1. The Prime Minister, or his deputy (chairman).
2. The Secretary of State for War.
3. The Secretary of State for Air.
4. The First Lord of the Admiralty.
5. The Chancellor of the Exchequer.
6. The Secretary of State for Foreign Affairs.
7. The Secretary of State for the Colonies.
8. The Secretary of State for India.
9. The Chief of the Staff (Navy).
10. The Chief of the Staff (Army).
11. The Chief of the Staff (Air Forces).
12. The Permanent Secretary of the Treasury (as head of the Civil Service).

In addition to such other persons as may be specially summoned, according to the nature of the business.

This body is to have no executive power of any kind (for which mercy we should perhaps be thankful), but is to recommend its ideas to the Cabinet.

Is it possible to conceive any more ineffective body than one composed of this astounding "galaxy" of officials?

Could any more infallible method be devised, by which the "responsibility" for defence could be more certainly "buried," than by dividing it amongst the various "stars" of this most imposing constellation; who, be it borne in mind, by virtue of their various official appointments, already carry at least the full load of responsibility which they are capable of bearing?

In reading these truly astonishing Cabinet decisions, it is impossible to avoid most thoroughly endorsing the one word of sound common sense which is to be found in that most astounding document.

This is contained in decision No. 2, and is to the effect that "the existing system . . . is not sufficient to 'secure' full initiative and responsibility for defence as a whole . . ."

IT IS *not* INDEED!

Having ventured with great diffidence to draw attention to the above facts, it now becomes my duty, with even greater diffidence, to offer suggestions as to the manner in which our lamentable position can be best and most effectually improved with the least delay.

The one and only method which has any prospect of success would appear to be the creation of a unified control of the national defence. Such control, to be of any practical utility, must be an "active" and "executive" control, with the power of co-ordinating and allocating the national resources. This implies the creation of an "Imperial Office," which will in future control ALL the forces of the Crown on the sea, on land, and in the air, and will be "responsible" for their efficient organization in relation and in proportion to the funds that may be voted for that purpose.

Anything short of that radical and fundamental reorganization of our national resources, both of offence and defence, will, in these days of rapid progress, be a delusion and a snare, for which in days to come we shall be called upon to pay dearly.

* * * * *

In conclusion, I feel it incumbent upon me to sound a note of warning, addressed in particular to the inhabitants of our great cities.

If it is thought that, because the raids on London during the war, caused the death of only five or six hundred citizens and the serious injury of over 1,200 others, in addition to structural damage of over £2,000,000, these figures bore any relation to the actual risk incurred from the air raids, a very erroneous impression of the facts will have been obtained. We have every reason to be thankful that our losses were confined within those limits, as they might quite easily have been enormously multiplied, owing to circumstances which would have been entirely beyond the control of the defence.

Still more important is it for all to realize that the possibilities of any *future* air attacks must bear still less comparison to the above figures, for, owing to the increase in numbers and efficiency of aircraft, the dangers to which the inhabitants of our great cities would be exposed if a modern air attack in force reached them are such as to *utterly defy description*.

It is the duty, therefore, of one and all of us to press for the immediate provision of adequate air forces for defence, and for the establishment of our air power on a standard which will bear the same relation to the forces of other nations as has long been considered indispensable for the insurance of our national safety by our "command of the sea."

By this means alone can we be sure that we of this generation are worthily carrying on the noble traditions of our ancestors, and are preserving intact that great national heritage which they have left us—the BRITISH EMPIRE—which has ever been so "hard to move" and so "impossible to alarm," but, nevertheless, is to-day the GREATEST EMPIRE which the world has EVER SEEN.

APPENDIX

COMPARISON OF THE ANTI-AIR DEFENCE OF LONDON WITH THAT OF PARIS

THE following report was rendered by Commander Rawlinson to the Admiralty in September, 1915 :

The diameter of the city of Paris is roughly $7\frac{1}{2}$ miles. The area to be defended is approximately 45 square miles.

The metropolitan area of London is 700 square miles.

There are employed in the defence of Paris at present—

127 Q.F. guns.
88 machine-guns.
41 searchlights.
2,500 men and 57 officers, exclusive of 60 aeroplanes and their personnel.

It is contemplated to still further increase the defence by the immediate addition of eighty more 75-mm. guns.

Although the problem of the defence of London against aircraft differs from that of Paris, in that the area to be defended is much greater and the form of attack to be expected is by Zeppelin rather than by aeroplane, yet the principal object of the defence in each case is the same, viz. :

> "To prevent the enemy's aircraft obtaining a position over the city from which material damage may be done."

To carry out a scheme of defence for London on the lines of the present Paris fixed gun defence would call for the provision of a very large number of guns, only a small quantity of which could ever be in action at one time.

The same object may, however, be achieved by the employment of mobile guns firing H.E. projectiles and moving on exterior lines at from 10 to 15 miles distant.

This was the method adopted in Paris previous to the establishment of the very complete scheme of fixed posts at present in existence, and in the case of London it presents the following further advantages:

1. The form of attack to be expected permits of considerably earlier information being obtained as to the direction of the attack, thereby enabling a concentration of the mobile defence to be effected on the line of the enemy's advance.

2. By this means, although the number of guns employed in defence may not be so great, yet the number which may be *brought to bear* on the attack may be considerably greater.

3. The roads and gun-positions available on the north and east of London are very suitable to such a scheme of defence.

4. The guns available, 3-inch and 3-pounder Q.F., both being high-velocity guns, are most suitable for the purpose and are capable of being easily and quickly transported and brought into action when suitably mounted, and guns of even larger calibre could also be used for the purpose.

5. The organization of such defence would be *more speedily carried out,* and become effective over the *whole area much sooner* than could be the case with any system of fixed posts.

6. Such mobile defence would be supplementary

to any interior fixed defences, which would be considerably reinforced thereby.

7. The enemy would be attacked and possibly driven off *before* reaching a position from which any damage could be done.

8. Should the line be pierced by the enemy, they could be subjected to further attack on their retreat.

9. A system of mobile defence could be organized and the whole metropolitan area be efficiently protected by the employment of a much *smaller number of guns* and *personnel* than would be the case with fixed defences.

(*Signed*) A. RAWLINSON
(*Lieut.-Comdr., R.N.V.R.*).

September 24th, 1915.

DETAILS OF ANTI-AIRCRAFT DEFENCES OF PARIS

Officers Responsible for—

1. The Military Governor of the Entrenched Camp of Paris is responsible for the defence of the city.

Acting immediately under his orders is a naval officer commanding the anti-aircraft defence.

The aviation camp attached to the city is charged with the defence *in* the air, and acts directly under the orders of the O.C. anti-aircraft defence.

The O.C. anti-aircraft defence receives all reports, issues all warnings, and commands *all* the defences in action against aircraft.

Guns:

2. In four exterior lines are *forty-one* fixed gun-positions, each post containing—

2 75-mm. Q.F. field-guns firing H.E. shrapnel or tracer projectiles.
1 37-mm. Q.F. gun.
2 machine-guns.

In addition to above, there are posted in favourable positions within the city—

4 49-mm. Q.F. guns and
6 machine-guns.

Each of the *forty-one* exterior posts is provided with a searchlight capable of illuminating aircraft at 10,000 yards. One third of these are mobile, in view of local variation of atmospheric conditions.

All guns, machine-guns, and searchlights are mounted on H.A. mountings of recent design.

Total armament:

82 75-mm guns.
41 37-mm. guns.
4 49-mm. guns.
88 machine-guns.
41 searchlights.

61 gun-posts in all.

It is in contemplation to still further increase the number of posts and to raise the number of 75-mm. guns to 150.

Personnel:

3. The force at the disposal of the O.C. air defences (*not* including the aviation camp) consists of—

2,500 N.C.O.'s and men and *57* officers, made up of—

Gunners and machine-gunners	1,900	men.
Observation posts ...	300	,,
Searchlights	250	,,
Meteorological posts ...	20	,,
Staff and sundries ...	30	,,
Total personnel ...	2,500	,,

The artillery provide the gunners, gun-positions, guns, and ammunition, and are responsible for their clothing, payment, training, and efficiency.

The Navy and engineers provide the search-lights, astronomical instruments, and their crews.

System of Defence:

4. The system of defence consists of—

(*a*) Exterior lines of observation posts to report approach of enemy aircraft.

These lines commence at approximately 50 miles distance from the city, and advantage is taken of all favourable ground or high buildings.

Each post consists of an N.C.O. and six or eight men.

There are *forty-two* observation posts in all, and each post is connected with headquarters in Paris by two independent lines of telephone.

(*b*) Of the four lines of fixed gun-positions, the first and exterior line consists of eight posts, and extends only on the north and east of city (the point most liable to attack). This line is roughly from *fifteen* to *twenty* miles distant.

The second, third, and fourth lines completely encircle the city and are from *five* to *fifteen* miles distant. They consist of—

Second line	...	... 15 posts.
Third line	...	... 11 ,,
Fourth line		... 7 ,,

(*c*) The interior guns and machine-guns are posted on high buildings, to defend the points most susceptible to attack within the city.

All gun-posts are connected by duplicated telephone connections with headquarters.

Range of Guns:

5. The 75-mm. guns have an effective *horizontal* range of 9,500 yards.

At an elevation of 50° their range is 6,000 yards at an altitude of 9,000 feet.

At higher elevations they can range to an altitude of 14,000 feet.

The guns are so arranged that any aircraft attempting to fly over the city should be under the fire of four guns simultaneously whilst crossing the line of defence at any point.

Aeroplanes:

6. In the aviation camp attached to the city are sixty aeroplanes, the majority of which are armed with machine-guns, and their further armament is proceeding rapidly.

Their duties are—

(*a*) To provide a constant air patrol of three machines at a constant height of 9,000 feet above the city, to be ready to meet on equal terms any enemy aircraft attacking at that altitude.

These machines are relieved every two hours.

(*b*) Four machines are in readiness day and night instantly to take the air in event of attack.

(*c*) On warning of the approach of enemy aircraft a large white canvas arrow is spread on the ground at the aviation ground, pointing in the direction of the attack, to guide the air patrols, who are instructed to meet and defeat such attack if possible *outside the city limits*.

(*d*) The waiting machines have orders, on taking the air, to proceed in the direction of the attack, gradually rising to 7,000 feet, and when they have attained that altitude they are to *return* in the direction of the city to intercept the enemy's retreat.

(*e*) There is a special order that all machines shall

immediately engage the enemy, without reference to the fire of the guns below.

(*f*) No machine, in event of attack, is to descend till the arrow at the aviation ground is withdrawn.

(*g*) All aviators are constantly practised in night flying with lights over the city to familiarize themselves with night conditions.

A number of landing-places are provided and illuminated, some of which are as much as 35 miles distant from the city.

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