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HISTORY

OF THE

CORPS OF ROYAL ENGINEERS

VOLUME IV

by

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PREFACE

A FEW words are necessary to explain the reasons for the publication of this volume which covers the period from 1885 to the outbreak of the Great War in 1914.

Three volumes of Corps history have already appeared ; Volumes I and II, which were written by Major-General Whitworth Porter, carry the history from the Norman Conquest to 1886, and Volume III, written by Sir Charles Watson, carries on the history from 1886 nominally to 1912. It necessarily happens that when a history is written closely after the events recorded the most recent events are not seen in proper perspective. Both Volumes II and III were completed at periods which were critically important in the history of the Corps, Whitworth Porter's volume II ending at a time when a very large increase was being made to the Corps both of officers and men, and Watson's volume III ending during the period of the changes in Army organization introduced in 1905 and 1906.

There is internal evidence that Watson intended to expand his volume, as some subjects, such as Fortification, are not touched on. Such expansion was prevented by the outbreak of the war in 1914 and by his own death in 1915. *The History of Submarine Mining in the British Army*, compiled by the present writer, was published in 1912 and covers the history in some detail of the large portion of the Corps, nearly one quarter of the whole, which was employed in the Submarine Mining Service ; the history covers the work of this branch from its early beginnings in 1863 to its breaking up in 1905. In addition to these volumes of Corps history *The Royal Engineers in Egypt and the Sudan* and the two volumes of *The Military Engineer in India*, all by Lieut.-Colonel Sandes, deal with parts of the history covered by this volume and cross references to these are given in many cases to avoid repetition. But even including these volumes, there still remain a good many gaps in the history dealt with in Volume II, and when I was asked to assist in the preparation of a volume dealing with the R.E. in the Great War of 1914–18, I suggested to the Council of the Institution of Royal Engineers that a preliminary volume might be prepared filling in these gaps in the early history and carrying the account up to August 1914.

In writing this volume I have made some departures from the form adopted in Volumes I and II. In these volumes the history of the

Corps is dealt with as a series of episodes centring round the wars in which the British Army has been engaged. The result is that most of the space available has been given to the military side of the work of the Royal Engineers. In the present volume I have endeavoured to describe the nature of their organization for the very important duties carried out in time of peace. Also during the whole period covered by this volume there has been a close connexion between the Army and the political history of the country, during which the supreme control of the Army, formerly exercised by a Commander-in-Chief in the name of the Sovereign, has been transferred to a civilian Secretary of State. Under this change Army organization has often become a pawn in the battle of political parties, with the result that a change of Government has been followed by changes at the headquarters of the Army, which, in its turn, reacted on the duties and growth of the Royal Engineers. In the first four chapters, I have tried to give a narrative of the principal events, political and military, during the period dealt with in this volume, with a note of the more important changes which affected the Royal Engineers. The fact that this volume has been written so many years after the events recorded has enabled a more detached view to be taken of these changes than was possible at the time Volume III was written.

Following the narrative, three chapters are given to a short description of the work of the Royal Engineers in our Colonies; these include, in addition to much valuable work by individuals, two campaigns in Somaliland and in North China, which compare in size, though not perhaps in results, with the various campaigns in Egypt from 1882 to 1898.

Six chapters are then given to the growth of personnel, and various aspects of Engineer work, including Fortification and the growth of the Field units. These chapters link up with similar chapters in Volume II and Volume III. In some cases it has been necessary to repeat shortly facts already dealt with in previous volumes, but cross references are also given. The only important exception is the work connected with Survey; this has been very completely dealt with in Volume III, Chapter VI, so that only short references have been made in this volume.

Chapter XIV, on the various civil activities of the Corps, must be read with the similar chapters of Volume II and Volume III and with the biographical notices which follow.

In the last part of the volume a series of biographies of selected officers have been added as in previous volumes, but a departure

from previous practice has been made in that the names have been selected not only of the officers of the Corps who have risen to high positions in the Army or the State, but include those of a number of officers representative of the various branches of engineering covered by the Corps. To make room for this increased number the length of each biography has been shortened.

Another departure from previous practice has been made in giving the rank of each officer at the time he is mentioned and not the rank or title to which he may attain later ; the latter detail can be readily ascertained from the Index.

Modern spelling has been adopted for place names as far as possible.

A large part of the information in this volume has been obtained from the *R.E. Journal* and from various publications in the Corps Library in London, but great assistance has been obtained from the War Office Library, especially in connexion with the work in the Colonies. *Follow the Sapper* by Lieut.-Colonel P. H. Kealy has also proved most useful in the earlier part of this volume. The whole volume has been read and criticized by Major-General H. L. Pritchard as Editor-in-Chief of the volumes of Corps History covering the period 1912 to 1938, and thanks are due to many other officers who contributed notes of their personal experiences or dealt with special branches of work. Among these are Major-Generals Sir Charles Gwynn, Sir Robert Lee, and E. V. Turner, Brigadier-General G. H. Boileau, and Colonels R. L. McClintock, R. S. McClintock, and R. A. P. O'Shee, while Colonel H. G. C. Swayne contributed valuable notes of his work in Somaliland as an explorer and surveyor.

Special thanks are also due to Mr. L. Moran for checking the typescript in detail and preparing it for printing.

W. Baker Brown.

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THE year 1885 was one of the most important in the history of the Royal Engineers, certainly the most important since the officers and men had been formed into one Corps in 1856. It has always been a characteristic of the Corps that it follows with interest every development of engineering science and its application to practical work, and in the use of such development for the work of the Army it often anticipated the future use of new inventions for other than Army purposes. Mention may be made of the telephone, arc lighting, the use of gun-cotton, the electrical detonator, the firing of charges under water, the construction and management of balloons, the system of visual signalling by flag, lamp or heliograph, and the development of mechanical road transport. In 1885 some of these developments had reached maturity, some were in their infancy.

Up to this time it may be said that the work of the Royal Engineers had been mainly on and under the earth, hence their designation of Sappers and Miners, now they were to develop additional

duties in and over the water and to begin a period of trial and experiment, which led thirty years later to the conquest of the air.

The organization and training of the Corps, which carried out all this work, had grown in a rather haphazard manner as additions had been made to their burden, but the increase in numbers was not in proportion to the work to be done. In 1885 a definite attempt was made to bring the organization and numbers into line with the duties.

In 1856, and for some years after, the Corps consisted of a number of officers and men formed into small companies of equal strength, with, in addition, a number of unattached officers in charge of the engineer work connected with the construction and repair of fortifications and military buildings.

The experience of the Crimean War had shown the necessity for the Engineers to be supplied with some form of Engineer train, for the transport of bridging stores and other equipment, and after much discussion, which is described in Volume II, Part II, Chapter II, of our *History*, special Field units called Troops (A and B) were evolved, while in 1870 a Telegraph Troop was added. Various changes in organization followed, notably in the attachment of sections of the B troop to Field Companies. In 1882 practically the whole of the recently formed Field units of the Corps were dispatched to Egypt to take part in the series of operations which culminated in the temporary withdrawal of our forces from the Sudan in July, 1885.

During these operations a new demand had been made on the Corps for railway work and two companies had been trained for this duty.

While this expansion was taking place, there had been a further heavy demand on the personnel of the Corps for the Submarine Mining Service and for the extension of the defences at coaling stations abroad and commercial ports at home, this involving work and expenditure not only for new fortifications but also for the barracks required for the increased garrisons.

The whole question was fully set forth in a memorandum dated the 20th December, 1884, prepared by the Deputy Adjutant-General R.E., Major-General Sir John Stokes. In this document the D.A.G. pointed out that the establishment of officers and men had been fixed as far back as 1862, and that since that date additional duties had devolved on the Corps which ought to occupy seventy officers though none had been added to the establishment. Also that out

of thirty General Service Companies existing in 1862, four had been converted to Field Companies and nine others to Telegraph, Submarine Mining and Railway Companies, leaving only seventeen for general duties, although the scope of the work of the Army had been largely expanded. This memorandum was endorsed by the Inspector-General of Fortifications, Major-General Sir Andrew Clarke, who submitted a scheme for the future organization of the R.E. based on a grouping of the various companies into battalions. On 16th April, 1885, he submitted a further memorandum on the development of the Submarine Mining Service in which he advocated, in addition to a considerable increase to the R.E. companies, the formation of Militia and Volunteer S.M. units at home and a battalion of Malays for the Eastern ports.

These proposals were strongly supported by the C.-in-C., H.R.H. Duke of Cambridge, and were remitted by the Secretary of State for War, Lord Hartington, to a strong Committee.

The President of this Committee was first the Earl of Morley, Under Secretary of State for War, but a change of government occurring before the Committee could meet, he was replaced as President, first by the Hon. Guy C. Dawnay and then by Lord Sandhurst. The members were General Viscount Wolseley (Adjutant General), Lieut.-General Sir A. Alison, Bart. (G.O.C. Aldershot), Major-General Sir C. G. Arbuthnot, R.A., Major-General H. A. Smyth, R.A., Major-General Sir A. Clarke (I.G.F.), Major-General Sir R. H. Buller (D.A.G. at H.Q.), Major-General Sir J. Stokes (D.A.G., R.E.), and Mr. R. H. Knox (Accountant General). Captain L. Darwin was Secretary.

The terms of reference to the Committee were (*a*) the necessary duties devolving on the Corps of Royal Engineers, (*b*) the strength of officers and men and the numbers of cadres to be maintained during peace, as will enable it with its reserves fully to meet the demands against it in war.

The Committee met for the first time on 31st July, 1885. The case for the R.E. was put forward by Sir Andrew Clarke and Sir J. Stokes, who were ably assisted by Colonel R. N. Dawson Scott (D.I.G.F.) and Lieut.-Colonel W. Salmond (A.A.G., R.E.). They had collected a mass of data and opinions, including extracts from Wellington's despatches complaining of the want of a Bridging train in the Peninsular War, the reports of various Committees and the opinions of many of the leading R.E. officers. These included Field-Marshal Lord Napier and General Lintorn Simmons, then

Governor and Commander-in-Chief at Malta. Special reports were submitted by Colonel R. H. Stotherd on the work of the Survey and by Lieut.-Colonel A. G. Durnford on the organization and equipment of Field Companies.

The Committee seem to have accepted with little discussion the necessity for a considerable increase in both officers and men and the urgent importance of proceeding with the defences of the Colonies and the commercial ports at home. Possibly this decision was influenced by the fact that we were, in 1885, in the middle of one of our periodical war scares with Russia, who was decidedly aggressive on the frontiers of Afghanistan and in the Eastern Seas.

The Committee issued two interim reports. In the first of these, dated the 15th August, 1885, after referring to the shortage of officers, they endorsed a recommendation made by the D.A.G., R.E., that instead of waiting for the output of an increased number of cadets from Woolwich, immediate steps should be taken to get officers from other sources. It was pointed out that it took nearly five years from the time of entry of a cadet at Woolwich before he completed his courses at Woolwich and Chatham and became a fully trained Engineer officer. The sources recommended were the R.M.College, Kingston, Canada, the India Engineering College, Coopers Hill, and the Universities. This report was accepted by the authorities and immediate action was taken by commissioning eleven officers from Canada.

The second report, dated the 5th February, 1886, dealt with the Survey Companies. The responsibility for the Survey of the United Kingdom had been placed on the R.E. since its inception in 1783 (Vol. II, Part III, Chap. II), but this arrangement has often been attacked by reformers. All the familiar arguments were repeated on this occasion. On the one hand, the Military members, headed by the Adjutant-General himself, argued that, though some trained surveyors were required for military work, the numbers employed on the Survey were in excess of any possible Army requirements and the Army Votes, if relieved of this expense, would have more money to spend on other services. On the other hand, the R.E. members argued that the work was for the Government which had no other department which could carry on the Survey and that it was really immaterial which section of the Estimates bore the expense, while the survey companies being trained in military duties were a very useful reserve for the service companies. They also appealed to the fact that the R.E. had a long and distinguished

record of work on the survey which had a world-wide recognition, and they pointed out that there were frequent demands for survey work in the Colonies which were best met by an organization on a military basis. The Committee accepted this view as regards the retention of the Survey under R.E. control, but insisted that the number of companies employed should be reduced to one. This report was sent in urgently in February, 1886, in the expectation that the reduction could be carried out in the Estimates 1886–7. But other Government departments were affected by the change, so the reduction was first deferred and eventually dropped. The final Report of the Committee was signed on the 28th June, 1886, after the Committee had held twenty meetings and accumulated a mass of evidence and reports. Most of its recommendations were adopted and it constitutes a record of the work which fell to the R.E. at this period and was the first attempt to form a comprehensive estimate of the numbers required and of the organization necessary to carry out the work.

The duties of the R.E. were summarized as under :—

Duties which had always formed part of the work of the R.E.

A. To take the field with the Army for
- (*a*) Bridging rivers,
- (*b*) Demolishing and restoring bridges, roads, etc.,
- (*c*) Rendering positions defensible,
- (*d*) Siege operations,
- (*e*) Water supply, piers, etc.

B. Work in Fortresses. Construction and maintenance of fortifications.

C. Administration of the expenditure on War Department works, buildings and lands.

To the above the Committee added the following list of duties which had been recently added :—

D. Telegraphic communication of an army in the field.
E. Defence of ports by submarine mines.
F. Construction and working of railways in war.
G. Use of military balloons.

On the question of organization they recommended that the Corps should be organized by battalions for administrative purposes, the company remaining the tactical unit. The number of Field

units were to be sufficient for two Army Corps. In addition to the units with the Army in the field, companies were required ready to be sent abroad for work on the base and the L. of C.*

Fortress engineers were to form part of the peace garrisons of all important fortresses.

The organization of the Submarine Mining Service proposed by the I.G.F. was accepted.

The number of companies recommended and their organization into battalions was as follows :—

Bridging.—Two Pontoon Companies in one battalion.

Telegraph.—Two mounted divisions and one unmounted to form a battalion. The unmounted division to work under the Post Office in peace and act as reserve to feed the Field divisions in war.

Field.—Two battalions each of four Field Companies, one Balloon Section and one Field Park, with a Depot Company to train recruits and to receive reservists on mobilization. The four Field Companies for the first Army Corps to be kept at war strength.

Fortress Companies.—To be organized into battalions.

Submarine Mining.—The companies at home to be grouped to form two battalions with headquarters at Chatham and Portsmouth. Companies or sections to be detached annually to ports for practice. There was also to be a Coast Battalion for the commercial ports at home, officered by promoted Warrant Officers, and an Eastern battalion for the defended ports in the East to consist of Malay companies under Royal Engineer Officers with native officers to assist. A native company was proposed for Jamaica.

The Committee also accepted the proposals of the I.G.F. for a considerable increase in W.O. and N.C.O. instructors at the S.M.E. and in the formation of new groups of senior W.Os. and N.C.Os. for charge of electrical work, machinery, and the Submarine Mining vessels. These were later called Military Mechanists.

The organization of the battalions proposed above was discussed at some length by the Committee. It was agreed that the organization could not follow that of a battalion of infantry on which the proposals were based. It was agreed that a centralized clothing account for each battalion would be unworkable except at Chatham, and that other duties performed by the Quartermaster in the

* As these companies were interchangeable as regards personnel and training with the companies in fortresses, the term Fortress Company was used for both classes instead of the former term of General Service Companies.

Infantry would have to be decentralized to the companies. In the result the provision of Lieut.-Colonels to command the various battalions was recommended, but the proposed appointment of a Major as second-in-command was rejected and Quartermasters were only allowed at Chatham and Portsmouth for the Submarine Mining Service, in addition to those already existing at S.M.E., Aldershot, Southampton and for the Telegraphs. A very useful innovation was the addition of six Quartermasters to be promoted from Military Foremen of Works, who were to be employed on works under the R.E. officers. This was the beginning of a most valuable group of officers which has since been considerably extended. The increases recommended by the Committee totalled 126 officers and 1,748 other ranks, bringing the total numbers on the British Establishment to 578 officers and 7,218 other ranks.

The increase of 126 officers was made up of 18 Lieut.-Colonels, 100 Majors, Captains and Lieutenants, and 8 Quartermasters.

In the course of the discussions of this Committee many proposals were made which affected the future of the Corps. Some of these were adopted. The most important was the adoption of the principle of continuous Engineer pay, under which all tradesmen were to be paid a daily rate of Engineer pay, which varied with qualifications, but which was paid irrespective of employment. (For details see Chapter VIII). This method had been adopted some years earlier by the Submarine Miners. It was now to be applied to the whole Corps. Some other questions were discussed but were not adopted. The R.A. members of the Committee raised the question of the transfer of Submarine Mining to the Royal Artillery, but this was rejected (*History of Submarine Mining*, Chap. V). Sir Redvers Buller suggested that the Telegraph Companies should form a distinct organization; this was also rejected.

General Lintorn Simmons, in the memorandum already referred to, threw doubt on the necessity of employing soldiers on railway work. In reply Sir Andrew Clarke pointed out the good work done by the R.E. Railway Companies in the Nile Valley, which was efficient and economical and contrasted it with the failure of the proposed Suakin–Berber Railway which had been entrusted to an English contractor of world-wide experience. This had proved a costly failure due to the difficulty of getting the civilian labour in the first place, except at extravagant rates of wages, and to the difficulty of controlling that labour under the conditions of active service.

The general question of the employment of R.E. on the construction and repair of barracks was discussed at some length. All the arguments on both sides, which have been repeated to a series of Committees and Commissions, were brought forward. The Engineer representatives claimed that employment on barracks gave useful training in practical work which would be most valuable in war, but the question seems to have been settled by a memorandum by Sir John Stokes in which he pointed out the economy effected by the employment of R.E. on such duties, which he estimated was at least £100,000 a year. He also justly claimed that the work had been most efficiently done, and added, "the comfort and health of the whole Army depended on the careful and thorough supervision of these works."

This report was accepted by the Government.

The proposal to group the companies into battalions had to be considerably modified. In the Submarine Mining Service two battalion headquarters were formed, one at Chatham for the companies at Chatham, Gravesend and Sheerness, and one at Portsmouth for the remainder. It had been intended that the companies allotted to defended ports could proceed to their ports for their summer practice and return to the battalion for the winter months. But it was soon found that it was much better to keep the companies at their stations all the year round, so that the battalion organization was superfluous. A battalion under a Lieut.-Colonel with Adjutant and Quartermaster was retained at Chatham, in St. Mary's Barracks, until 1892 when it was merged in the Service Battalion.

A Bridging Battalion under a field officer was formed at Aldershot and the Telegraph Divisions had a partial battalion organization under the officer commanding the Telegraph Division employed by the Post Office. In 1890 a Balloon Section was formed at Chatham; from 1891 this unit was stationed at Aldershot and in 1892 the Balloon Factory (which was officially designated the School of Ballooning until 1897) was moved from Chatham to Aldershot.

The formation of battalions for the Field and Fortress Companies was not found practicable. But the additional Lieut.-Colonels approved under this scheme made possible a much more complete organization of Commands into R.E. Sub-Districts and the Lieut.-Colonel R.E. in charge of a Sub-District became the commanding officer of any R.E. companies in his area. Where more than one company was stationed in a Sub-District, an acting adjutant was

allowed, and in some cases Warrant Officers or Quartermaster Serjeants were posted for military duties.

The proposal to have a special Depot Company for each Field Battalion was dropped in favour of sending all recruits for training at Chatham.

The term "Battalion" continued to be used in an indefinite sense in Army Estimates for several years after this date, but this did not mean that there was any real analogy between the organization of a group of Engineer companies and that of an Infantry battalion.

The terms of service recommended by the Committee were: enlistment for 3 years and 9 years in the Reserve for the Mounted branch, the Pontooniers and the Field Battalions; enlistment for 7 or 8 years with 5 or 4 in the Reserve for the remainder. This was accepted for the Drivers and Pontooniers, as these had little foreign service, but it was found impracticable to treat the Field Companies differently from the Fortress Companies, as the class of men required in both was identical and the balance of advantage lay in making the N.C.Os. and men of the Field units available for foreign service equally with those of the Fortress Companies. For further details see Chapter VIII.

The approval of this report was followed by a period of great activity in the Corps, additional officers were admitted, more recruits were obtained and as these were trained new units were formed. The Submarine Mining Service expanded very rapidly; a Commandant was appointed for the Eastern Battalion with headquarters at Singapore; commissions were given to a number of senior Warrant Officers in the Coast Battalion and arrangements were made to expand the Submarine Mining Militia and to form and train the Volunteer Submarine Mining Corps at the commercial ports.

The division of the Engineer Districts into Sub-Districts was applied to stations at home.

Meanwhile the two officers at headquarters who had carried through this reorganization completed their appointments. Sir Andrew Clarke was succeeded by Lieut.-General Lothian Nicholson and Sir John Stokes by Colonel Robert Grant.

One of the first jobs to fall to the lot of the new I.G.F. was the question of the improvement of barracks, and especially the reconstruction of the hutted camps at Aldershot, the Curragh and other stations, which were originally built just after the Crimean War. The whole question was investigated by a Parliamentary Commission on the Army Estimates for 1888, presided over by Lord Randolph

Churchill. General Nicholson gave evidence before this Commission in the most outspoken manner, and asked for a sum of £8,913,000 to put matters right.

One result of this inquiry was the passing of the Barrack Act of 1890 which authorized a loan of £4,100,000 for the reconstruction and improvement of barracks. A new branch of the I.G.F's. office under a Deputy I.G.F. was formed to deal with this expenditure. The details of this and subsequent loans are dealt with in Volume III, Chapter V.

It is noteworthy that though this additional work had not been provided for by Lord Sandhurst's Committee of 1886, no addition was made to the Establishment of the R.E. to provide for the twenty-five officers employed on loan work.

Another important step in the Engineer organization was reached about this time in a closer definition of the duties and relative responsibilities of the I.G.F. and the D.A.G., R.E. Before the formation of the Corps of Royal Engineers, in 1857, the Inspector-General of Fortifications, who was the direct successor of the older title of Chief Engineer of England, had been directly responsible for all engineering matters "as well as for all Corps attached to the Engineer Department of our Ordnance." On the abolition of the Board of Ordnance in 1857, the Inspector-General of Fortifications became similarly responsible to the Officer Commanding-in-Chief. In 1859 his duties were separated, the Inspector-General of Fortifications became responsible for Works Services to the Secretary of State for War, and the D.A.G., R.E. to the Officer Commanding-in-Chief, through the Adjutant-General, for the military administration of the Corps. This meant a real divorce of functions, for the Secretary of State in the War Office and the Officer Commanding-in-Chief in the Horse Guards at that time worked almost independently of one another. In 1870 the Commander-in-Chief and his staff were moved to the War Office and were definitely placed under the general control of the Secretary of State. But for many years the relative position and duties of the two senior officers of the Royal Engineers was the subject of discussion until, in 1886, it was decided that the Inspector-General of Fortifications was the official head of the Corps, and when Lieut.-General Lothian Nicholson took over the duties in 1886, he was appointed "Inspector-General of Fortifications and Director of Works and also Inspector-General of Royal Engineers." For further details see Volume III, Chapter I, and Chapter X of this volume.

The D.A.G., R.E. remained responsible for the military duties, discipline, military training, recruiting, organization and equipment of units and the drafting of officers and men. But on the posting and distribution of officers to stations he had to consult the I.G.F., and the latter was also responsible for the pattern and supply of technical equipment.

Before this question was finally settled, one more Committee was assembled in 1891. It was composed of the General Sir Lothian Nicholson, I.G. Fortifications; Major-General R. Grant, D.A.G., R.E.; Major-General R. Dawson Scott, Commandant S.M.E.; and Captain F. G. Bowles, R.E., was the Secretary. This committee reviewed the whole of the R.E. organization, not only at headquarters but in the commands. In order to decentralize work, new Queen's Regulations had been issued in 1885 throwing increased responsibility on the General Officers Commanding Districts and this produced a certain amount of friction between these officers and their Engineer advisers. It is always difficult to bring expenditure on building work within the limits of funds voted annually by Parliament without incurring liabilities which will affect the expenditure in future years. All services which must be spread over several years thus require the special approval of Parliament. Also, as the funds available for repairs and maintenance are seldom sufficient to carry out all the work required, it is a definite instruction to all commands that such funds may not be diverted to new services, however desirable. In Queen's Regulations, 1889, the staff of a G.O.C. was divided under three heads: (*a*) Discipline and training, (*b*) Supply, transport, movement, quartering, (*c*) Engineer Services; and it was laid down that the District Commanding Royal Engineer was a staff officer of the G.O.C. and the head of the Engineer Services branch.

The Senior Engineer Officer in a command was therefore responsible for bringing such financial restrictions to the notice of the General Officer Commanding. On this point most of the General Officers Commanding Districts were called on to give evidence before the Committee, headed by General Sir Evelyn Wood, then commanding at Aldershot.

In the result the principle that the War Office must maintain a control on the expenditure was confirmed, but various alterations were made in the Regulations to define the relative responsibility of the different officers.

While the organization was thus developing, an important advance

was being made in coast defence. In 1886 a series of operations was carried out at Milford Haven. This port was put in a state of defence, according to the prevailing standard, a minefield was laid, protected by a boom with a defence of guns and electric lights. It was attacked by a strong Naval force composed of the Channel Squadron with additional small craft. The operations were very interesting and are described in Chapter III, *History of Submarine Mining*. The main lesson learnt was the necessity of establishing a proper system of command at each defended port and of practising all the different arms in working together. Stress was also laid on the importance of developing the system of electric-light defence. Further details as to how these recommendations affected the system of coast defence are given in Chapter XI of this volume.

As a result of these operations, Lord Wolseley, the Adjutant General at Headquarters, addressed a minute to the Secretary of State, Mr. W. H. Smith, in which he advocated the separation of the Garrison Artillery from the Field Artillery and that the Garrison Artillery should take over the charge of the submarine mines and electric lights. A special committee was appointed in December, 1886, under the presidency of Lieut.-General Sir A. Alison, Commanding at Aldershot. It included the Inspector-General of Fortifications, Lieut.-General Nicholson; the Inspector-General of Artillery, Major-General Goodenough; the G.O.C. Chatham, Major-General Hon. R. Monck, and the G.O.C., Devonport, Major-General T. C. Lyons, who had been in command of the defence at Milford Haven. This Committee reported that the Submarine Mining defences should remain with the Royal Engineers, giving as their reason that it would be impracticable to provide one body of men who would be equally fit to undertake at any moment the duties of Garrison Artillery or Submarine Mining.

The operations at Milford Haven were followed by a smaller series at Langston Harbour, near Portsmouth, and this again by a valuable series of experiments with electric lights at the Needles entrance, one result of which was a recommendation for a large increase at all ports in the anti-torpedo boat defence of Q.F. guns and electric lights.

This produced another Committee. In 1890 Mr. E. Stanhope, who in 1887 had succeeded Mr. W. H. Smith as Secretary of State for War, revived the proposal for the formation of a Coast Defence Corps, to be formed by an amalgamation of the Garrison Artillery and the R.E. employed on defence work. The Commander-in-

Chief, H.R.H. the Duke of Cambridge, dissented from this proposal.

The whole question of the organization of Coast Defences was then considered by a very strong Committee, of which the Rt. Hon. E. Stanhope was Chairman. The members were Field-Marshal H.R.H. the Duke of Cambridge, the Rt. Hon. Lord Brownlow, the Rt. Hon. Lord Sandhurst, Lieut.-General Sir William F. D. Jervois, R.E., Major-General E. F. Chapman, R.A., Major-General Goldsworthy, M.P., Mr. G. C. T. Bartley, M.P. The Secretaries were Major R. M. Ruck, R.E., and Captain W. St. P. Bunbury, R.A. In the final report the Committee rejected the proposal to form a Coast Defence Corps on the ground that it would involve very serious interference with the work and traditions of existing Corps, and would probably prove unattractive for this reason to both officers and men. On the question of the control of electric lights the Committee was equally divided, four members, headed by Mr. Stanhope, recommending the transfer of the charge of all electric lights to the Garrison Artillery, while four members, headed by the Duke of Cambridge, "could see no sufficient evidence why the Royal Engineers should be relieved of this duty."

On the question of Submarine Mining five members thought that it should form part of the duties of the Garrison Artillery, but that the change would take some years to effect. Three members, the Duke of Cambridge, Lord Sandhurst and Sir W. Jervois, signed a minority report protesting against this paragraph as useless, as no action was recommended. They concluded with a terse sentence which really sums up the labours of this and the previous Committees, "It is submitted that the true solution of the problem before the Committee is to be found in a well-organized system of command, and in the necessary improvement of existing departments, and not in disturbing the most efficient parts of our present organization."

The steady increase in the numbers of the Submarine Mining Service had thrown a heavy strain on the School of Submarine Mining at Gillingham, so in 1892 two new schools of instruction were started at Portsmouth and Plymouth, in each case the staff of the School being also responsible for the mining and electric-light defence.

Meanwhile the Field units of the Royal Engineers had continued to develop. For the Field Companies the most useful innovation was the invention of the R.E. Toolcart to carry tools in the field. This form of cart was first designed by Captain J. C. Tyler, R.E.,

based on his experience in the Egyptian campaign. It was on the same principle as the field gun, of two two-wheeled vehicles hooked together. This gave great flexibility and enabled the vehicle to be taken across country. Details of the cart were altered, but the principle remained up till the time of the introduction of mechanical transport and was adopted to other vehicles not only for the R.E. but for the general use of the Army.

There was also during this period and up to the outbreak of the war in South Africa a continual improvement not only in the patterns of all R.E. equipment but in the methods of using it. Some details are given in Chapter XIII of this volume. In addition to the regular work of the R.E. in the development and construction of fortifications and barracks and the Field units, there were continual demands for officers and men for other duties. Although the expeditionary force had been withdrawn from Egypt, a considerable body of officers remained attached to the Egyptian Army, whose work is described in Volume III, Chapter III. This was, however, only a part of a larger problem, the development of Africa. In 1885 this was fairly known as the "dark Continent." Fifteen years later nearly the whole had been opened up and various European nations had established at least zones of interest if not settled governments. In the development of the portions controlled by the British Empire, the Royal Engineers had an honourable share.

In 1898 developments in China led to increased interests in that country, in the extension of our settlement at Hong Kong and the occupation and fortification of Wei-hai-wei. Some account of these various operations are given in Chapters V, VI and VII of this volume.

In 1895 a new Fortress Company, the 43rd, was raised and divided between Mauritius and St. Helena; in 1889 the 44th Fortress Company was raised and embarked the following year for Wei-hai-wei and Esquimalt; and in 1900 the last of the Submarine Mining Companies, the 48th, was formed for service at Esquimalt in place of a detachment of Royal Marines.

In 1897 the Auxiliary Forces of the Royal Engineers received an important addition in the formation of the Corps of Electrical Engineers with headquarters in London. (*History of Submarine Mining*, Chapter IX.) This Corps was formed to assist in the working of defence electric lights in home ports, but rendered valuable assistance in the field in South Africa and during the Great War.

Although details of the work of the Royal Engineers in India

do not fall within the scope of this volume, the fact that the Corps had to maintain a large body of officers in India, had a very important bearing on many questions, such as the supply of officers, their early training and their periodical relief. The importance of this last consideration increased very much during the period covered by this chapter. At the beginning—in 1885—the majority of R.E. officers in India voluntarily undertook permanent service in that country, though there were always some who for health or other reasons, reverted to the British service after a tour in India. But ten years later, the conditions of pay and service ceased to attract and gradually officers had to be detailed for service in India just as they were for other stations abroad, until in 1902 the system of volunteering was stopped and all officers became liable to take a term of service in India. The number employed in India was then 380 which, added to the 150 employed in the Colonies and coaling stations, meant that more than half the total number of officers of the Corps were serving abroad.

Further, the Army in India was more dependent on the services of the Royal Engineers than at home. In this country, in emergency, help can be obtained from retired officers or civilian sources to replace Engineer officers taken for active service. In India such sources of help were much more limited and not only were the R.E. responsible for military works such as barracks, frontier roads and defences, but a number of R.E. were employed on Public Works, the Indian Railway and Survey. Such officers formed a general reserve for the Field Army.

It is noteworthy that in all the many Committees and Reports on the organization of the R.E. up to this date the responsibility for the supply of trained Engineers for India is seldom mentioned and was certainly not sufficiently appreciated.

In 1891 Sir Lothian Nicholson was appointed Governor of Gibraltar and was succeeded as Inspector-General of Fortifications by Major-General Robert Grant, the D.A.G., R.E., who was given the temporary rank of Lieut.-General while holding the appointment, which he retained for seven years. He was succeeded as D.A.G. by Major-General J. M. H. Maitland who was followed in 1896 by Major-General W. Salmond.

Although no spectacular change occurred during General Grant's term, the Corps, and indeed the whole Army, developed in every branch during his long tenure of office. He was thoroughly trusted by his superiors and subordinates and keenly interested in all sides

of Engineer work. As President of the Colonial Defence Committee he was responsible for the defences of our coaling stations, most of which were completed during his tenure of office. He received a special letter of thanks from the Secretary of State for the Colonies when he relinquished this appointment in 1898 ; see the biographical notice in Volume III, page 365. He was succeeded by General Sir Richard Harrison who held the appointment till the end of the South African War.

In 1895 H.R.H. the Duke of Cambridge resigned the appointment of Commander-in-Chief and was succeeded by Viscount Wolseley. The Duke had been Colonel-in-Chief of the Corps of Royal Engineers since 1868 and retained this Colonelcy till his death in 1904. During his long tenure at the War Office he had been a good friend of the Corps, in which he took a great interest. He always enjoyed his visits of inspection to Chatham and followed closely the developments of new forms of engineering.

In 1895, on the appointment of Lord Wolseley as Commander-in-Chief, the responsibility of this office was reduced and the work of the War Office was divided between four senior officers, the Adjutant-General, the Quartermaster-General, the Inspector-General of Fortifications and the Inspector-General of Ordnance. The last was a new appointment which included the control of Artillery and Ordnance Services. The title of this appointment was changed to Director-General of Ordnance in 1899. Each of these four great officers reported direct to the Secretary of State.

In 1896, in order to obtain room for new Naval Barracks at Chatham, the Admiralty proposed that they should take over St. Mary's Barracks and part of the digging ground. This was agreed to, provided the Admiralty would reprovide the accommodation for the Electrical School and other establishments then in St. Mary's Barracks.

The end of the century was noteworthy for the advance of the Egyptian Army up the Nile under the command of the Sirdar, Sir Herbert Kitchener. This advance commenced in 1896 and was completed in 1898. The Egyptian Army was assisted by a brigade from India and two brigades of British troops. There was a large contingent of Royal Engineers for the control of railways and other duties. The operations, which resulted in the smashing of the Mahdi, were completely successful. They are described in full in Volume III, Chapter III, and in *The Royal Engineers in Egypt and the Sudan* by Lieut.-Colonel E. W. C. Sandes.

When the South African War broke out in 1899, the R.E. at home were fully organized with Field units sufficient for one Cavalry Division and two Army Corps. Each Army Corps was composed of three Infantry divisions each with two brigades of Infantry. In addition there were Telegraph and Railway units and Fortress Companies for the Line of Communications. It is interesting to note the number and nature of the R.E. units and the organization which had developed up to this time and which was put into use for the first time during this campaign.

At the headquarters of the Army there was a Chief Engineer with the rank of Major-General, with a staff officer and an A.D.C.; with the Cavalry Division there was a Field Troop; with each Infantry Division, a Lieut.-Colonel as Commanding Royal Engineer with one Field Company; with the Army troops there was a Lieut.-Colonel as C.R.E. with one Bridging Troop, a Telegraph Division, a Balloon Section, a Field Company and a Field Park. On the Line of Communications there was a Director of Railways and a Director of Telegraphs.

In addition to the above, which embarked with the Army Corps, there was the garrison at the Cape. This included one Fortress Company, 29th, and two unattached R.E. officers, under Colonel W. G. Morris, Chief Engineer, who became Chief Engineer, Line of Communications. There was a sub-district in Natal under a Lieut.-Colonel with one officer. This small body of Engineers was reinforced a little before the outbreak of war by the 7th Field and 8th Railway Companies, which were detailed for Cape Colony, and by the 23rd Field Company, a section of the Telegraph Battalion and the 2nd Balloon Section which joined the force in Natal and were later besieged in Ladysmith. The single Balloon Section which had hitherto been maintained at Aldershot had been expanded into two sections.

The troops in Ladysmith were subsequently organized as the 4th Division and seven additional divisions sent out from England had each the same Engineer organization as above.

The Royal Engineers for the Line of Communications were reinforced by four Fortress Companies mainly employed on railway work and two more Fortress Companies were subsequently added. There were also further units for Balloon, Telegraph, Railway and Survey work and for Steam Transport, the latter a recent development. Other units were added until in June, 1900, the total of the Corps serving in South Africa had reached a strength of 212 officers

and 4,490 men, in addition to detachments from Militia and Volunteer units, which in May, 1901, reached a total of 49 officers and 1,020 men.

A full account of the war is given in Volume III, Chapter IV.

As the Army at home was denuded of Engineers, additional units were formed. These included two Pontoon Troops, eight Field Companies, two Field Parks, four Balloon Sections, a Telegraph division, five Fortress Companies and a Railway Company. The formation of these units increased the Corps by 65 officers and 1,970 men, making the total establishment in 1902 1,028 officers and 9,110 other ranks.

For works services at home thirty-seven special officers were appointed under the title of Acting Engineers.

On the conclusion of the South African War, many of the additional companies were disbanded.

Meanwhile in spite of the heavy drain for officers and men all the other industries of the R.E. had been carried on. It had been found necessary to strengthen the Coast Defences by the addition of electric lights for which men had to be trained. This is dealt with in a later chapter.

In 1900 Lord Roberts was appointed Commander-in-Chief in succession to Lord Wolseley, leaving Lord Kitchener in command of the Army in South Africa.

On the appointment of Lord Roberts, the arrangement of duties at the War Office was again modified. The Commander-in-Chief took *control* of the branches of Adjutant-General, Director of Intelligence and Mobilization and the Military Secretary, but he *supervised* the Quartermaster-General, Inspector-General of Fortifications, Director-General of Ordnance and Director-General of the Army Medical Service. The last four officers retained their right of direct access to the Secretary of State.

In 1902, Major-General W. Salmond, who had completed six years in the appointment as D.A.G., R.E., was succeeded by Colonel R. C. Maxwell and at the same time the status of the appointment was reduced to that of A.A.G. This was the last change in the R.E. organization of what may fairly be called the great period of growth of the Corps, a period during which it had increased in numbers and efficiency and had proved its usefulness not only in the arts of war but in the less spectacular works of peace.

CHAPTER II

NARRATIVE 1902 TO 1906

End of South African War—Position in 1902—Esher Committee on the construction of barracks by R.E.—Reorganization of Army by Mr. Brodrick—Army Corps Commands—Major-General W. T. Shone appointed I.G.F.—Criticism of Army Corps system—Mr. Arnold Foster appointed Secretary of State for War—Committee of Three—Committee of Imperial Defence—Army Council—I.G.F. abolished—Director of Fortifications and Works—Inspector-General—Inspector of R.E.—D.A.A.G., R.E. abolished—New branch under Q.M.G. for railways—Secretary Mechanical Transport Committee—Colonel Sir G. Clarke, Secretary Imperial Defence Committee—Colonial Defence Committee retained—New Organization for Home Army—Seven Commands—Officers in charge of Administration—Chief Engineers to advise General Staff—Grouping of Coast Defence Commands—Grouping of depots—O.C. Records appointed to command Depot at Chatham—R.E. organization as affected by above changes—Work in War Office—Influence of Secretary of State—Submarine Mining Service abolished—R.E. in charge of Electric-Light Defences—Owen Committee—Admiralty claim all R.E. barracks at Chatham—Franklyn Committee on R.E.—New proposal for Reserve Officers—Appointment of Evelyn Wood Committee—New Director of Barrack Construction—Death of H.R.H. Duke of Cambridge—H.M. King Edward VII becomes Colonel-in-Chief—Mr. R. B. Haldane becomes Secretary of State for War—Summary of changes.

This chapter links up with Vol. III, Chaps. I and IV, and *History of Submarine Mining*, Chaps. IV and V.

At the conclusion of the South African War in 1902, the Corps of Royal Engineers had reached a peak as regards expansion and usefulness. The British Army had just completed successfully the largest war in which it had ever been engaged, lasting over two and a half years with a quarter of a million men in the field. During the war the Royal Engineers had developed in every branch and during the last twelve months of the war had designed and carried out a system of blockhouses and barbed-wire barriers which had been instrumental in bringing the fighting to a conclusion. They had taken over from the enemy, repaired, organized and run about 1,400 miles of railway and the telegraph system of two large countries, the Orange Free State and the Transvaal.

After the war there was necessarily a period of contraction and reduction of units, but it was unfortunate that this was combined with a reconstruction of the War Office and Army generally, during which the fine organization of the Royal Engineers built up during the previous twenty years by a series of experienced officers was pulled to pieces and put together again in a form which proved distinctly less efficient. An attempt is made in this chapter to show how it was done and why, leaving to the subsequent chapters the story of how the organization was gradually built up again to the form in which the Corps entered on the Great War.

The position in May, 1902, may be briefly recapitulated.

At the War Office the Corps was controlled by General Sir Richard Harrison, one of the most popular and most trusted officers of the Army, assisted by a very competent staff. In addition to his duties as Inspector-General of Fortifications and Inspector of Royal Engineer units, he was a member of the Army Board and the adviser of the Secretary of State and the Commander-in-Chief on all questions affecting engineer work or duties. He was an *ex-officio* member of the Defence (Naval and Military) Committee and President of the Colonial Defence Committee. In short, the I.G.F. was the head of an organization which was a branch of the General Staff of the Army dealing with all the problems of the defence of the Empire.

In addition to the I.G.F. there was a branch of the Adjutant-General's office under a Major-General R.E. who was responsible for all questions of personnel affecting the Corps and also the organization and equipment of R.E. Field units.

The R.E. were also in touch with all other branches of the War Office by representation on various committees. They had established a system of financial control and delegation of duties to the Commands and Districts, which was later commended by the Esher Committee.

Outside the War Office, there was in each Command, District or Colonial Garrison, a Commanding Royal Engineer with the rank of Colonel or Lieut.-Colonel, who was a staff officer of the General Officer Commanding for all Engineer questions.

Further details of this organization will be found in Volume III, Chapter I, and in Chapter X of this volume.

In 1902 the question of the employment of Royal Engineers in the construction and maintenance of barracks was again brought to the front and a special Committee was formed to investigate. The general question is discussed in Chapter XII of this volume, but as

the report of this Committee led later to rather large changes in the organization of the Royal Engineers it may be considered here. The members of the Committee were Viscount Esher, then Secretary of the Office of Works, Major-General E. P. Leach, V.C., R.E., and Mr. J. Macvicar Anderson, F.R.I.B.A. Mr. J. M. Bull was Secretary. They were (1) To consider the present system of construction and maintenance of barracks under the Royal Engineers and to report whether they should not be relieved of barrack work. (2) To suggest the manner in which the construction and maintenance of barracks should be carried out if the officers of the R.E. were relieved thereof. The Committee held a number of meetings and examined thirty-eight witnesses. Evidence as to the work done under the Loan Acts was given by Colonel C. M. Watson, Deputy Inspector-General of Fortifications in charge of loan work. His evidence covered much of the detail given in Volume III, Chapter V. Among other matters he pointed out that the Army had increased by 60,000 men in the previous four years without any increase in the R.E. except for war purposes and that with 200 R.E. officers employed in South Africa there was necessarily a shortage of officers for other duties. He was examined at considerable length as to the inconvenience and probable loss of withdrawing the R.E. officer in charge in the middle of a contract, owing to the requirements of foreign service or military duties. In reply he explained the steps he had taken in concert with the D.A.G., R.E., to retain officers employed on loan works for a definite term of years. He stated that the total number of officers solely employed on such work was twenty-four, of whom six were at the War Office.

In their report, the Committee criticized the existing system but not the way in which the R.E. had done the work and they agreed with the opinion expressed by nearly all the witnesses examined that the work connected with the construction and repair of barracks gave a training to the officers and men which was very valuable in war.

They recommended that part of the building work, that connected with the larger new barrack services, should be transferred to a new department which should in the main be permanent and civilian. The department of the I.G.F. should be reorganized accordingly. The head of the new department was to be a senior officer (presumably drawn from the Royal Engineers), not under the rank of Major-General, appointed for five years. Under him there should be a staff of four architects and forty-seven subordinate officers. Of these, two of the architects and not more than one quarter

of the subordinate posts might be filled by R.E officers. All officers to be appointed to London and to be detailed to work by the Director in the Central Office, whether in the Home Commands or at foreign stations. The work to be allotted to the new department was to include all loan work, and all new services in the Annual Estimates of £500 and over. All land services were to be put under the new Director of Works. The Inspector of Fortifications was to continue to be responsible for all fortification work, army ordnance buildings, all periodical painting, all repairs to barracks, and minor new barrack services under £500 for any one service.

Major-General Leach in a minority report dissented from the paragraphs of the report which criticized the work of the R.E. and suggested that if the R.E. were overworked and unable to attend to their military duties, the remedy was an increase in their establishment or preferably the employment of retired R.E. officers or civil engineers holding Militia Commissions. He suggested that if a department should be formed under a Director of Works, the latter should remain under the control of the I.G.F. No action was taken on this report and it was eventually absorbed into the other changes introduced in 1904.

Towards the end of 1902, when Mr. Brodrick was Secretary of State for War and Lord Roberts was Commander-in-Chief at the War Office, a reorganization was carried out of the eleven districts at home which were grouped to form what were called Army Corps Commands. There were eventually to be six such Commands, of which only three were formed in the first place : the I Army Corps had its headquarters at Aldershot and comprised the troops in the old Aldershot district ; the II Army Corps, with headquarters at Salisbury, included the old Eastern, Thames, Woolwich, South Eastern, Western and Salisbury Plain districts ; the Irish Command formed the III Army Corps. The rank of C.R.E. at Aldershot was raised to that of Major-General and the appointment was given to Major-General Sir Elliot Wood who had been C.R.E. in South Africa. A new appointment of a C.R.E. with the rank of Major-General was made for the Southern Command and the appointment was given to Major-General D. A. Scott. The Chief Engineer in Ireland retained his rank as Colonel.

On 1st April, 1903, this scheme was modified, the IV Army Corps area was formed to include the Eastern, South Eastern, Woolwich, Home (London) and Thames districts, with headquarters in London, and the headquarters of the V and VI Army Corps were fixed at York and Edinburgh.

Colonel G. Barker from C.R.E Eastern district, became C.R.E. IV Army Corps. The remaining Colonels' appointments were unaltered. This reorganization of the Army was a definite step forward. By grouping some of the Districts in England into larger Commands, it relieved the War Office of detail. At the same time the headquarters of Commands, many of which had been situated in the Coast Fortresses, were removed to centres which were better adapted to control the training of the Field Armies. This enabled the Coast Fortresses to be organized with a view to their work in war.*

In April, 1903, General Sir Richard Harrison completed his period of service in his appointment as I.G.F. and was succeeded by Major-General W. T. Shone, who had a distinguished record in India both as a soldier and as an administrator, and it seemed as if under his leadership the Corps would have before it a further period of useful service.

But other influences were at work. The organization under Mr. Brodrick and Lord Roberts had had a " bad Press." It was attacked for not being sufficiently drastic in remedying admitted defects which had become apparent during the South African War. Some critics claimed that an Army Corps system was unsuited to the conditions of the Empire and that the use of such a term was due to an attempt to copy the military organizations of foreign countries based on compulsory service.† Also a large section of the Liberal party, which was then in opposition, was clamouring for a drastic reduction in the amount of the Army Estimates.‡

Two other trains of thought also contributed to complicate the problem. One of these was a perfectly reasonable desire to improve the organization at the head of the Army, and to develop a General Staff on the German model to think out military problems and to prepare and train the Army according to its probable work. The

* This alteration and many details of the arrangements for the Command of Coast Fortresses and of the organization of troops at home; followed closely the proposals made in an essay by Captain W. Baker Brown, R.E., which was successful in gaining the Gold Medal of the R.U.S.I. in 1899.

† Although the alterations referred to affected primarily the reorganization of the whole Army and the War Office, they had such a drastic effect on the organization and work of the Corps that a short, general review of the changes made and proposed seems necessary before describing how they affected the R.E.

‡ Autobiography of Richard Burdon Haldane, afterwards Secretary of State for War.

other was a political question, to put the whole control of the Army under the Secretary of State representing the Cabinet.

This latter had been a subject of contention for many generations. During the long tenure of the appointment of Commander-in-Chief by H.R.H. the Duke of Cambridge, the question had often been raised, and a workable compromise had been arrived at.

When, in 1895, Lord Wolseley was appointed Commander-in-Chief a change was made in the position of this officer, and the heads of the four principal branches of the War Office, among whom was the I.G.F., reported direct to the Secretary of State. But when Lord Roberts was appointed C.-in-C., in 1900, a change was made in the reverse direction. Lord Roberts had spent most of his service in India, where the Commander-in-Chief was the recognized head of the Army, so that on assuming the Home Command he got the Adjutant-General and Director of Military Intelligence placed under his control. This change was not approved by some students of military affairs in this country.

These various lines of criticism came to a head in October, 1903, when Mr. A. J. Balfour, who was then Prime Minister, in carrying out a reconstruction of his Cabinet, transferred Mr. Brodrick to the Indian Office and appointed Mr. Arnold-Foster as Secretary of State for War in his place. At the same time Mr. Balfour appointed a Committee of Three to prepare a scheme for the reconstitution of the War Office. The members of this Committee were Lord Esher, Rear-Admiral J. A. Fisher, R.N., then Naval C.-in-C. at Portsmouth, and Colonel Sir George Sydenham Clarke (late R.E.) who was at the time Governor of Victoria. Colonel G. F. Ellison was Secretary of the Committee. It was desired to prepare a scheme and to carry out any necessary changes of personnel at the War Office before Parliament met on 15th February, 1904, and as Sir George Clarke did not arrive in England till December, 1903, the work had to be done quickly. The Committee began at the top and their first reports, which were dated 11th January, 1904, dealt with the formation of the Defence Committee and an Army Council.

Joint Naval and Military Committees on defence questions had been constantly assembled in the past and in 1892 a standing Naval and Military Defence Committee had been formed, of which the heads of the Admiralty and War Office were members. But this Committee only dealt with the arrangement for our coast defences at home and abroad.

In 1900, realizing the necessity of co-ordinating the work of the War Office and Admiralty and of ensuring that they were working

in agreement with the general policy of the Government, a Committee of the Cabinet was formed of which the Duke of Devonshire was President and the Prime Minister (Mr. Balfour), the Secretary of State for War (Mr. Brodrick), and the First Lord of the Admiralty (Lord Selborne) were members.

In 1902, on the initiative of Lord Selborne and Mr. Brodrick, this Committee was expanded by absorbing the Joint Naval and Military Committee into a Committee of Defence for the Empire, of which the Duke of Devonshire remained President. The Duke also became the President of the Colonial Defence Committee. The War Office representatives on the main Committee were Lord Roberts, the Commander-in-Chief, and Major-General Sir William Nicholson, the Director of Military Intelligence. The I.G.F. ceased to be a member of this Committee but the D.I.G.F. remained Secretary.

The Esher Committee took this Committee as their starting point, but recommended that the Prime Minister should be *ex-officio* President and that there should be a permanent Secretariat with representatives of the Admiralty, War Office, India and the Colonies. They recommended the Colonial Defence Committee should be absorbed in the new Defence Committee.

The proposals for the Army Council were, in accordance with the terms of reference, to follow the Admiralty system of higher administration, that is, control by a civilian head who would be a member of the Cabinet, assisted by a Board of Officers representing the various branches of the Service. The acceptance of this principle involved the abolition of the office of Commander-in-Chief and the distribution of his responsibilities and duties partly on to the Secretary of State and partly on to the senior member of the Council who was to be called Chief of the General Staff.

In fixing the numbers of the Army Council, the Committee followed the practice of the Admiralty and recommended four Military and two Civil members in addition to the Secretary of State as Chairman, and a Permanent Secretary.

It seems permissible to suggest that in taking the Admiralty organization as a fixed guide, the Committee were making difficulties for themselves and for future Army Administrators, a criticism which has been justified by the many changes in Army organization and control which have been made since 1904.

Up to the time of the South African War, the work at Headquarters had been controlled by five branches under the Commander-in-Chief, Adjutant-General, Quartermaster-General, Inspector-

General of Fortifications, and the Director-General of Ordnance. These five were the Military members of the Army Board.

By accepting the Admiralty figure of four members it became necessary to abolish one of the three administrative heads and the appointment of I.G.F. was selected for reduction. At the same time the administrative duties of the Army were divided into two groups, without regard to the Corps which handled them, the Q.M.G. taking, in addition to duties carried out by A.S.C., the control of the Army Ordnance Department as far as it concerned the supply and storage of arms and equipment, the control of barrack policy and the movement of troops and stores by rail and sea. This latter involved the formation of a new Directorate under the title of Director of Movements and Quartering, which was staffed partly from the R.E.

The remaining administrative services were grouped under the fourth member for whom the title of Master-General of the Ordnance was revived. This branch was divided between two Directors, the Director of Artillery, who was responsible for the pattern and manufacture of guns, arms, vehicles and all other technical equipment, and the Director of Fortifications and Works who was responsible for fortifications, barracks, hospitals, army ordnance buildings, rifle ranges, training grounds, and the pattern and supply of special engineer equipment.

The work of the Royal Engineers was to be further reduced by the formation of a new Directorate for Barrack Construction which was to be placed under the Under Secretary of State in accordance with the recommendations of Lord Esher's Committee of 1902.

In connexion with the general reorganization the Committee recommended two changes which were of considerable importance. In the first place they adopted the principle of the "clean sweep," that is, that in addition to the C.-in-C. all the heads of branches and services were to be called on to resign, so that the new régime would start, not only with an entirely new Council, but also with new Directors. The second point was a decision that none of the Directors at the War Office or the heads of technical services in the Commands should hold rank higher than that of Colonel. The full effect of this latter decision does not seem to have been realized. The actual rank held by the head of a branch does not affect his efficiency, but under the system of compulsory retirement adopted for the Army, mainly in the interests of the promotion in the junior ranks, an officer of the rank of Colonel must retire at the age of 57 and no exceptions are allowed to this rule. The effect was that no

officer whose age exceeded 57 could be employed in the Army on any service of a technical nature. Such a decision was contrary to the practice in all Government departments and to the experience of civil life, where experts such as architects, engineers or accountants are still regarded as leaders in their profession for many years after the age of 60.

This decision was relaxed only in the case of the Army Medical Service, in which the head of the service at the War Office and the senior Medical Officers in the larger Commands were granted General's rank.

On the 18th January, 1904, the Committee issued their third report dealing with the appointment of an Inspector-General who was to be independent of the Army Council and was to be assisted by Inspectors for the various arms, among whom was an Inspector of Engineers with the rank of Colonel.

These recommendations were adopted by the Government and the first Army Council was appointed on the 6th February, 1904. Some little time elapsed before the various subordinate appointments were made, but eventually the parts of the organization which affected the R.E. took the following form :—

The first Inspector of Royal Engineers was Colonel G. Barker, formerly Chief Engineer IV Army Corps Command. The first Director of Fortifications and Works was Colonel R. M. Ruck, who had been for many years at the War Office as Assistant Inspector and Inspector of Submarine Defences, and had rejoined the War Office in 1902 as Deputy Inspector-General of Fortifications. The appointment as Assistant Adjutant-General, R.E., was retained by Colonel R. C. Maxwell. The first Director of Movements and Quartering was Colonel H. M. Lawson.

The branch for Military Intelligence, which was largely officered by the R.E. and had reached a high standard of efficiency under Major-General Sir J. C. Ardagh and Lieut.-General Sir W. G. Nicholson, both officers of the R.E., was transferred to the General Staff, with little alteration, as the Directorate of Operations and Military Intelligence. But in accordance with the decision referred to above, Sir W. Nicholson was removed to the half-pay list and his place was taken by another officer.

The new office of the Director of Fortifications and Works was organized in five branches, three under Assistant Directors who were graded as Colonels, and two smaller branches under the Inspector of Submarine Mining and the Inspector of Iron Structures. The appointments held by Lieut.-Colonels under the title of Assistant

Inspector-Generals were abolished. The number of appointments for junior ranks was limited to five Staff Captains but a few additional R.E. officers were employed as necessary.

The appointment of D.A.A.G. under the Assistant Adjutant-General was abolished in 1905, part of his work being transferred to an officer in charge of R.E. Records at Chatham and the work connected with the equipment of Field units being transferred to the D.F.W.

The new Directorate of Movements and Quarterings developed a new branch for the supervision of all questions connected with railways. This was officered by the R.E. There was also under the Q.M.G. a Mechanical Transport Committee of which the Secretary was a R.E. officer.

The Imperial Defence Committee was enlarged and rearranged and Colonel Sir George Sydenham Clarke was appointed the first Secretary. The Colonial Defence Committee was not abolished but was retained as a sub-Committee of the Committee of Imperial Defence with Major J. E. Clauson, R.E., as Secretary.

In subsequent reports during February and March, 1904, the Esher Committee elaborated their proposals for the organization of the Army outside the War Office. These were, however, very much modified in practice and were altered again in 1906 by Mr. Haldane. Some points which affected the R.E. may be referred to here.

For the organization of the troops in the United Kingdoms the Committee followed the arrangement of large Commands, initiated by Mr. Brodrick, but considered that the only Army Corps organization required was that at Aldershot and that all other troops should be organized by divisions and brigades only. The remainder of the country outside the Army Corps area was to be divided into four large Commands, each Command being again subdivided into two administrative Districts.

This scheme was considerably modified and the United Kingdom was finally divided into seven Commands, four large—Aldershot, Southern (Salisbury), Eastern (London) and Ireland—and three smaller Commands—Northern (York), Welsh and Midland (Chester) and Scotland (Edinburgh). London was made a self-contained District. This scheme took effect from 6th January, 1905.

In April, 1905, the C.R.E. of each Command was called Chief Engineer. In the autumn of this year the Major-Generals, R.E., at Aldershot and Salisbury were replaced by Colonels. When the rank of Brigadier-General was introduced in September, 1905, this

rank was given to the Chief Engineers of the four larger Commands.

A new departure in Army organization was made by the appointment in January, 1905, of a senior officer in charge of Administration in each command, this officer had the rank of Major-General in the four larger Commands and the rank of Brigadier-General in the three smaller. A Major-General in charge of Administration was appointed for South Africa, but no similar appointment was made in any other Command abroad.

This change followed the recommendation of the Esher Committee that the G.O.C.-in-C. of Commands should be relieved of administrative details. Under this scheme the Officer in charge of Administration became the head of the Administrative Services in a Command and also controlled the A.G. and Q.M.G. staffs. One of the important duties of the Officer i/c Administration was the control of finance on which he corresponded direct with the War Office. He thus took general control of the funds allotted for Engineer Services, though in practice all such funds were placed at the disposal of the Chief Engineer. On the other hand the fact that a senior officer was always available for reference and that the system brought all the heads of Services in daily contact proved distinctly beneficial. As the Chief Engineer has important duties in advising the General Staff on training in Engineer work and such services as the provision of rifle ranges and training grounds, it was decided that the Chief Engineer of a Command should act as technical adviser of the General Staff and should have direct access to the G.O.C.-in-C. if he wished to bring any question to his notice.

As the Administrative Generals were necessarily drawn mainly from officers of experience in the Administrative Services, the new arrangement opened new opportunities for senior R.E. officers (see Volume III, Chapter VII).

Under the G.O.C.-in-C. of the Commands the Cavalry, Field Artillery and Infantry of the regular Army were grouped into their fighting formations and formed one Cavalry and eight Infantry Divisions. Each Infantry Division included two Infantry Brigades of four battalions each, with Cavalry, Artillery and Engineers. The first three divisions had their headquarters at Aldershot, the remainder were centred at Tidworth, Dover, Colchester, Curragh, Cork and in Scotland.

A new organization was introduced for the Coast Defence of the British Isles, the whole of the coastline being divided into eleven Coast Defence areas, each area being centred on one of the defended ports. The Coast Defence Commanders reported direct to the

G.O.C.-in-C. of their Command on the same footing as the General Officers Commanding Divisions.

It was decided that the Commanders of these areas would be drawn exclusively from the R.A. and R.E. and though no definite allotment was made between the two Corps, in practice the distribution remained the same until 1914. The areas were grouped in three classes, in the first class were Portsmouth, which included Weymouth defences, Plymouth, which included Falmouth defences, and the Thames and Medway defences which included Gravesend and Sheerness with headquarters at Chatham. These three areas were Major-Generals' commands. In the second class were the defended areas centred round Dover, Pembroke Dock, Cork including Berehaven and the Scottish defences. The Commander of these was given the rank of Brigadier-General. The third class included the defences centred at Harwich, the Tyne, including Tees and Humber defences, Liverpool, and Lough Swilly in North Ireland. These were to be commanded by a locally employed Lieut.-Colonel of the R.A. or R.E. who was to be given the rank of Colonel.

Of the above, the Major-General's Command at Chatham, the Brigadier-General's Command in Scotland and the defences at Liverpool and at the Tyne were allotted to R.E. officers.

To complete the organization of the troops at home, the depots in the United Kingdom were given a District organization. Up to this time each Infantry Regiment had a separate depot under a Colonel who also was O.C. records, and each depot had a separate pay office attached. The Esher Committee recommended a grouping into nineteen Districts, but the arrangement adopted was a grouping into fourteen Districts each under a Colonel. The number was later reduced to twelve. Similar arrangements of depots were recommended for the other branches of the Army.

In the Royal Engineers, the arrangement which had gradually grown up and which had worked very well was an organization in two depots. The principal depot was at Chatham and was under the command of the Commandant S.M.E., with, under him, an Assistant Commandant who dealt with all military questions. There was a second depot at Aldershot which trained the drivers for the mounted units and also the men of the Bridging units who were specially enlisted. This depot was under the C.R.E. of the Aldershot Command who had to assist him a Lieut.-Colonel, R.E., with the title of O.C. Troops and Companies. These depots were controlled from the War Office as regards recruiting and drafting. The actual

records of the rank and file were kept at Chatham under a Quartermaster, R.E.

It was now decided to appoint an officer of Colonel's rank as O.C. R.E. Records. This officer was to be stationed at Chatham and was to command all the R.E. personnel at that depot.

The organization of R.E. for the Field Army was practically the same as during the South African War. Each Infantry Division had one C.R.E. and one Field Company and the Army Corps at Aldershot had a full group of Corps units which included Bridging, Telegraph and Balloon units and a Field Park, with a Lieut.-Colonel as C.R.E. Corps Engineers. There was also sufficient of these special units to supply two additional Army Corps, and also Fortress (General Service), Survey and Railway Companies for the Line of Communications.

For the Cavalry a new R.E. unit called a Field Troop had been evolved from the experience of South Africa.

For the Fortresses, the existing R.E. organization remained almost unchanged. In the three larger defences at Portsmouth, Plymouth and Chatham, there was a Chief Engineer with the rank of Colonel and under the Chief Engineer each area was divided into Districts each under a Lieut.-Colonel. The smaller defence areas each formed an Engineer District under a Lieut.-Colonel.

To each Fortress one or more units of R.E. were allotted (see Chapter VIII).

The C.R.Es. allotted to divisions were also in charge of the Engineer District which included the Headquarters of their division and in parts of the country not covered by the above organization there were additional Districts under Lieut.-Colonels. For the details of these and also for the subordinate organization for the control of Engineer Services see Volume III, Chapter I. It will be noted that owing to the conversion of the C.R.E. of a Command into a Chief Engineer the sub-Districts in charge of a Lieut.-Colonel were now called districts.

These changes, though brought together here for convenience of reference, took some time to effect. Meanwhile the rearrangement of duties and work in the War Office had been proceeding somewhat slowly. The arrangement under which the responsibility for Engineer work in the War Office was divided between three officers—Inspector R.E., D.F.W. and A.A.G.—all of whom held the rank of Colonel, caused some inconvenience, especially as the A.A.G. was made the responsible officer for advising the General Staff on all questions of the organization and training of R.E. units. The difficulties were minimized by an unwritten agreement that the three officers would

keep one another informed of all important questions which might affect another branch. In September, 1905, the D.F.W. was given the rank of Brigadier-General.

One practical difficulty was the fact that the War Office staff was split up between a number of buildings in the London area. The centre was in Pall Mall, where was the office of the A.A.G., R.E., and the Master-General of the Ordnance, but the Director of Fortification and Works and the group of Inspectors under the Inspector-General were in the Horse Guards, Whitehall, the Intelligence branch was in Queen Anne's Gate and other branches were scattered. It happened that the new War Office building in Whitehall, which had been in progress for six years, was approaching completion, but it was not occupied till December, 1905.

Another difficulty was that the new Secretary of State for War, Mr. Arnold-Foster, did not fit easily into the new organization. Before coming to the War Office, he had formed his own theory of Army organization, which did not coincide with the theory which formed the basis of the recommendations of the Esher Committee. He had committed himself to support the proposal, often made in Parliament and the Press, to split the Army into two parts, a short-service Army for home defence and a long-service one for service in India and the Coaling Stations. This proposal had been strongly supported in a previous generation by Sir Charles Dilke and had been thoroughly investigated. It always broke down on the difficulty of enlisting a long-service Army for foreign service unless arrangements could be made to alternate periods of home and foreign service. It would also require considerable extensions of barracks at home for the larger number of recruits which would have to be enlisted. It was, therefore, not accepted by the Committee of Imperial Defence.

On several questions the views of the Secretary of State considerably affected the R.E. The first of these was the question of the Submarine Mining Service. This service, which started in 1863, had been the subject of considerable controversy, of which some details are given in the *History of Submarine Mining in the British Army*, Chapter V. The questions of whether the submarine mines should be worked by the Army or Navy and whether, if the Army were responsible, they should be in charge of the R.E. or the R.A., or whether, if the Navy were responsible, the mines should be in charge of the Royal Marines, had been often discussed in Parliament and by many Committees, but the decision had always been the same: that the Admiralty did not want to be tied to any fixed defences.

The development of the submarine boat caused this question to be reopened in 1903, when the Admiralty suggested that all mine defences should be withdrawn and that the buildings and barracks used by the Submarine Miners should be handed over to the Admiralty for the use of submarine boats and their crews. This was referred to a joint Committee of senior officers from the Admiralty and War Office under the Presidency of Lieut.-General Sir William Nicholson. This Committee failed to reach an agreement.

The Secretary of State for War, when a private member, had supported the point of view that mines being an " aquatic " service should be in charge of the Navy. On coming to the War Office in 1904 he reopened the question with the Admiralty and received a reply that the Admiralty were now prepared to take over the whole responsibility for the mine defence of our ports. This was accepted by the Army Council. Further details are given in Chapter V, *History of Submarine Mining in the British Army* and in Chapter XI of this volume.

The submarine mining gear was therefore transferred to the Admiralty, the mines were altered to the naval pattern, the electrical gear was sold or destroyed and the boats and vessels were distributed to other naval uses.

It was, however, decided that the R.E. with their auxiliary forces would continue in charge of the Electric-Light Defence at all defended ports, and as these had been increasing more rapidly than the personnel could be trained to man them, the net result of these changes made only a small reduction in the strength of the R.E., but it did involve several changes in organization, which are dealt with in Chapter VIII, while the R.E. Militia and Volunteer units were much reduced.

The alteration of Admiralty policy required a reconsideration of the whole question of defence.

In addition to the changes due to submarines, a very important development was taking place at this time in the improvement of naval gunfire, which resulted in a great increase in the range at which naval action could take place. Up to this time this range had been usually put at 4,000 yds. The new system of laying and range finding increased that threefold. The changes approved included the reduction of the close defences, and considerable alterations and additions to the heavy gun defence. These changes gave a good deal of work to the Engineers for some years. (See Chap. XI.)

Another change supported by the Secretary of State was the transfer of the whole of the Engineer barracks and establishments at

Chatham to the Navy. As explained in the previous chapter, arrangements had been made in 1900 to hand over St. Mary's Barracks and the ground adjoining to the Admiralty, to be used in connexion with the extension of the Naval Barracks and a new building had been provided behind the R.E. Institute to replace the Electrical School and other establishments housed in St. Mary's Barracks. The Admiralty now asked that this policy should be extended and that the whole of the Engineer establishments, including Brompton Barracks and the Institute Buildings, should be handed over to them. This proposal would obviously have had a very serious effect on the efficiency of the R.E. It was, however, approved in principle by the Army Council and schemes were prepared to take over the Engineering College at Egham for the Officers' School and to move the depot into some of the new barracks at Tidworth, which were then under construction. The detailed schemes were well advanced when the whole project was brought to a sudden conclusion by the action of Lieut.-General Sir William Nicholson, who as senior Colonel Commandant of the Royal Engineers asked for an interview with our Colonel-in-Chief, H.R.H. The Duke of Cambridge, and brought the scheme to his notice. As a result the decision was arrived at that the R.E. were not to be moved from their old home with which they had such close relations.

In October, 1904, the Secretary of State wrote: "Proposals should be put forward with the object of reducing the numbers of the Royal Engineers. This force is obviously in excess of the requirements of the Army." A Committee was at once formed composed of the Director of Personal Service, Major-General W. E. Franklyn, as President, with Colonel R. C. Maxwell, A.A.G., R.E., and a representative of the General Staff as members. They first met on the 27th October, 1904, and reported on the 2nd December, 1904. This Committee did not take evidence, but simply recorded actual numbers required for war or peace as laid down in various decisions by the War Office. The result thus constitutes a concise summary of the organization of the R.E. at the end of 1904. In explanation of this procedure the Committee began by pointing out that no accurate estimate could be arrived at until the newly formed General Staff had decided the strength of the British Army which was to be permanently maintained and what troops could be spared from South Africa where the garrison was still in excess of normal requirements and where there were a number of R.E. officers temporarily employed on public works and on railways. The Committee, therefore, commenced by stating the number of the R.E.

officers required in time of war according to the requirements of the General Staff, which included the equivalent of two complete Army Corps, but they pointed out that certain proposals then under consideration might involve the addition of twenty-one more officers to the total war requirements. They also pointed out that the number of R.E. officers in India had been reduced from 380 to 350 by the loan of officers for the South African War, and that the Indian Government had written that owing to the reorganization of the Indian Army there would be an increase of work for the Military Works Department to provide additional barracks, ranges and training grounds. That Government had already asked for an increase of the number of R.E. officers from 350 to 395 and had intimated that they might ask for a further increase in the near future. Under the arrangements made with the Indian Government in the case of mobilization of the whole Army, India would require an immediate increase of seventy-six officers over the above increased establishments. The Committee finally worked out the war requirements as under :—

For the British Army :		
Expeditionary Force	147	
Indian reinforcements	76	
Other Field Forces at home	36	
Home Garrisons	111	
	—	370
Colonial Garrisons, etc.		136
Indian establishment (peace strength)		395
Egyptian Army		15
Depots		24
Adjutants' Auxiliary Forces (reduced from 24)		13
Special duties at home, War Office, Staff, etc. ...		32
		985
Add 10 per cent for sick, committees or employment on Line of Communications, Army Staff, etc.		98
Total War requirements :		1,083

Making a similar statement of the numbers required in peace, on the assumption that all surplus units were withdrawn from South

Africa, they reached a total of 936 for officers paid on Army Votes as under :—

British	526
Indian	395
Egyptian	15
	936

To these had to be added 56 officers employed under other departments of the Government, of whom 36 were paid entirely on other than Army Votes and 20 received Regimental pay only.

Deducting the peace establishment of 936 from 1,083, there would be a deficiency of 147 of which 56 could be met by calling on the officers specially employed, leaving a deficiency of 91. They pointed out that this deficiency was mainly in the junior ranks and could not be met from the normal reserve of R.E. officers as, though this consisted of 65 officers, the majority were over 50 years of age and only 12 were below Field rank. They therefore proposed the formation of a special reserve of officers drawn from young civil engineers who were to be given a short course of twelve months instruction followed by short annual military training sufficient to enable them to be employed with Field Companies. This proposal was approved and was the beginning of a valuable class of Officers which was to do fine service during the Great War, 1914–18.

Discussing the possible reduction of the peace strength of the R.E., the Committee stated that the present strength was 999 against the proposed strength of 992, but that there were in addition 38 acting engineers employed during the war, which could be gradually reduced.

The Committee also reported that, while the officers of the R.E. who were departmentally employed were properly shown on the strength of the R.E., there was no reason why any part of their pay should be borne by Army Votes. This was accepted and was carried out in the Estimates for 1905–6. The report was accepted by the Army Council and immediate steps were taken to send out the extra officers to India as units were withdrawn from South Africa. But no further reductions could be made in the number of R.E. officers, which totalled 1,033 in the estimates for 1905–6.

The Secretary of State was, however, not satisfied, and insisted on the whole question being referred to yet another Committee under the presidency of Field-Marshal Sir Evelyn Wood. The members were Sir Edward Law, K.C.S.I. (late R.A.), Sir Vincent

Caillard (late R.E.), Colonel G. Barker, R.E., the Inspector of R.E., and Mr. H. de la Bere representing the finance branch, with Captain E. D. Swinton, R.E., as Secretary. This committee met for the first time on 10th June, 1905, but did not render its final report till 19th April, 1906, and as its recommendations were considerably modified by the alterations in Army organization introduced by Mr. Haldane, the details are considered in the next chapter.

While the above discussion was proceeding, considerable difficulty was being found in starting the new Directorate of Barrack Construction. Several senior R.E. officers to whom the appointment was offered declined, as they considered the proposals unworkable, and the Institution of British Architects, who were asked to name a civilian as Director, replied that the salary offered was not attractive. The Secretary of State finally appointed a civilian architect—Mr. H. B. Measures—and the new department was started in the autumn of 1905. It was, however, on a much smaller scale than that contemplated by Lord Esher's Committee of 1902. No attempt was made to apply the organization to foreign stations, while the work at home was limited to new services of £2,000 and over, instead of the lower limit of £500 recommended by the Committee.

Instead of a staff of fifty-one officers, the new department had thirteen only. The relief to the R.E. was therefore very much less, and this has an important bearing on the question of the number of officers required, as the Evelyn Wood Committee based their recommendations on the assumption that the new Directorate would take over the bulk of the hospital and barrack work both at home and abroad.

In the midst of these controversies one event of considerable importance to the Corps must be recorded. In 1904 the Corps bade farewell to an old friend in the person of their Colonel-in-Chief, H.R.H. the Duke of Cambridge, who passed away early in the year. In his place His Majesty King Edward VII honoured the Corps by assuming himself the appointment of Colonel-in-Chief from the 1st May, 1904, and showed his personal interest in the Corps by a visit to Chatham on the 21st October, 1904, when he inspected all the Royal Engineer units on parade in Brompton Barracks. After the parade His Majesty lunched at the officers' mess.

But in spite of the difficulties caused by the many changes, the work of the R.E. continued without serious interruption. On the barrack side, work was caused by the alterations of units and organization, and use was made at many stations of hutting, provided for the South African campaign, which was now surplus to

requirements. The garrison in South Africa had to be housed and the large schemes of barrack construction under the different Loan Acts were continued to the end of 1905 (Volume III, Chapter V). The equipment of Field units was also under revision to embody the changes in pattern and detail, based on the experience of the South African War. One of the first acts of the new General Staff had been to form a War Establishments Committee to consider all units of the Field Army. Some details of how this affected the R.E. is given in Chapter XIII of this volume. Special Committees reported on the organization of the R.E. for Balloons, Railways and Telegraphs.

Towards the end of 1905 there was a change of Government. Mr. A. J. Balfour resigned and was succeeded as Prime Minister by Sir H. Campbell Bannerman. The Secretary of State for War in the new Cabinet was Mr. R. B. Haldane who took office 10th December, 1905, and with his appointment there opens a new chapter in the history of the British Army.

This is, therefore, a convenient point to record the effect of the changes which followed the recommendations of the Esher Committee. Before 1904 the work under the I.G. Fortifications was divided between three senior officers who were in the position of Directors, who represented the head of the branch on Committees and who often visited stations and discussed technical details with the General Officers Commanding and their C.R.Es. Under the new organization the D.F.W., in addition to his work as Engineer adviser to the Master-General of the Ordnance, had to carry out much of the detail work formerly done by two of these senior officers.

The move into the new War Office brought him into closer contact with his own Chief and with the Directors of other branches, but he had lost the right of direct approach to the other members of the Army Council. Also, as he no longer carried out formal inspections of all Commands at home, he lost touch to some extent with the General Officers in Command. These disadvantages were reduced to a minimum by the close touch maintained with the Inspector of R.E. and with the new Administrative Generals. Also the Army undoubtedly benefited by the fact that the holder of the appointment, Brigadier-General R. M. Ruck, had a long record of previous service at the War Office, with the result that he was frequently consulted by the Directors of the new branches.

In the Adjutant-General's branch the former head of the Engineer personnel, whether graded as a D.A.G. or A.A.G., had been practi-

cally working as a Director under the Adjutant-General. From 1904 he was working under two Directors in the Adjutant-General's branch—Director of Recruiting and Director of Personnel—and was also the adviser to the Director of Military Training, under the Chief of the General Staff, who was responsible not only for training but for the organization of the Army for home defence. In this case also, Colonel R. C. Maxwell, with his long experience of the work of the Corps, both in peace and war, and his intimate knowledge of all its details, was able to materially assist the Directors of other branches.

But on the whole it must be admitted that the changes introduced by Lord Esher and Mr. Arnold Foster had resulted in a weakening of the Engineer branch of the Army. The further changes introduced later as described in the next chapters, led to the strengthening, of certain branches, such as the Signal and Air Services, and to many improvements in the details of equipment and training. But as regards what may be called the General Service work of the R.E. there was a reduction in numbers and status as compared with the position of the Corps on the outbreak of the South African War.

CHAPTER III

NARRATIVE 1906 TO 1908

New Liberal Government—Mr. R. B. Haldane becomes Secretary of State for War—Sir William Nicholson becomes Q.M.G.—Report of Evelyn Wood Committee—Position of C.R.E. of a Division—Employment of R.E. in repair of barracks—Improvements asked for in Telegraph Service—Survey and Ballooning—Pay and prospects of R.E. officers—Reduction of Generals' appointments open to R.E.—Importance of work of Royal Engineers as shown by Russo-Japanese War—Recommendations—Increase of Field Companies—Field Troops—Reduction of Bridging Companies—Recommended combination of Telegraph and Signal Services—Royal Engineer staff recommended for Army and Corps headquarters—Siege warfare—Organization of R.E. in Fortresses—Calculations of war and peace strength of R.E.—Training of officers and men—Pay and promotion of officers—Recommended that R.E. should be a branch under the General Staff—All barrack work to be transferred to new Directorate of Barrack Construction—Omissions in Committee's report—Organization of R.E. in Coast Fortresses—Action taken on that report—Major-General C. F. Hadden appointed M.G.O.—Haldane's scheme for the Army—Large Divisions of three Brigades—Distribution of Divisions and Brigades—R.E. distribution—Man-lifting kites and dirigible balloons—Administrative organization modified—Command of Chatham Depot reverts to Commandant S.M.E.—Haldane's Territorial Army—Special Reserve—Territorial Divisions—Engineer units.

This chapter links up with Vol. III, Chap. I and *History of Submarine Mining*, Chap. XV.

THE year 1906 opened at a critical point in the history of the Army and of the Corps of Royal Engineers. The previous year, as described in the last chapter, had been one of divided counsels between the rather drastic changes introduced by the Committee of Three and the somewhat uncertain views of a Secretary of State, whose considered opinions differed from those of the Committee and who for the last few months had been in indifferent health. The Conservative Government during 1905 had been obviously tottering to its fall, and had been too busy with other matters to give any clear guidance on Military questions. In fact the post of Secretary

of State for War was looked on with distaste by many politicians. The leader of the Liberal party, Mr. H. Campbell Bannerman, who became Prime Minister, was, although he had once been a Secretary of State for War, not really interested in Army matters, and many officers feared that there would be a drastic cut in Army Estimates and a corresponding loss of efficiency.

Fortunately there was in the party a group of what were called Imperial Liberals who, though in a numerical minority, carried a personal authority out of proportion to their numbers. Their leaders were Mr. Asquith, Sir E. Grey and Mr. R. B. Haldane. The latter was an eminent lawyer and seemed marked out for one of the legal appointments in the new Ministry. But the highest of these, that of Lord Chancellor, had been already promised to another Minister, and Haldane offered to take the post of Secretary of State for War, provided he was given a free hand by his colleagues. This proved a fortunate decision for the Army and the Empire.

Mr. Haldane joined the War Office wholly ignorant of Army affairs, as he states in his own autobiography, but he set to work at once to make a close study of all details, just as he had been in the habit of doing with a legal brief. He found the whole organization in a state of flux ; the new General Staff was only finding its feet, while the peace organization of the Army was different from that required for war. He found in the new Army Council and the subordinate Directors a group of straightforward men with a full knowledge of the details of their profession and anxious to help him in every possible way. In a private letter he called them " Angels." The opening of the new War Office building in December, 1906, helped by bringing all the branches together, while the Permanent Secretary, Sir E. Ward, established an excellent system in the Secretariat. A further gain was the rearrangement of the Civilian Finance organization which, on moving into the new War Office, detached branches to work with the various members of Council, so that a friendly liaison was soon established between the military and civilian staffs, which had not been possible when they occupied different buildings. Mr. Haldane, on the advice of Lord Esher, appointed Colonel G. F. Ellison as his private secretary, which brought him into close touch with the changes recommended by the Esher Committee.

With characteristic caution, he refrained from adopting any definite scheme of Army reform and when the Military members asked his intentions, he humorously suggested that a period of

at least nine months must be allowed to elapse before he could be expected to produce an offspring !

One change was made at once in the Army Council ; Major-General Plumer, the Q.M.G., resigned and was succeeded by Lieut.-General Sir William Nicholson. Nicholson had had a distinguished career in the R.E. and on the Staff. He had served on the Staff in India and South Africa, and, from 1902 to 1904, had been Director of Military Intelligence at the War Office. In 1903 he had been appointed one of the members representing the War Office on the Imperial Defence Committee when it was first formed by Mr. Balfour. He was one of the senior officers " axed " by the Esher Committee (with some reluctance in his case) and had been sent in 1904, as Military Attaché, to the Russo-Japanese War. His inclusion in the Army Council undoubtedly strengthened that body and when, in 1908, he was appointed Chief of the Imperial General Staff he became the right-hand man of Mr. Haldane in the carrying out of the organization of the General Staff and the formation of our Field army. On one point he was especially useful, as in the discussions in the Committee of Imperial Defence he was able to hold his own with Lord Fisher and others who had rather dominated that body. This was a matter in which his predecessor as C.I.G.S., and other eminent soldiers before him, had failed.

Mr. Haldane, in addition to a close study of the questions under consideration in the War Office, made himself acquainted with the military organizations of France and Germany and in the spring of 1906 attended the German military manœuvres. In spite of his predilection, from his early training, with German methods and German thought, he returned from this trip with the definite conviction that the intense German military organization could only be directed against their neighbours and that there was a serious risk of the British Army being drawn into the conflict. He therefore directed his energies to such an organization of the British Army as would enable this country to defend its position as an Imperial power ; though it was not until about two years later that the aggression of Austria in the Balkans, and of Germany in Morocco, forced the British Government and the British Army into those close relations with the French which eventually drew us into the Great War.

Meanwhile the Committee of Imperial Defence was functioning and as a result of their discussions Mr. Haldane joined those who were called the " Bluewater school," which held that, given naval

preponderance of our Fleets and the continued efficiency of our existing Coast Defences, there was no risk of invasion by any considerable force, so that the whole strength of the Army could be prepared for fighting overseas.

With these preliminary remarks, which are necessary to explain the very considerable changes which followed in our military organization, we may now resume the narrative of events as they affected the Corps.

In April, 1906, the Evelyn Wood Committee sent in their report. They had been in session for ten months, during which they had met collectively thirty-four times and had accumulated a great mass of evidence. Their terms of reference covered the whole organization of the Royal Engineers, the numbers required in peace and war, their training, rates of pay, employment in peace and the method of raising the necessary reserves to complete the war establishments.

The formation of the Committee was rather unusual. The president, Sir Evelyn Wood, was a distinguished soldier who had held many of the highest appointments in the War Office and had frequently acted as President of the various Committees which usually precede any alteration in military organization or conditions of service. But instead of including members representing the various branches of the War Office, the Secretary of State had invited two retired officers, formerly serving in the R.A. and R.E. respectively, but who had no recent military experience. The only serving member was Colonel George Barker, the Inspector of R.E. The Secretary of the Committee was Captain E. D. Swinton, then employed under the Director of Fortifications and Works.

The preparation of details for consideration of the Committee fell mainly on these two officers. Colonel Barker had had a varied experience in the R.E.: in his younger days he had been an Instructor in Submarine Mining; as a Captain he had served in the Egyptian campaign in 1882, as Adjutant to the C.R.E., 1st Division; and later he had commanded the Pontoon Troops at Aldershot. He had been employed for some years in the Fortification branch of the War Office and had held several senior positions as a Colonel. Captain Swinton had been an Assistant Instructor in Fortifications at the S.M.E. and had served in the South African War, during which he was adjutant of the locally raised Railway Pioneer Regiment. These officers were, therefore, well fitted to represent the various branches of the Royal Engineers and also they were able to draw

on the offices of the Director of Fortifications and Works and of the Assistant Adjutant-General R.E., for suggestions and tables of numbers and establishments.

The discussions and examination of witnesses included two points which require special reference. The first of these was the position and duties of the Lieut.-Colonel R.E. with a division. The regular Army at home was at this time organized in eight divisions, each containing two brigades of Infantry and the Royal Engineers allotted to each division consisted of one Lieut.-Colonel as C.R.E. and one Field Company with six officers. The R.E., after their experience of the South African War, were asking for a second Field Company with each division, that is, a scale of one Field Company to each brigade. This was resisted by some officers of other arms, who not only considered that one Field Company was sufficient, but considered that the Lieut.-Colonel was unnecessary and that the Major Commanding the company could give any necessary advice to the General Commanding and would receive his orders from some officer of the staff.

The second point was whether the R.E. should continue to carry out repairs to barracks, after the larger and more interesting work of new construction had been transferred to the new branch of the Director of Barrack Construction.

On the first point the views of a number of senior officers of all arms, many of whom had commanded detached forces in South Africa, were examined. Some of them thought the Lieut.-Colonel with the division was redundant when several divisions were working together, but necessary to a detached force. None of them wished for any reduction in the numbers of the R.E. and many asked for additional Engineers for bridging, telephone and similar duties. Lord Roberts and Sir John French, then commanding at Aldershot, said they would want the Lieut.-Colonel with each division and would like the number of the R.E. increased.

Of the large number of Engineer officers examined, Lieut.-General Sir William Nicholson and Lieut.-General W. T. Shone, both of whom had seen much active service in India, pointed out that in that country, in addition to a C.R.E. with each division, there were one or two officers attached as Field Engineers, who were employed in organizing and superintending local labour or military working parties on such duties as road-making, bridging or water supply. This point was supported by several other R.E. officers from their experience of active service. Several officers also made

the point that if the Major of the company is called to attend on the General, he will, in most cases, have to hand over the command of the company to his Captain. There was also a consensus of opinion that the C.R.E. of a division must be an Executive Officer and not simply a Staff Officer.

On the question of the responsibility for the repair of barracks, there was agreement that if all new construction were handed over to the new Barrack Construction branch, which was only just being formed, then repairs should also be transferred. Colonel R. M. Ruck, the Director of Fortifications and Works, submitted a scheme for the division of the Engineer works between the D.B.C. and himself. Under this scheme the R.E. were to retain all work connected with Fortifications, Army Ordnance buildings and smaller details such as rifle ranges. He thought that with this division of duties he could arrange to give both officers and men of the R.E. companies sufficient technical work to maintain a good standard of technical training. He pointed out, however, that the division of duties would give no financial saving to the country as a whole.

In addition to dealing with these controversial points the Committee obtained valuable evidence as to the necessity of improving the Telegraph Service to include the provision of telephone communication at least so far as Brigade Headquarters. Schemes for the future organization of the Telegraph Service were put forward by Major E. G. Godfrey-Faussett and Major H. B. H. Wright and were generally supported by the senior officers who gave evidence. A memorandum by Major C. F. Close on the necessity of improving the preparation of military maps and the use of the Survey in war was put forward and supported by the Director of Military Operations. A very complete report, which had been drafted by Captain H. L. Pritchard, was put in by Brigadier-General H. M. Lawson on the railway organization necessary in war and Lieut.-Colonel J. E. Capper advocated an increase in Balloon units.

The general impression produced by a reading of the evidence after a lapse of thirty years is that the R.E. could and should have made out a very good case for a considerable increase of the numbers of both officers and men, but refrained from doing so. This was a matter of policy. The views of the President of the Committee expressed during the proceedings were that " he had come to curse and remained to bless," but he would not go so far as to recommend an increase in the expenditure on the Royal Engineers. It followed that if more Engineers were required in one direction, such as

Telegraphs, something else must be reduced. When the inquiry started the future of the Corps, and indeed of the whole Army, was in the melting pot and the Corps had already received somewhat drastic treatment in the reduction of rank and pay for the R.E. officers in senior appointments. The officers responsible thus seem to have thought it better to concentrate on keeping as much as possible rather than to attempt increases.

On the question of the pay and prospects of R.E. officers, the Committee obtained opinions from many of the officers who gave evidence. All agreed that any reduction of pay would be likely to result in a reduction of candidates for commissions in the R.E. The senior R.E. officers pointed out that their prospects had been impaired by a new regulation made in 1901, under which promotion to Major-General was to be by selection to fill an appointment, in place of a previous regulation, under which a number of vacancies as Major-General were allotted in proportion to each arm of the service. They pointed out that as selection was made from one list of Colonels, the arm of the service which had the quickest promotion would obtain an undue proportion of appointments. They also pointed to the fact that, under recent changes, the rank attached to five senior appointments connected with Engineer work and formerly held by General Officers, had been reduced to that of Colonel. These appointments were I.G.F., D.A.G., Commandant S.M.E., and the Chief Engineers at Aldershot and Salisbury. They also objected to the withdrawal of Engineer pay from Colonels appointed Chief Engineer, a loss of about £180 a year.

The Committee in their final report, dated the 19th April, 1906, dealt first with war requirements. They pointed out that the general trend of modern war, in South Africa, 1899–1902, and also the reports on the Russo-Japanese War, emphasized the importance of the work of the Engineers. Also that Engineers are especially necessary in the British Army, which, being enlisted on a voluntary basis, draws its material mainly from the labouring classes and thus has a much smaller proportion of men with technical training than foreign armies conscripted from all classes. They also commented on the increased use of entrenching in attack as well as in defence. They concluded that recent war experience and the preponderance of evidence emphasized the necessity for an increase in the proportion of certain Field units of Engineers and of the Engineer staff with an army in the field.

They recommended that the number of Field Troops should be one

to each Cavalry brigade, each troop to include some trained telegraphists and that an equipment for light bridging for cavalry was essential.

They agreed with the recommendations of the majority of the witnesses that there should be two Field Companies with each division and recommended that each company should carry out bridging, searchlight, brigade telephone and divisional telegraph duties in addition to its present Field engineering duties. For bridging they recommended that a small bridging train, carrying material for 50 yds. of bridge, should be attached to one of the Field Companies of each division, but if this were done they recommended that the Bridging Companies should become Bridging Trains, the special class of pontooniers which had done such good service in South Africa being abolished. The making of bridges when required was to be carried out by the Field Companies.

They recommended a combination of the Telegraph Service with the Signal Service to carry out all communication services down to battalions or brigades of Artillery, the interior communication of the battalion or brigade being arranged regimentally.

They recommended an organization of Telegraph Companies for communications back to the base, also an organization of wireless telegraphy, the whole under a Director of Telegraphs.

In April, 1905, the six balloon sections on the establishment had been renamed Balloon Companies, one company being allotted to each Army Corps (three divisions) ; the Committee recommended that each company should be capable of putting in the air two balloons or two flights of kites.

Searchlights were recommended but should not be formed into separate companies. Instead the Committee suggested that one searchlight with the necessary power plant should be attached to each Field Company, with a section of a strength of one officer and ten men. This detachment to be responsible for all searchlights, rockets, star shells or flares.

Partly to meet the increase of Field Companies with the divisions, they suggested the abolition of the C.R.E., Field Company and Field Park allotted to each Army Corps.

For the Engineer staff of an army in the field the Committee recommended with Army Headquarters, an Engineer-in-Chief (Major-General) and one Staff Officer ; with each Army Corps, a Chief Engineer (Colonel) and one Staff Officer ; and with each division a senior officer of the Royal Engineers.

The Committee recommended a complete organization for the railway service in war.

They recommended that the organization of the Ordnance Survey under the Royal Engineers should be retained, with some reduction of numbers at home but with an increase of the number of Colonial Survey Sections, and that the number of Survey Companies at home should be reduced from four to three.

In an important paragraph, they discussed the question of siege and fortress warfare and recommended that, should this form of warfare develop, the Engineer work would be begun by the Field Companies, to be supplemented by Fortress Companies from the home stations, the latter being replaced from the Auxiliary Forces.

For work in fortresses the Committee adopted a scheme which had been prepared in the offices of the D.F.W. and A.A.G. following on the abolition of Submarine Mining. This involved the retention of thirty-three companies for defended ports at home and abroad, with two companies composed of sections of the Coast Battalion for distribution between the commercial ports in Great Britain. Each of these units to have a war strength based on the actual station requirements. In addition there was to be one Workshop Company to be employed at the S.M.E., Chatham, in peace, and to form the nucleus of an establishment for the Line of Communications in war.

As regards applying the above recommendations to the whole Army, the Committee remarked that they could not make any exact determination until a definite decision had been arrived at as to the strength and organization of the armed forces necessary for the defence of the Empire.

In the absence of any decision on this important point, the Committee had to assume an organization which they put at three Army Corps (nine divisions) and four Cavalry brigades, and on this basis they calculated that a total of 240 officers and 8,873 other ranks would be required for the Field Army and, adding officers employed on the Army Staffs, with an allowance for wastage during the first year of about 20 to 25 per cent, they arrived at a total of 324 Officers and 10,900 other ranks.

For duties in fortresses, depots and other duties not with the Field Army they calculated 420 officers and 4,822 other ranks would be required.

For India, which was not included in their terms of reference, they put the number at that included in the peace establishment

of 387 officers, thus making no allowance for any additions on mobilization.

This gave a total of war requirements of 1,131 officers and 15,725 other ranks.

Turning to the peace establishment, the Committee based their calculations on the number of units required for war, with peace establishments based on a calculation of the numbers required to provide sufficient reservists to make up the difference between peace and war establishments.

They investigated the assistance which could be obtained from the various forms of auxiliary forces, especially for telegraph and railway work.

Following the proposal to abolish the separate Bridging units for war they recommended the abolition of the Bridging Companies, the material to be kept in store but to be drawn on by Field units for annual training. The only special increase recommended was that the number of recruits under training at the depots should be shown under a separate establishment, not included in the strength of units.

On the question of the employment of the R.E. on barrack work, they recommended that as the work on new constructions was to be handed over to the new civil Barrack Construction Department, the maintenance of barracks should also be taken over by this department, leaving to the R.E. the construction and maintenance of all fortifications, Army Ordnance buildings, hutments, rifle ranges and camps.

In a summary of the peace establishments recommended, they arrived at a total establishment of 957 officers and 9,440 men.

To bring these numbers up to the proposed war establishment an increase of 174 officers and 6,285 other ranks would be required. It was calculated that the existing reserves would be sufficient to provide the " other ranks."

For the officers, the Committee recommended that the number of R.E. officers employed in other branches of the Government such as survey should be increased to a hundred, of whom it was calculated that seventy-five would be available for military duty. The number of officers in the R.E. reserve (sixty-seven) was calculated to provide fourteen more and for the balance the Committee endorsed the proposal adopted by General Franklyn's Committee for the formation of a Special Reserve of a hundred young engineers composed of civilian engineers who would have a special training in military subjects.

In the second portion of their report the Committee discussed the training of officers and men.

The report was accompanied by detailed tables showing the employment of R.E. officers in June, 1905, which show the very great variety of employment and work which has to be carried out by officers of the Corps. The totals were :—

Regimental employment	518
Extra regimental employment at home and abroad ...	70
Employed on semi-civil work	8
Employed on civil work	28
Total British Establishment	624
Total Indian Establishment	370
	994
Coast Battalion, Quartermasters and Riding Master ...	61
	1,055

The Committee proposed the reduction of the peace establishment by forty-five officers, including six Lieut.-Colonels.

The questions of the pay and promotion of R.E. officers were discussed at some length. They pointed out that owing to the slower promotion in the Corps and the non-allowance of soldier servants, the officers of the R.E. during the first twenty-seven years of their service were financially little better off than the Cavalry, A.S.C., or Garrison Artillery and received much less pay than the officers of the Royal Army Medical Corps, and this in spite of the fact that the officers of the R.E., for the proper performance of their duties, must have a high standard of professional attainments. They commented on the fact that the pay of the Royal Engineer colonels on the Staff had been considerably reduced and that all the appointments reserved for Royal Engineers formerly held by Major-Generals had been abolished. They recommended that no further reduction should be made in the pay of Royal Engineer officers. Also that there should be some system of selection or brevet promotion to enable specially qualified officers to reach higher rank at an earlier age, with further facilities for the employment of Engineer officers on the Staff. They specially suggested that two R.E. officers should be

selected for the command of Infantry brigades and that R.E. officers should be considered for the command of a division.

A good deal of discussion centred on the position of the Royal Engineers in the organization of the War Office and in the Commands. This has always been a subject of discussion. It is one of the characteristics of the Royal Engineers that their work touches that of every other branch of the Army. In peace the larger part of their work is concerned with Barrack and Sanitary services which affect very closely the health and comfort of the soldiers and thus bring the R.E. in frequent contact with the Army Medical Service and the branch of the Quartermaster-General's staff which deals with quartering. There is also contact with the Royal Artillery in the design of fortifications in peace and in the working of electric lights and communications in war. But in a Field Army the work of the R.E. in the fighting line is mainly concerned with the Infantry.

The Esher Committee, following the old organization under which the R.E. and R.A. formed part of the Ordnance Corps, placed the R.E., in their new organization of the Army Council, under the Master-General of the Ordnance, but this arrangement proved unsatisfactory. The control of the Artillery naturally formed the larger part of the work of this officer, so that the Master-General of the Ordnance was always drawn from the R.A., with the result that the head of the Engineers in the War Office had to communicate with the Army Council and the Secretary of State through an officer of another branch of the Service. The system had been at work for only two years, but in spite of goodwill on both sides, the disadvantages had already become apparent.

As the Committee had recommended that the Barrack work should be transferred to another branch, they recommended that the Royal Engineer organization should be treated both in peace and war as a branch of the General Staff. The peace organization was to be under a Director of Engineers with branches for Coast Defence, Field Engineering including Telegraphs, and Railways. The war organization was to be in three distinct branches under an Engineer-in-Chief, Director of Telegraphs and Director of Railways, each reporting to the Chief of the General Staff.

This report has been dealt with at some length as it constitutes a very complete record of the general opinion of the Army and the leading officers of the Royal Engineers at the time. It was not adopted as a whole for various reasons and some of its recommendations were not put into force until the experience of the Great War had proved

their value. It is easy to be wise after the event, but it may be well to consider here some points on which the report of the Committee might have been criticized at the time. The proposals for the organization required in war were based on the experience of the South African War and provided a complete system for the actual fighting troops. They did not, however, include any R.E. for the work immediately behind the fighting line. In the previous organization this has been provided for by the inclusion with each Army Corps Headquarters of a C.R.E. with a Field Company and a movable store depot called a Field Park. This organization was abolished and nothing was substituted. Also there was no provision for R.E. services on the Line of Communications between Army Headquarters and the base, except one small Works Company. This is the more noticeable as, in the case of the Telegraphs and Railways, a complete organization was proposed in each case, each with a Director at the head. In the proposed peace establishment the most noticeable omission is the absence of any margin for casualties. Each establishment is calculated at the bare minimum and no allowance is made for absence due to sickness, leave of absence, irregularity in recruiting, officers and men absent from their units on special courses of instruction, or, in the winter months, the number of officers and men on passage to and from foreign stations. All such casualties fall on the establishment of home units and should be covered by a margin for wastage of 15 to 20 per cent. Perhaps the Committee cannot be blamed for the defects of this system which was in general use throughout the Army and when applied to the Infantry gave rise to the expression of " squeezed lemons " ; but the organization of the Royal Engineers is so much more complex than that of the Infantry that a special margin in their case might well have been recommended. These points were dealt with later by another Committee.

The recommendation to transfer all the Barrack work to the new Director of Barrack Construction was impossible from the first. The original proposal for this new Directorate was that it should be a Military branch under a Major-General, officered by a mixture of Civil and Military architects and engineers, and should carry out all new Barrack services of the value of £500 and upwards, both at home and abroad. The new branch had not been formed when the Evelyn Wood Committee first met and they naturally assumed it would be set up as proposed. In fact, when the new Directorate was formed it was on a purely civilian basis and was only entrusted

with the control of new services at home stations, each of £2,000 and over. The new Director declined to undertake the control of any Barrack work abroad and this omission rendered impossible the reductions in numbers proposed by the Committee. It may be interesting to consider, if the whole of the Barrack work had been withdrawn from the Corps on the home establishment, how it would have been possible to supply trained officers for work in the Military Works Department in India, and how it would have been possible to give suitable technical training to officers and men employed at home with Field units outside the Coast Fortresses. Also what would have been the views of General Officers Commanding Fortresses abroad, when they were told that a civilian staff would be sent out to look after their barracks and that some of their R.E. officers would be withdrawn?

A few words of explanation may be given on the proposed organization of the R.E. in Coast Fortresses, which introduced some novel features. Before the abolition of Submarine Mining, the Royal Engineers in Coast Fortresses were formed in two distinct groups of units, the Submarine Mining Companies, who were responsible for the mines and electric lights, and the Fortress Companies (so called), who were responsible for "Works" and included a small body of telegraphists for Communications. All the officers and men of the Submarine Mining Companies were specially trained in their special duties and the men included a large proportion of specialists for electrical and water work. The rank and file were selected for this special work immediately on completion of their recruit drill, but were not trained in Field works or Bridging. The officers were fully trained as officers of Royal Engineers. In all fortresses the heavier and less skilled work connected with mining was done by an auxiliary corps of Militia or Volunteers of enlisted natives. The strength of the Submarine Mining Companies at each port was based on the actual station requirements. The headquarters of the companies thus always remained in the same place, the personnel being replaced by drafts. The Fortress Companies, on the other hand, had a uniform establishment of ninety-three other ranks and, as regards officers and men, were interchangeable with the Field Companies. The rank and file had a full course of Field Engineering as recruits and these companies did an annual training in Bridging and Field duties. For the large garrisons which required more than ninety-three men, two or more companies were allotted, while for the small garrisons companies were sometimes divided.

The abolition of Submarine Mining reduced the number of specialists required and the length of the special annual training and made it possible to give all the rank and file of this branch a short recruits' training in Field works and to put all companies through an annual course of Bridging and Field work identical with that of the Fortress Companies. This change gave a valuable reinforcement to the numbers of R.E. available for the Field Army. At the same time the method of station establishments was applied to all stations. In the small stations the men of both branches were formed into one company, thus reducing the number of cadres, but at the larger stations, where the numbers required much exceeded 150, two or more companies were formed, in which case the two classes of men for Electric Light and Works were kept in separate companies. In practice, in fortresses the working unit was a section or group, so that the company organization was mainly for administrative purposes, but keeping the Works personnel together in separate units at the larger stations enabled a complete unit to be withdrawn if required and this proved a valuable feature of the organization during the Great War. But for work in peace the officers and men of both classes worked together as parts of a whole, each group and each individual being employed where he would be most useful. The small special group of Telegraphists was absorbed into the Electric Light Companies and the groups of Mechanists were rearranged (see Chapter VIII).

The proposal to transfer the Barrack work to a different branch died a natural death as explained above. This also prevented the reduction in the number of officers being carried out, except the reduction of six in the number of Lieut.-Colonels.

The peace establishments were affected by the decision to hand over to the Canadian Government the garrisons of Halifax and Esquimalt, which took effect in 1906, by the gradual reduction of the troops in South Africa and by the increase of the number of R.E. officers in India to replace those lent to South Africa.

In the Estimates for 1906–7 a reduction of 500 was made in the peace establishment of " other ranks."

The recommendation for the employment of R.E. in command of divisions or brigades was met by the appointment of Brigadier-General H.M. Lawson to command a brigade of Infantry in Dublin and later to command the 2nd Division at Aldershot. Later other officers of the R.E. were given the command of brigades.

With the allotment of certain Coast Defence Commands to the

R.E., and a share of the appointments in charge of Administration, the prospects of the senior officers of the R.E. were approved.

Apart from the organization of the R.E. in Coast Fortresses which was carried out as proposed, the only additions which were made as a consequence of this Committee were an increase of Field Troops and the provision of Divisional Telegraph Companies. The additional Field Companies were not approved and the Field Companies raised for South Africa were disbanded as they were brought home from that country. The Bridging Companies were reduced to Bridging Trains and the specially enlisted pontooniers were abolished. The addition to the strength of the depot to provide for the recruits under instruction was refused, but the Adjutant-General stated that the home units would be maintained at 75 per cent of their nominal establishment. Although the reduction of the officers employed on Barrack work was not carried out, many details of General Ruck's scheme were adopted, especially the allotment of the Officers Commanding Field and Fortress Companies at home to take charge of Engineer Works divisions, and the increased employment of Quartermasters. The very valuable body of Surveyors (of Works) which had helped the R.E. for many years were renamed Inspectors of Works and given military rank and status, so that they could be employed in charge of Works.

A new unit was formed at Aldershot to provide searchlights for the Field army.

In April, 1906, the group of six Balloon Companies on miniature peace establishments was replaced by the Balloon School, which was to undertake experiments with power-driven aircraft and be capable of providing two Balloon and Kite Companies for war. The Commandant Balloon School, Brevet Colonel J. E. Capper, also became Superintendent of the Balloon Factory, which with the Balloon School was now located at Farnborough, in succession to Colonel J. L. B. Templer, who retired on attaining the age of 60 after twenty-eight years of pioneer service in military aeronautics.

In February, 1907, Colonel (temporary Major-General) C. F. Hadden was appointed Master-General of the Ordnance *vice* Major-General J. Wolfe Murray.

In 1907, a new scheme of organization for the Field army was promulgated. It was based on the principle adopted by Haldane that the whole of the regular Army at home should be organized to provide an Expeditionary Force which could be used on the Continent in support of the French in case of aggression by Germany.

The scheme of an Expeditionary Force of 20,000 only, formed into an Army Corps, with headquarters at Aldershot, was abandoned.

For the new force the unit was a division of three Infantry brigades, instead of two brigades as formerly, with a corresponding increase in other arms. The Cavalry were to form one Cavalry Division of four brigades.

The organization of Commands at home was not affected by these changes except that the headquarters of divisions were located as follows: the 1st Division was at Aldershot complete with its three Infantry brigades; the 2nd Division had its headquarters and two brigades at Aldershot; the 3rd Brigade (Guards) being supplied by the London District; the 3rd Division had its headquarters at Salisbury, with brigades at Tidworth, Portsmouth and Plymouth; the 4th Division had its headquarters at Woolwich, with brigades at Colchester, Woolwich and Shorncliffe; the 5th Division had its headquarters at the Curragh, with brigades at the Curragh, Dublin, and Belfast; the 6th Division had its headquarters at Cork, pending the development of a new headquarters and training ground at Fermoy where a large park had been purchased. Two brigades of this division were in Ireland with headquarters at Fermoy and Tipperary, the third was in the Northern Command with headquarters at Lichfield. The headquarters of the Cavalry Division was at Aldershot with Brigade Headquarters at Aldershot, Canterbury, Norwich and the Curragh.

The Lieut.-Colonels Commanding R.E., at Aldershot (2), Salisbury Plain, Woolwich, Curragh and Fermoy were to be the C.R.Es. of the six divisions. The Lieut.-Colonel Commanding Troops and Companies, Aldershot, was to be the C.R.E. of the Cavalry Division. The Field Companies and the Divisional Telegraph Companies were, so far as possible, quartered in the same area as the headquarters of their division.

In addition to increasing the size of a division to correspond with those of foreign armies, the new organization had other advantages of a political nature. Thus an organization of six divisions instead of nine gave an appearance of economy, though this was mainly confined to the reduction in the number of headquarters. The dropping of the term Army Corps also met a certain form of criticism in the Press, though arrangements were continued to divide the Army into groups of two or three divisions and a war establishment was prepared for such a subordinate headquarters. The Engineer units allotted to each division were two Field Companies and one

Divisional Telegraph Company, with a Lieut.-Colonel as C.R.E. The Telegraph Company was an addition, but the rearrangement of the Field Companies, though nominally complying with the recommendation of the Evelyn Wood Committee, actually gave no increase in the number of R.E. in the Field Army, and, in addition, the three Bridging Companies had been reduced to trains. The net result of these changes was that the strength of the R.E. with the Field Army was one-third less than was considered necessary in 1899, on the outbreak of the South African War. The groups of Army Telegraph Companies and Bridging Trains were reduced in numbers from three to two. Altogether a reduction of 700 was made in the strength of the R.E. in the Estimates for 1907–8.

In spite of this somewhat disappointing decision, all ranks of the R.E. did their utmost to get the best results out of the new organization. Every detail of the equipment was revised, as described in Chapter XIII, and the training of officers and men in its use was continued and developed. Among other improvements, the introduction of man-lifting kites doubled the value of the Balloon units, a dirigible balloon or airship was completed and flown, and two experimental aeroplanes were built and tried. Experiments were also continued in connexion with the use of wireless telegraphy in the field, and wireless apparatus for eventual use in power driven aircraft was devised and tried in balloons, while useful progress was being made in the development of an organization for railway work in war and in experiments with mechanical transport.

In 1907 a small but important change was made in the organization of the Administrative services. When Mr. Haldane visited Germany in 1906, he was much struck with the efficiency of their army organization, especially in the definite separation which existed between their General Staff and the Administrative services. This separation was continued in the field as well as in peace-time. It was considered as important to prevent the General Staff from meddling in administration as to prevent the administrative organization from interfering in affairs which belonged to the General Staff. To ensure this in Germany the two sides of the organization were not housed in the same building. In his autobiography, Mr. Haldane says that all the time he was at the War Office in London he did his utmost to carry out an analogous division as closely as could be. Had he remained at the War Office he meant to have combined the three administrative functions of the Adjutant-

General, Quartermaster-General and Master-General of Ordnance under a single head.

The new organization of General Officers in charge of Administration, which had been started in 1905, was in accord with this general principle, but some uncertainty had arisen as to the position of the Adjutant-General and Quartermaster-General Staffs. These staffs, which were drawn from the same group of officers as the General Staff, were acting as intermediaries between the General Officers in charge of administration and the heads of the Administrative and Technical services and were issuing orders in the name of the Administrative General on technical questions. This procedure was now stopped and it was ruled that these Staff Officers were only to deal with matters affecting their own branch, that is, the Adjutant-General Staff with Personnel and Recruiting and the Quartermaster-General Staff with Movements and Quartering. On questions affecting their own work, the heads of services, which included the Chief Engineer, were to deal direct with the General in charge of Administration. This arrangement was successful and continued unchanged in the Home Commands throughout the Great War.

During the Summer of 1907 a change was made in the organization of the Depot at Chatham and the School of Military Engineering. Before the new organization introduced by the Committee of Three, the Commandant at Chatham, who held the rank of Major-General, had been in command of the School of Military Engineering and of the Depot and Service Companies of the R.E. stationed at Chatham. He was also in military command of the Thames and Medway defences and, as the senior R.E. officer, was responsible for the R.E. Headquarter mess. This arrangement which had worked very well and smoothly for several years was broken up and, following the recommendations of the Committee, the work connected with the Depot and the training of recruits was withdrawn from the control of the Commandant S.M.E. and put under an officer of Colonel's rank, who was also officer in charge of R.E. Records. This was done on account of a fancied analogy with the organization of the Infantry.

At the same time the rank of the Commandant S.M.E., who remained responsible for the training of the officers, was reduced to that of Colonel and a new appointment of a Major-General was made to command the Thames and Medway Defences. The results were unsatisfactory. Under the method of work, which had developed after many years' experience, the training of the officers and men

overlapped in many ways. Military duties and drill were learnt by the officers when attached to the Depot Companies, while for much of the technical training, officers and men had to work together. The attempt to serve two masters resulted in constant friction and, after a personal investigation on the spot by two members of the Army Council, they decided to restore to the Commandant S.M.E. the command of the Depot and all R.E. units at Chatham.

The office of O.C. Records, with the Colonel in charge, was removed to Gravesend, but as this officer had to work in close touch with the R.E. Depot it was a few years later moved back to Chatham. But the O.C. Records was henceforth to be regarded as working directly under the War Office and was excluded from the chain of local military command.

Following the organization of the regular forces, Mr. Haldane developed in 1907–8 the new organization of the auxiliary forces with which his name will always be connected. Up to that date these forces had been organized in two main groups, the Militia and the Volunteers, including the Yeomanry under the latter heading. The Militia was an old constitutional force which could be called out to reinforce the regular Army and was then liable for service in any part of the world. The Infantry battalions were affiliated to regular battalions on a county basis, but were not formed into brigades or divisions. They had no field units of artillery or engineers, but there were many good and efficient units of Garrison Artillery, and Engineer units for Submarine Mining in Coast Fortresses. There were also two very efficient battalions of engineers both situated in Wales, the Royal Anglesey and the Royal Monmouthshire. The Volunteers were a comparatively modern force, raised originally for local defence at home. They had a comparatively short annual training, but being drawn from the better educated classes had attained considerable efficiency. There were no field units of artillery and engineers, but there were a number of efficient garrison units who undertook the greater part of the defences at the commercial ports. There were also a number of engineer units who were trained in engineer field duties, entrenching, bridging and siege warfare, but who were not supplied with the equipment necessary to take the field.

Under Mr. Haldane's scheme, the Militia units were changed to the "Special Reserve," whose primary duty was to receive and train the new recruits joining during a war and to pass them on as drafts to their regular units. The Infantry were organized in battalions,

which could be employed at home in such duties as the garrisons of Coast Fortresses.

As the existing R.E. Militia units were not suited to perform such duties for the R.E., the two Welsh groups were organized to form companies to supplement the R.E. units where required. The Royal Anglesey had to provide one Siege Company and a Railway Company and the Royal Monmouthshire one Siege Company and two Railway Companies. The companies were to work as detached units.

In each case the Militia unit had a Headquarters and a Depot Company to maintain the supply of men to their own companies. Experience shows that it was unfortunate that the efficient Submarine Mining Militia had not been converted into similar Works units. There was no local or other reason why Engineer Militia should have been limited to Wales, and a dozen such units distributed over the agricultural parts of England and Scotland, recruiting from the agricultural labourers and training, as the Submarine Mining Militia did, during the winter months, would have been of incalculable value during the first months of the Great War.

For the Volunteers and Yeomanry Mr. Haldane evolved the bold scheme of forming them into a Field Army organized exactly as the regulars, that is a number of divisions and mounted brigades as a mobile force, and other detached units as Army troops and to man the Coast Defences. Each division was to be commanded by a Major-General of the regular forces with a small permanent staff who would be responsible for the training and inspection of all the units constituting a division. In the same way the Commanders of Coast Defence areas would be responsible for the training of the units allotted to their Commands. As there were no Militia or Volunteers in Ireland, additional British units were included in the Liverpool group of units to man the defended ports in that country. For the administrative organization of the force Mr. Haldane adopted the principle of Territorial areas and organized, on a county basis, local committees which controlled the funds allotted for the Territorial Force.

The total organization comprised 14 divisions, 14 mounted brigades, with 25 unattached Infantry battalions and R.A. and R.E. for Defence works. The number of R.E. units required was 28 Field Companies and 14 Divisional Telegraph Companies for the 14 divisions, with 23 Works Companies and 19 Electric-Light Companies for the Defence work. The organization of the above

into battalions varied with each locality and according to the previous distribution of Engineer units, but eventually the Field units were grouped into fourteen battalions, for each of which a regular Adjutant and small permanent staff were provided by the R.E., while the Works and Electric-Light Companies were affiliated with the local R.E. units.

There were also five groups of Telegraph Companies for Communications, each with an R.E. Adjutant, two corps of Electrical Engineers (London and Tyne) and the Engineer and Railway Staff Corps.

The above organization took some time to settle down. A good deal of discussion centred on the position in the defence scheme of the London Electrical Volunteers and the Tyne Electrical Volunteers, whose establishments were considerably in excess of local requirements, and who were providing detachments on mobilization for the southern defended ports. Eventually both Corps were retained.

This completes the account of the changes introduced by Mr. Haldane. The narrative of events is continued in the next chapter.

CHAPTER IV

NARRATIVE 1908 TO 1914

Position in 1908—Liaison with French—Scheme for Line of Communications in France—Discussion with General Staff—R.E. units for L. of C.—Brig.-General R. M. Ruck succeeded by Brig.-General Rainsford-Hannay—Major-General G. Barker succeeded by Brig.-General F. C. Heath—Directorate of Barrack Construction put under M.G.O.—Siege operations—Bangalore torpedo—Bridging—Explosives—Changes in Signal Service—Committee under Brig.-General A. J. Murray—Difficulty in maintaining personnel of R.E. units—Kitchener Committee—Recommendations—Introduction of Pioneers—Courses at S.M.E.—Increase of Field Companies recommended but not approved—Postal Service—Organization of services behind the Field Army—Grouping under Directors—Agadir—Mobilization arrangements reviewed by Mr. Haldane—Changes at Admiralty—Discussions in Committee of Imperial Defence—Brig.-General F. Rainsford Hannay retired under age clause—Succeeded by Brig.-General G. Scott-Moncrieff who was promoted Major-General—Retirement of Major-General R. M. Ruck—Changes in organization of D.F.W's. Office—Retirement of Sir William Nicholson—Nicholson raised to peerage—Brig.-General G. H. Fowke appointed Inspector of R.E., succeeded as A.A.G. by Colonel R. S. Curtis—New organization of Signal Service—R.E. Field Squadron formed—Air Battalion formed—Royal Flying Corps formed—Increase of Works services for Flying Corps—Printing, Lithographic and Photographic units—Barrack work and sanitation.

This chapter links up with Vol. III, Chap. I.

In 1908 the Army was beginning to settle down after the three changes of organization introduced by three successive Secretaries of State. From 1908 to 1914 the framework of the Army Council and the organization of Commands at home and overseas remained nearly the same, except in South Africa, though the Army was by no means stable and changes were still being made in units and strengths.

Early in 1908 Austria absorbed the countries of Bosnia and Herzegovina; Austria was at this time a member of the Triple Alliance and this arbitrary act alarmed the members of the Double

alliance—Russia and France. France, therefore, approached the British Government to ask how far the latter would support her if war became imminent, and a joint meeting of the military staffs of both nations was arranged to discuss details of disembarkation and railway time-tables in the event of a part of the British Expeditionary Force being sent to France. It is only necessary here to consider how this decision affected the Engineers.

In connexion with this discussion the Administrative branches of the Army began to prepare a scheme for the organization of the Line of Communications of an expeditionary force operating with the French Armies on the western frontier of Belgium. Up to this time the War Establishment Committee at the War Office had been working on a theoretical Line of Communications consisting of a base, a line of railway, 100 miles long, with a railhead, from which extended two roads, each 30 miles long, each ending in an advanced depot. The only R.E. organization so far prepared was the Chatham Works Company (29th), for which a war establishment had been arranged to provide (1) a store depot office and workshop at the base, (2) a store depot office and workshop with the headquarters of the company at railhead, and (3) two advanced store depots. When it came to apply this theoretical organization to the conditions in France, a decision was arrived at that there would be three bases for the disembarkation of troops and stores, which were later fixed at Boulogne, Havre and Rouen. The R.E. then asked for instructions from the General Staff as to what form of Engineer organization would be required for this Line of Communications area and suggested that this should take the form of the ordinary R.E. peace organization and that there should be a senior officer of R.E. as C.R.E. at each base and railhead and other officers under them in charge of stations or areas as required. In reply the General Staff stated that the French Government had undertaken to carry out all administrative work connected with the landing of the troops, their movement by rail to the selected position and all movements of reinforcements or stores up to railheads. In reply to this it was pointed out that, even under these conditions, it would be desirable to have officers of the R.E. detailed to each base, to act as liaison officers between the French authorities and our Army.

Eventually as a compromise, the Assistant Adjutant-General R.E., Colonel F. C. Heath, arranged to keep about thirty officers of the R.E. detailed for work on the Line of Communications on mobilization and also specially to tell off the two Fortress Companies (20th and

42nd), employed in peace on works at Portsmouth and Plymouth, for duty on the Line of Communications if required.' This was approved and later, in 1913, a war establishment was prepared for these two companies which included some horsed transport. But no war establishment was prepared for the R.E. officers and no subordinate staff was detailed for work under these officers.

Meanwhile the General Staff had prepared the war establishments for the headquarters of the Army and for a subordinate headquarters for a Corps of two or more divisions. But instead of the organization for the R.E. which had been recommended by the Evelyn Wood Committee, following the experience of the South African War, the only representative of the R.E. on the Headquarters Staff was one Brigadier-General, and there was to be one Colonel on each Corps Staff. It was laid down that these officers were to be advisers only and thus to have no administrative or executive functions. Each officer was assisted by one clerk and was allowed two batmen. A similar arrangement was made for the senior officers of Royal Artillery and the absence of responsibility was emphasized by the allotment of one motor-car to be shared by the two senior officers of R.A. and R.E.

The R.E. officers in the senior positions were hardly able to take such an organization seriously, but their representations were met by the reply that, as the French had undertaken to carry out all administrative services for the British Army, there was no need for an Engineer organization for Works and the Engineer units with the Field Divisions were only fighting troops, for whom the necessary orders would be issued by the General Staff.

At that time in spite of the warnings of many responsible officers that the next war would be a war of positions, as shown by the experience of the Russo–Japanese War of 1904–5, the General Staffs of both the French and British Armies were convinced that any possible war would be a war of movements and manœuvres and that the effort required on both sides was so immense that a decision would be arrived at in two or three months and could not be extended beyond six or eight months without causing a collapse of world finance. When asked if there would not be intervals when troops would be resting in camps or billets, the reply of the General Staff was that any Engineer work required of this description would be carried out by a Director of Works under the orders of the Quartermaster-General of the Force.

Meanwhile some changes were taking place at headquarters.

In April, 1908, Brigadier-General R. M. Ruck completed the term of his appointment at the War Office. Although struggling with difficult conditions and with a reduced staff, Ruck had been successful in maintaining the efficiency of the Engineer organization. He had a difficult time at first in dealing with the changes introduced by the Esher Committee and Mr. Arnold-Foster, and had been successful in obtaining many modifications in these proposals, notably in saving the Aeronautical Service which was threatened with extinction. He consistently protested against the reduction in the status and pay of the senior officers of the R.E. When Mr. Haldane came to the War Office the conditions became less difficult.

On leaving the War Office Ruck was promoted Major-General and appointed Major-General in charge of Administration, Eastern Command. He was later given the dormant appointment of Inspector-General of Communications for the Expeditionary Force and acted in that capacity in the manœuvres of 1911.

He was succeeded at the War Office by Colonel F. Rainsford-Hannay, who was given the rank of Brigadier-General on appointment. Rainsford-Hannay had had considerable experience in the War Office, first as Inspector of Submarine Defences and then as A.I.G.F. After leaving the latter appointment in 1904, he had been in succession Chief Engineer in Ireland and Commandant S.M.E.

Later in the year the Inspector-General of the Forces, H.R.H. the Duke of Connaught, completed the term of his appointment and was succeeded by Sir John French, and at the same time Major-General G. Barker was replaced as Inspector R.E. by Colonel F. C. Heath, who was given the rank of Brigadier-General. Heath was followed as A.A.G., R.E., by Colonel J. L. Irvine, then O.C. Troops and Companies, Aldershot.

At the beginning of 1908 a change was made in the position of the Directorate of Barrack Construction. This Directorate had been organized on a purely civilian basis and was entirely centralized. Instead of appointing officers in each Command to supervise works in progress, the Director retained all his officers in London and employed "clerks of works" for the local supervision of contractors. He refused to make use of any of the staff who had been working under the R.E. His work was also undoubtedly hampered by the closing down of the Barrack Loans, which had been in use for the previous twenty years and which were not nearly exhausted. Whatever the reason, the result was a considerable slowing down of the progress

of the various building schemes then in hand. The General Officers in command of areas, who had been encouraged to interest themselves in the progress of barrack accommodation, not only found their local schemes were delayed but could not find anyone on whom they could put the blame. There was thus a general protest against the working of the new branch and a demand for the return of the Royal Engineers.

In the result the Directorate of Barrack Construction was transferred, at the end of 1908, from the control of the Civil Under Secretary of State to the control of the Master-General of the Ordnance. At the same time the ruling that this Directorate should undertake all services at home, of £2,000 and over, was modified and it was decided that the allotment of services for execution by the D.B.C. and D.F.W. would be arranged each year by the M.G.O. after consultation with these officers.

Following these changes there was a steady improvement in the training and equipment of the whole Army, in which the R.E. had an important share.

Among many investigations and committees on details of units and equipment, reference may be made here to the consideration of methods of siege operations, which had been brought to the front by the Russo-Japanese War of 1904.

The conduct of such operations had always been a prominent duty of the R.E. and the courses of Fieldworks, for both officers and men, at the School of Military Engineering, included training in the details of sapping and mining, the construction of earthworks and bomb-proof cover. The question was discussed at some length by the Evelyn Wood Committee of 1905, and in 1908 a Committee under Colonel L. B. Friend was formed to consider siege warfare and made some recommendations, among which was one that the two Fortress Companies at Portsmouth and Plymouth as well as the Siege Companies of the Monmouth and Anglesey Special Reserve should be specially trained in siege work.

Combined operations for practising the conduct of a siege were carried out at Chatham.

The difficulty of attacking earthworks by field artillery, especially in view of the flat trajectory of modern types, was by that time fully realized by R.E. Officers. As early as 1900, Major L. C. Jackson, R.E., the Instructor in Fortification at the S.M.E., suggested the use of trench mortars and hand-grenades as likely to be required in the future.

The increased use of barbed wire in South Africa not only produced a demand for better wire-cutters, but started the development of methods for cutting through the wire barrier by the use of explosives. One of the best of these was the Bangalore torpedo, designed in India by Major R. L. McClintock, R.E.

The whole of the equipment of Engineer units, including the patterns of special Engineer vehicles, was reviewed and improved during the period covered by this chapter; so that it may be claimed that, though the number of the R.E. allotted to the Field Army was much below that asked for by the best Engineer opinion, the actual training and equipment of the units allotted had reached a very high standard. Further details are given in Chapter XIII.

At the end of 1908 an important change was inaugurated in the organization of the Signal Service of the Army. Signalling by flags and lamps had been originally started by the R.E., but in 1876 this duty had been transferred to the Infantry, and a School of Signalling, which developed a very efficient visual system, had been formed at Aldershot. This was used for all the internal communications of brigades and also for general Army purposes, in co-operation with the R.E. Telegraph units. A serious disadvantage of the system was that it attracted many of the keenest Officers and N.C.Os. of the Infantry, so that battalions found on mobilization that these officers and men were withdrawn for their special duty. Also the increased efficiency of telephones, which were only gradually coming into use for Army purposes, made it desirable to include this instrument in the Army organization. The Evelyn Wood Committee two years previously had recommended an amalgamation of the R.E. Telegraph units with the Signal Service and this proposal was now taken up by the General Staff, and a Committee was formed under the Presidency of Brigadier-General A. J. Murray, then Director of Military Training, to consider the whole question. The R.E. members of this Committee were Colonel J. L. Irvine and Major E. G. Godfrey Faussett. The Committee recommended that the R.E. should be responsible for a combined Telegraph and Signal Service with establishments which would involve an increase of the R.E. by about 800 men. But, as a temporary arrangement, some of these were to be found from the trained Infantry signallers and about twenty-five Infantry officers were to be attached to the R.E. for the new organization.

Meanwhile considerable difficulty was being found in maintaining the personnel for the ordinary units. In 1902 the terms of enlistment

for the dismounted R.E., except certain groups, had been altered from the previous seven years with the colours and five in the reserve to the short service of three years with the colours and nine in the reserve, with the option later of extending to seven with the colours ; but it was found that the number who so extended was insufficient to provide the drafts for Fortress units abroad. During the period from 1902 onwards various experiments had been made in the pay of the ordinary soldier, service pay had been granted and then converted to proficiency pay, while good-conduct pay was cancelled. In the result the pay of the Infantry was considerably increased, but the pay of the R.E. was reduced by the loss of good-conduct pay. One consequence of these various changes was that recruiting for the R.E. had fallen off and it was found impossible to maintain the establishment and quite impossible to provide for any increase. Further, as the garrisons of stations abroad had to be maintained, and the strength of Fortress (general service) Companies at home had been reduced to a minimum, this deficiency fell largely on the Field Companies at home.

With the increased standard of training now being called on from all branches of the Army, there was an increased call on the Field Companies to assist in the training of Infantry during the summer months. The peace establishment of these companies was small, but the actual strength sometimes fell to only 45 per cent of that establishment. The Adjutant-General who was responsible for personnel was now regretting the loss of the 1,200 men, reduced in 1906 and 1907, so that in 1909 and 1910 an increase of the establishment by about 500 men was approved, but this was insufficient.

In 1911 the whole question was referred to another Committee under the Presidency of Field-Marshal Lord Kitchener.

This was the last of the big Committees which investigated the organization of the R.E. before the Great War. It is interesting as illustrating what is called the swing of the pendulum. During the preceding nine years the R.E. had been on the defensive against criticism and demands for reduction, which, if they sometimes originated from the Secretary of State, were supported by the General Staff. Now the pendulum was swinging the other way and it was the heads of the branches of the General and Adjutant-General's Staff on whom, under the Army Council system, fell the responsibility of maintaining an efficient Army, who were asking for increases in the Corps of Royal Engineers to enable this latter

to carry out that development of military engineering which the growth of modern science had made necessary.

The members of the Committee were :—

Lord Kitchener, Chairman ; Brigadier-General R. F. C. Carleton, Director of Recruiting and Organization ; Major-General Sir A. J. Murray, Director of Military Training ; Mr. W. P. Perry, Director of Financial Services ; Brigadier-General F. Rainsford-Hannay, Director of Fortifications and Works ; Major-General R. M. Ruck, in charge Administration, Eastern Command ; Brigadier-General G. K. Scott-Moncrieff, Chief Engineer, Aldershot. Mr. C. F. Watherston was Secretary.

The Committee first met in May, 1911, and held twenty-three meetings. The case for the Adjutant-General's Staff was stated by Brigadier-General G. Ellison, who had just relinquished the appointment of Director of Organization, while a number of the senior officers of the Corps also gave evidence.

In their final report, which was dated 29th August, 1911, the Committee considered that aeronautics, now that flying was emerging from the experimental stage, the postal services of the Army and the traffic duties connected with railways, should be no longer considered as part of the work of the R.E. They recommended that the Signal and Communication Service should remain under the R.E. and confirmed the organization proposed by Sir A. J. Murray's Committee. They recommended that the Field Searchlight Company should be broken up and the equipment put into reserve, but added that no other engineer duties could be reduced or transferred to other branches of the Army.

In the war organization of the Royal Engineers with the Field Army, the Committee recommended an increase in the number of Field Companies with each division from two to three and also that the bridging material which accompanied the Field Companies should be formed into Divisional Bridging Trains.

A good deal of evidence was taken on the employment of Field Companies on works. Brigadier-General A. E. Sandbach suggested that if the training of N.C.Os. and men of the Field units was limited to what may be called field engineering and military bridging, the time required for training could be considerably shortened. All the other Engineer officers examined, took the view that the essential characteristic of the R.E. was the enlistment of " tradesmen " as distinct from " labourers " and this view was supported by Brigadier-General Ellison, who added that, as recruits were enlisted at an early

age, the men must be given opportunities of practising and improving their skill at trades while in the service. It was therefore agreed that the men of the Field Companies must be employed on Works outside the training season, and Brigadier-General Scott-Moncrieff gave interesting details of the financial saving which had resulted at Aldershot from the employment of the Field Companies on Works during the winter months. Other officers who had tried a similar experiment agreed with this but pointed out the very small number of men who could be detailed for such work, owing to the calls of foreign service, leave, etc. Some officers therefore suggested that the Field Companies should be relieved of the necessity of finding foreign drafts.

Another proposal made by Brigadier-General Ellison was that recruiting would be helped by the enlistment of men of good education as " pioneers," who could be taught a trade in the service and that this suggestion would reduce the cost of the Engineer units, which was considerably higher than that of an equal number of Infantry.

In the result the Committee accepted this view and recommended the introduction of a new grade for Engineer pay under the heading of " pioneer." Pioneers to be drawn from men of above the normal intelligence of Army recruits ; the number of such men not to exceed 50 per cent of the establishment of Field Companies. Signal and Works units were also to include a proportion of pioneers.

There was no time between the date of this Committee and the opening of the Great War to test the value of this recommendation, but it seems doubtful if it had any practical effect on recruiting. There is no such trade as " pioneer " in civil life and the term was used to describe young men with some capacity for learning a trade, but, as will be seen from Chapter VIII, the majority of recruits for the R.E. were already drawn from this class. Also with a system of voluntary enlistment, there was no procedure for selecting men of above the normal intelligence from the ordinary Army recruits.

In discussing the question of the peace establishment, the Committee seemed to consider themselves bound by the same limitation as previous Committees, that under no conditions was it permissible to recommend any increase in the establishment of the R.E. as it existed at the date of inquiry. In order to obtain the extra officers and men for the additions they recommended for Field and Signal units, it was therefore necessary to make reductions in some other branch, which could only be the Fortress Companies. As explained

above, these companies which were organized on station establishments, included two distinct classes, men trained for electric-light work and men not so trained but required in time of war for Works and land fronts. Both classes were composed of tradesmen, and it was suggested that as the electric-light men could execute works, the separate works men could be reduced.

The Committee therefore recommended a reduction of the R.E. in Fortress Companies of 150 men at home and 600 men abroad, leaving details of how this reduction was to be effected for further consideration. They suggested that this reduction would so reduce the call for drafts that the Field Companies need only be called on for the reliefs for the three Field Companies abroad.

In order to enable the officers commanding Field Companies to give their whole time to training during the summer months, they recommended that these officers should be relieved of responsibility for the charge of an Engineer division.

They discussed the numbers required for railway work and recommended the retention of two R.E. Companies at Longmoor for railway construction work, also the retention of the two companies of the Royal Monmouth Special Reserve and one company of the Royal Anglesey, who were trained in railway construction. The staff required for control of railway traffic to be obtained from civil railway companies under a form of special reserve.

They referred in some detail to the important " works " which would have to be carried out by the R.E. on the Line of Communications, but beyond confirming the organization of the Works Company at Chatham they made no special provision of Engineers and staff for the Line of Communications work.

The Committee gave considerable time to an investigation of the courses of instruction for officers at the S.M.E., Chatham; reports were obtained from all the instructors and comments were added by Colonel J. E. Capper, who had just been appointed Commandant. Two points in these reports are noteworthy. Major A. M. Henniker, Chief Instructor in Construction, pointed out that engineer works on the Line of Communications are hardly mentioned in the histories of campaigns and cannot be practised on manœuvres. They were, therefore, often entirely overlooked, though they require more Engineer officers than the Field Army itself. Much of the course of the Construction School was essential for the Field Company officer, such as details of trades, the use and supply of tools and materials, water supply or sanitation. The

course was designed for general building and engineering for military purposes and the time which was given to what may be called peace work covered only some ten to twelve days.

Major A. H. Dumaresq, the Instructor in Electricity, pointed out that, though the science of electricity had increased enormously, the time included in the compulsory course for all R.E. officers had been cut almost to vanishing point.

In their final report, the Committee recommended some alterations in the detail of the young officers' courses at the S.M.E., increasing the total period of the course by about six months.

The above summary only covers the salient points of the report. Taking a general view, the recommendations of the Committee as regards the future of the Aeronautic and Signal Service, which were adopted, marked a definite advance in the efficiency of the Army. But except for the increase of the courses at the S.M.E., the remaining recommendations for increases were either dropped or negatived. The additional Field Companies asked for were not granted, and one of the two Field Companies (54th) in South Africa was brought home and would have been broken up if the war had not started. A reduction recommended in the establishment of the Field Troops was approved. The reduction of the Fortress Companies abroad was not carried out, and was really impracticable. Although the Electric-Light personnel could be employed on Works in peace, they would in war-time be fully employed on their special duties, so that it was essential to have an additional body of R.E. for the work required in conjunction with the Infantry on the land fronts. The experience of the Great War fully justified this contention and when the threat to our overseas defences had been met by the disappearance of hostile ships from distant seas, these Fortress units were withdrawn and gave a very welcome reinforcement to the Field units.

The employment of the Field Companies on Works was approved, but the officers commanding these companies were relieved of the charge of Engineer divisions so that they could give their whole time to training. The employment of these officers in charge of divisions had been part of General Ruck's scheme for Works, on the assumption that the Director of Barrack Construction would be responsible for barrack maintenance as well as for new services.

The withdrawal of the Postal Service from the R.E. was not carried out. This organization was formed on a special reserve basis from employees of the General Post Office and, when their status was

discussed, the officials of the Post Office represented that they had a long association with the R.E. through their joint work in connexion with the Telegraphs and Telephones and asked that the Postal Service should continue to be considered as part of the Corps.

During this year, 1911, a detail was published of the organization of the services behind the Field Army which considerably affected the Engineers.

In this organization, grouping by Corps was abandoned and groups were formed according to the work to be done. For the Engineers there were to be groups for Signals, Railways, and Works. Each of these groups was to be under a Director, with the rank of Colonel or Brigadier-General, each Director to have one Deputy and one Assistant, both Colonels. This staff was to work in two parts, one of which was to be under the control of the Director, with the Assistant Director under him, and the other was to be under the Deputy Director. A small office staff was allotted to each part.

It was further laid down that one part was to be with the Army Headquarters, and one with a senior officer called the Inspector-General of Communications, who was to command and co-ordinate all services behind the Field Armies. It was left for local decision as to whether the Director should be with Army Headquarters or whether he should be on the Line of Communications, and be represented at Headquarters by his deputy. Each Director was also to be under the control of one of the three senior Staff Officers at Army Headquarters; the Director of Signals was to be directly under the Chief of the General Staff; the Director of Railways and the Director of Works were to be under the Quartermaster-General.

It will be seen that this organization cut across the peace organization of the Army; it did not follow the Army Council distribution of duties, as the Master-General of the Ordnance was not represented. Also it did not follow the peace organization, under which a General Officer in charge of Administration commanded and co-ordinated all the Administrative services, including the personnel, ordnance, engineering, supply and transport. Further, the arrangement under which the Directors of Services were partly under the Inspector-General of Communications and partly under the Headquarter Staff was likely to cause confusion. It was, of course, fully realized that the General Staff must control policy,

but this does not necessarily imply that they should issue detailed instructions on technical questions.

No establishments were prepared for the officers and men working under these Directorates and it seems to have been assumed that the ordinary peace organization would be followed.

During the year 1911 there was another war scare on account of the action of the Germans at Agadir. Mr. Haldane caused the whole of the preparations for the dispatch of the Expeditionary Force to France to be reviewed and found to his surprise that, while the military preparations were well advanced, the details of the cross-Channel movement of the Force, for which the Admiralty was responsible, had not been prepared. He brought the question to the notice of the Prime Minister and the Imperial Defence Committee, with the result that there was a change in the Cabinet and Mr. Winston Churchill was appointed First Lord of the Admiralty with a definite mission to form a General Staff for the Navy to work in concert with the General Staff of the Army. The result of the combined action of these Staffs was shown three years later in the very successful way in which every detail of the movement of our Army overseas was foreseen and provided for.

In 1911 a change was made in the status of the Director of Fortifications and Works. It has been stated above that one of the changes introduced by the Esher Committee had been a decision that all appointments as Directors at the War Office or the heads of services in Commands must be held by officers below the rank of Major-General. The inconvenience of this system in compelling the surrender of their appointments, if officers were selected for promotion, had already been recognized and in several cases the rule had been broken by the retention of such officers to complete the usual four-yearly period of employment. But the rule that officers of the substantive rank of Colonel must retire at the age of 57 was strictly enforced.

In September, 1911, Brigadier-General F. Rainsford-Hannay reached the age of 57 and, there being no vacancy for his promotion to Major-General, was compelled to retire after holding the appointment for three and a half years. His period at the War Office had been one of steady progress, the picking up of loose threads and the putting into practical effect of the decisions discussed in the previous chapters. One noteworthy event was a revision of the *Regulations for Engineer Services*, which was edited by Major A. M. Henniker, R.E.

Brigadier-General Rainsford-Hannay was succeeded by Brigadier-General G. Scott-Moncrieff who was then holding the appointment of Chief Engineer, Aldershot. Scott-Moncrieff had had considerable experience of active service and had also specialized in Barrack construction. He had held the appointment of Instructor in Construction at the S.M.E. and, from 1906 to 1910, had been A.D.F.W. at the War Office, in charge of the branch dealing with Barracks. He was thus the obvious choice for the appointment of D.F.W., but he was only about twelve months younger than Brigadier-General Rainsford-Hannay and thus would come under the age rule after only twelve months in the appointment. While considering his selection the Army Council decided that, if promoted, Brigadier-General Scott-Moncrieff could continue in his appointment, but that such promotion would be dependent on the occurrence of a vacancy in the Generals' list into which he could be promoted. He was appointed on these conditions and the following year when he was reaching the age limit no vacancy had occurred. On hearing of this difficulty, Major-General R. M. Ruck, who had still some months to run before the completion of his appointment in charge of Administration, Eastern Command, offered to retire voluntarily on the understanding that the vacancy thus created would be filled by the promotion of Scott-Moncrieff. This offer was accepted. It was in this rather unusual way that the status of the head of the Corps at the War Office was raised to that of a Major-General.

One rather unexpected result followed from this change when, a little later, the appointment of Master-General of the Ordnance fell vacant. The Artillery officer selected for the appointment was Colonel S. B. Von Donop, who was thus junior to Scott-Moncrieff. The latter was approached as to whether he would object to serving under an officer of junior rank and replied that of course he would not object. Colonel Von Donop was given the rank of Major-General on appointment and represented the Engineers on the Army Council, but he left the details of Engineer questions to the D.F.W. to a much greater extent than his predecessors had done.

Major-General Scott-Moncrieff made some changes in the organization of his office. Up to this date it still had the organization, started in 1905, of three larger divisions under Colonels and two smaller technical divisions under the Inspector of Electric Lights and Inspector of Iron Structures, these officers having the rank of Major. Colonel J. W. Cowan, who was the President of the R.E. Committee and also the head of the branch dealing with rifle ranges,

lands and the Staff for Engineer Services, was due to retire under the age rule. Cowan was an expert rifle shot and Scott-Moncrieff was anxious to retain him for the special work connected with rifle ranges for the Territorial force, for which a considerable extension was in progress. To provide for this without increasing the number of branches, the D.F.W. combined the Electrical and Machinery divisions under Colonel W. R. Stewart who had succeeded Cowan and reduced the status of the heads of these branches to that of Staff Captain. The Chief Engineer, Aldershot, was at the same time appointed *ex-officio* President of the R.E. Committee, but the Secretary of the Committee remained in the War Office, as the head of a subdivision under Colonel Stewart.

In 1912 Sir William Nicholson, who had been promoted Field-Marshal in June, 1911, completed his service as Chief of the Imperial General Staff and was succeeded by General Sir John French. On retirement Nicholson was given a peerage under the title of Lord Nicholson of Roundhay.

In June, 1912, Lord Haldane, who had been raised to the peerage the previous year, was appointed Lord Chancellor. Haldane was succeeded as Secretary of State by Colonel J. Seely, but remained a member of the Imperial Defence Committee.

The appointment as Inspector of Royal Engineers, which had been held since September, 1908, by Brigadier-General F. C. Heath, was given in September, 1912, to Brigadier-General G. H. Fowke, who was succeeded as A.A.G., R.E., by Colonel R. S. Curtis. These Officers were holding these appointments on the outbreak of war in August, 1914.

Meanwhile effect was being given to the two big changes approved by the Kitchener Committee, the new organizations for the Signal Service and the Flying Corps.

The changes in the Signal Service began with the appointment of Colonel R. S. Curtis as Commandant of the Signal School at Aldershot (followed in 1913 by Lieut.-Colonel J. S. Fowler), and the existing Telegraph and Signal Services were amalgamated to form various units on mobilization (see Chapter XIII).

With the formation of the Signal Service, the appointment of a Lieut.-Colonel at Aldershot, under the title of O.C. Troops and Companies, was abolished, the command of the Mounted Depot devolving on a Major. There remained three Lieut.-Colonels R.E. at Aldershot, namely, the Commandant Signal School, and the C.R.Es. of the 1st and 2nd Divisions. The senior of these acted as

O.C., R.E., for charge of the Officers' Mess and the Regimental Establishments; the appointment of the Adjutant R.E. was continued.

The four Field Troops with the Cavalry Brigades were formed into a squadron under the command of a Major who was also the C.R.E. of the Cavalry Division. The appointment of a Lieut.-Colonel as C.R.E. was abolished.

In October, 1909, the administration of the Balloon Factory had been divorced from the military side; the Commandant Balloon school ceased to be in charge of the Factory, and a civilian, Mr. Mervyn O'Gorman, was appointed as the superintendent, working directly under the Master-General of the Ordnance. Colonel Capper remained as Commandant of the Balloon School until October, 1910, when, although an air expert of world-wide reputation, he had to leave the aeronautical service on completion of the regulation period of five years as a substantive Lieut.-Colonel and promotion to substantive Colonel, the post being a regimental one. He was succeeded by Major Sir Alexander Bannerman.

In April, 1911, the Balloon School was reorganized as the Air Battalion, R.E., with an establishment of 14 officers and 182 other ranks, including 6 officers of other corps. This was a prelude to the expansion of the aeronautical service which was anticipated consequent upon the rapid advances which were occurring in the development of aviation and the probable formation of a separate air arm. The Air Battalion had the duty of training officers and men in the handling of all forms of aircraft and providing a body of expert airmen from which air units for war could be organized. It was supplemented by an Air Battalion Reserve of up to 100 officers who had qualified as aeroplane pilots at civilian flying schools and would be called up in due course for further training. At the same time the Balloon Factory was renamed the Aircraft Factory.

The war scare of the summer of 1911 accelerated the expansion and the formation of a separate air arm. In the spring of 1912 the Royal Flying Corps was formed, to contain Military and Naval wings* and a Central Flying School. The establishment of the Military Wing was 112 officers and 893 other ranks, with a considerable scale of aircraft, equipment and mechnical transport. It was inaugurated on 13th May, 1912, and took over from the Air Battalion, the bulk of whose officers and men transferred to the

* The Naval wing shortly became the Royal Naval Air Service and the designation " Military Wing " was abolished.

R.F.C. The responsibilities of the Royal Engineers for military aeronautics had now ended, after providing a foundation for the new air arm.

In his autobiography Lord Haldane assumed credit for taking military aeronautics out of the hands of the Master-General of the Ordnance and the Royal Engineers. Such an expression is hardly fair to the valuable pioneer work done by the Royal Engineers and attached officers since ballooning was first introduced into the Army in the late 1870s, and especially to the work done by Colonel Capper between 1903 and 1910, and his colleagues and successors in the Balloon School and the Air Battalion up to 1912, not only in improving ballooning equipment and technique, but in the introduction of kites, the construction and operation of three experimental airships, early experiments with aeroplanes, and the commencement of military flying with the few machines that could be obtained. That the development of airships and flying had not proceeded further and faster was not due to any want of skill or zeal in the Engineers, but to the very small allotments of funds placed at their disposal for air work, the disbelief in the practicability of aeroplanes which had prevailed in the highest quarters, and the hampering effects upon their efforts by the divorce of the Balloon Factory from the military side in 1909. The Balloon School and the Air Battalion were dependent upon the Factory for the issue of aircraft and major repairs and overhauls, for which they had no facilities, while under the new régime the Factory had as its main object concentration upon research and experiments in the design of aircraft and their components (from which valuable results were in the event achieved), and had no co-ordinatory incentive to treat the upkeep in aircraft of the military side for training purposes as one of its first responsibilities. In 1909 before the separation the total annual cost of the army aeronautical service, including all personnel and equipment of the Balloon School and the Balloon Factory, was approximately £30,000. In 1914 the allotment for military aviation, including the Flying Corps and the Aircraft Factory, but excluding provision for airships, which had then become the sole prerogative of the Navy, was £1 million.

Although the air service had been divorced from the Corps in 1912, the works Branch had much to do to provide for the rapidly growing establishments of the R.F.C. By an arrangement in the War Office the construction of barracks and officers' messes for the R.F.C. was undertaken by the Director of Barrack Construction;

but the provision of landing grounds with their aeroplane sheds, workshops and other buildings was allotted to the R.E., and within two years extensive projects had been carried out or were in hand on Salisbury Plain and at Montrose, Farnborough, Dover, Orfordness and Portsmouth. The total works estimate for these services in 1914 was £500,000.

In 1913 following the appointment of Major-General Sir John Cowan as Quartermaster-General, the Directorate of Movements and Quarterings, first formed in 1904, was broken up and the work under the Q.M.G. was formed into two Directorates. The first of these was called the Directorate of Supplies and Quartering, under whom there was a Quartering Subdivision, which dealt with barrack policy and was responsible for the appropriation, occupation and equipment of barracks, hospitals, etc. There was no representative of the R.E. in this branch. The second Directorate was called the Directorate of Transport and Movements and included subdivisions for Movements and Railway Transport and for Transport (excluding railways). Under the first of these the railway work was in the charge of Captain H. O. Mance, R.E., who was graded as a Staff Captain. In the second, Captain A. E. Davidson, R.E., was employed as Secretary of the Mechanical Transport Committee.

In addition to the various units referred to above, war establishments were prepared for three small units to be formed on mobilization for printing, lithography and photography. The first of these accompanied the Army Headquarters, the other two were to be sent out if required. The personnel for these units was drawn from the School of Military Engineering, Chatham, where schools of instruction had long been formed for each subject. The war equipment of the Printing section included a specially designed and fitted vehicle which carried the technical plant and could be used as a working office in the field.

During the years from 1911 to 1914 there were many changes in the personnel of units, decreases were made in the personnel of the Field Troops, the Search Light Company was broken up and, as establishments were released, additions were made to the Signal Service. In the Army Estimates for 1914 the number of R.E. as voted was 1,057 officers and 9,187 other ranks.

While the above narrative deals mainly with the organization of the R.E. for the Expeditionary Force, all the normal activities of the Corps were continued. The number of R.E. officers paid by the Indian Government, which had fallen to 350 in 1902 owing to

the loan of officers for South Africa, was gradually increased till it reached 407 in 1914.

The work connected with the construction and maintenance of the defences of the coaling stations continued with increased vigour. The changes approved in 1904–5 were completed and a new programme for the close defence of docks and other important establishments was in progress during 1914.

A reference must be made to the work in construction of barracks. With the transfer of the Director of Barrack Construction to the control of the Master-General of the Ordnance, the Director of Fortifications and Works regained some part of his position as the adviser of the Army Council on barracks construction, and good progress was made in the design and provision of new barrack accommodation, especially in connexion with married quarters. The period covered by this chapter was noteworthy for the increased interest in sanitation, using this term in its wider sense. These improvements followed the remarkable development in medical science which started with Major Ross's discoveries in connexion with malarial fever. Another striking advance was the discovery of the cause and prevention of Malta fever.

Much more attention was now being paid to such questions as the ventilation of barrack rooms, the allotment of floor space and cubic space per man and the distance between beds. In all such questions the initiative came from the Royal Army Medical Corps, but the executive action fell on the R.E. If the former represented the head, the latter were the hands! The two Corps were brought together in the War Office by the Army Sanitary Committee, later called the Army Medical Advisory Board, which had been in existence for many years and on which the R.E. were represented by the A.D.F.W. in charge of barracks. The results of the joint work of the two Corps were shown in a marked improvement in the health of the Army and a reduction in the number of men detained in hospital.

CHAPTER V

THE ROYAL ENGINEERS IN THE COLONIES—CANADA—WEST AFRICA

Development of Colonies—Trading companies—British Government take charge—Engineer work in the Colonies—Last fighting in Canada—West African Settlements—Garrisons—West Indian Regiment—Military Police—West African Regiment—West African Frontier Force—West Indian Fortress Company, R.E.—Captain Montague Ommaney appointed Permanent Under Secretary of State—Mr. Chamberlain pushes on railways and roads—Gambia—Expedition against Fodi-Kabba, 1892—Lieutenant G. H. Boileau—Sierra Leone—Freetown fortified 1885—Lieutenant M. Nathan—Yonni Expedition 1887—Captain H. B. MacKay, R.E.—Expedition to Tambi 1892—Captain W. H. Robinson killed—Second Expedition—Expedition against Sofas 1893—Lieutenant C. W. Gwynn—Organized rebellion, 1898—Railway started 1899—Gold Coast—Ashanti 1873—Expedition 1896 under Sir Francis Scott—R.E. employed—Telegraph work—King deposed and fort built at Kumasi—Rising, 1900—Governor besieged in fort—Attempts at relief—Colonel Willcocks takes command—Lieutenant R. S. McClintock joins force—Captain E. P. S. Roupell—Kumasi entered and country pacified after severe fighting—Major M. Nathan appointed Governor—Boundary Commissions and Surveys—Major A. E. Watherston Commissioner Northern Territory—Died 1909—R.E. officers employed on Public Works—Major W. E. Lees—Major G. A. J. Leslie—Oil Rivers and Lagos—Lieut.-Colonel H. E. McCallum—Lieutenant E. V. Turner builds telegraph line to Jebba—Lieutenant R. L. McClintock clears Niger—Lieutenant R. S. McClintock continues telegraph work—Railway construction—Sir Percy Girouard Governor of Northern Nigeria—Boundary Commissions.

This chapter links up with Vol. II, Chap. XXIII (Ashanti War), Vol. III, Chap. VI, pp. 180, 194–9 (Survey) and pp. 203–9 (Boundary Commissions).

As explained in Chapter I, all through the period covered by this volume there was a series of small wars, mainly connected with the development of our Colonies. In such development, the Corps had an important part, both as soldiers and as engineers.

The growth of nearly all our Colonies followed a certain routine. There was first the stage of exploration, followed by a development of trade and the formation of trading companies with extensive rights of government. Then as trade increased trouble arose internally with the inhabitants and externally with other nationals who might be competing for the local trade; complications were also sometimes introduced by missionary enterprise. Trouble with the inhabitants led to military operations, usually conducted by local armed police, but if these were not successful an appeal was made to the Central Government and help given by naval and military forces. Trouble with other nations had to be settled diplomatically, sometimes by an exchange of territory, sometimes by a division. In either case sooner or later the Home Government had to appoint an official in charge, first as Consul or Commissioner, later as Governor, when the rights granted originally to the various trading companies were limited and finally cancelled.

In the early stages of the occupation of an uncivilized country the need for a special body of engineers is not apparent, there are no roads or railways, bridges are of primitive construction, maps are unknown and telegraphy represented by drum signals. Further the early traders and armed police soon found out for themselves the best methods of dealing with sanitation and water supply and the construction of a zariba, stockade or elementary forms of fortification. In this respect they followed the precedent of the Roman armies, of which it has been said that every man was an engineer. The tactical features of the country, which were mainly determined by the thick "bush," did not call for any elaborate survey. It is thus noteworthy that the earlier efforts of the Royal Engineers centred round the use of explosives to blow in stockades and that any work of the nature of field engineering was usually carried out by locally trained native tradesmen. Once the preliminary stages were past, increasing demands were made on the Royal Engineers for Survey work and Boundary Commissions and then as engineers to construct roads, railways and telegraphs, to provide water supplies, to lay out townships and construct Government buildings. Further, the nature of the climate prevented the continuous employment of Europeans for more than a few months at a time, so that it became necessary to undertake the training of the local native to carry on the permanent working of railways and telegraphs; or as one officer put it, to convert the somewhat bumptious, partly civilized natives of the coast towns into humble

and useful members of society. And there followed as a necessary sequence the formation of special Government departments to control the various engineer services, which in many cases were started by the Royal Engineers but eventually were all absorbed into the Colonial Civil Service.

Australia

In 1885 the Colonies of Australia and New Zealand had reached the stage of settled government. The important work done by officers of the Royal Engineers in the settlement of these Colonies is described in Volume II, Part II, Chapter V.

Canada

Canada also had reached this stage, but in 1885 there occurred the last rebellion of the Indian tribes led by a half-breed, Louis Riel. This was put down by an expedition of local troops under Major-General Sir F. Middleton, G.C.M.G. No British troops were employed, but the Royal Engineers were represented by Captain H. de H. Haig, R.E., then serving at Halifax, Nova Scotia, who was appointed Assistant Quartermaster-General to Middleton's force. Two graduates from the Kingston Military College, who took part in this campaign, joined the Corps, in 1886, as Lieutenants H. C. Nanton and P. H. du P. Casgrain. Captain Haig was thanked by the General Commanding and was Mentioned in Despatches for his services.

West Africa

In Africa, by 1885, we had established a firm hold on Cape Colony and Natal in the south, and in Egypt and its hinterland the series of campaigns were in progress which ended with the withdrawal from the Sudan in 1886. The details of these are dealt with in Volume II and Volume III of our *History*, and in *The Royal Engineers in Egypt and the Sudan*. The centre of Africa was still largely unknown and unexplored, but on the west coast of Africa there was a group of small settlements, many of them dating back to the sixteenth century. These were then known as The Gambia, Sierra Leone, Gold Coast, Lagos and The Oil Rivers. Of these the only one with a permanent British garrison was the Colony of Sierra Leone, where the harbour of Freetown was just being fortified as a base for our Naval squadron on the African station. As the climate of West Africa was then dangerous for Europeans, the garrison was

composed of a battalion of the West Indian Regiment recruited in the West Indies ; to this was added native Artillery and Engineers, in each case with a small group of British Officers and N.C.Os. The Engineer unit was a section of the West Indian Fortress Company. Detachments of the West Indian Regiment were from time to time stationed in the other Colonies, but the latter depended for protection mainly on some form of military police under British Officers and N.C.Os.

In 1898, consequent on the rebellion in the Sierra Leone Protectorate, a regular battalion of native troops, called the West African Regiment, was raised from two local tribes. It had a strength of 1,000 with 25 British Officers and 49 British Sergeants and other ranks and was organized in 10 companies. This was a regular Army unit paid and administered by the War Office.

In the same year it was decided to raise a native force in Nigeria, to be called the West African Frontier Force, and Colonel F. J. Lugard, who had had much experience of local fighting in East and West Africa, was selected for the command. The first force raised by Colonel Lugard in Nigeria was composed of two battalions, but in 1900, on the advice of a Royal Commission, this force, and all the local battalions in the West African Colonies, were brought into this organization which included the North and South Nigeria Regiments, each of two battalions, the Gold Coast Regiment of two battalions, the Sierra Leone Battalion and the Gambia Companies. Each unit was commanded by British Officers and N.C.Os. drawn from the regular Army on an eighteen months' engagement. These units were paid for by British funds, administered by the Colonial Office. The general command of the Force was vested in a senior officer called the Inspector-General W.A.F.F., who with an assistant had his headquarters in the Colonial Office in London, made periodical inspections and took command when larger operations were contemplated. The local regiments had attached to each a small battery of Artillery with 7-pr. guns and machine-guns.

During the operations in Sierra Leone and Gambia, the section of the West Indian R.E. Fortress Company at Sierra Leone and most of the R.E. officers at Sierra Leone took part in some of the small expeditions into the interior. During the Ashanti campaigns of 1873 and 1895 detachments of R.E. were sent out from England and rendered valuable service, and in 1898 and 1899 special detachments for telegraph work were sent out to start the system of telegraphs in Nigeria.

A local company of " pioneers " was raised in Nigeria in 1898, composed of natives, with a stiffening from the Madras Sappers and Miners, and a company of men with some trade experience was formed during the 1900 campaigns in Ashanti. Such companies were attached for administration to one of the local regiments.

In the development of these Colonies, the R.E. had an important share, in the person of Captain Montague Ommaney, R.E., who had joined the Colonial Office as third Crown Agent in 1877. When Mr. Joseph Chamberlain was appointed Secretary of State for the Colonies in 1897 he promoted Ommaney to be Permanent Under Secretary for the Colonies and from this association there began a new phase in our Colonial history. Ommaney had for some years been insistent in developing the engineer side of Colonial work, especially the construction of roads and railways, but financial difficulties had prevented any substantial progress. Mr. Chamberlain took a wider view and realized that financial expenditure of a capital nature was essential before the Colonies could develop. Arrangements were therefore made to push on the construction of roads and railways in both West and East Africa. From this period also dates the employment of Royal Engineer officers as Governors of Colonies, as will be seen from the following narrative.

The following short descriptions of the various Colonies, with a summary of the military operations and the work of the R.E. in each case, is arranged in geographical and not in chronological order, beginning from the Gambia and following round from the west to the south and east. This enables the work of the R.E. in each area to be presented as a whole. Only a few details are given to illustrate the work of the R.E.; such details could be repeated many times over. Also it must be remembered that all work was done under extraordinarily unfavourable conditions of climate; heavy rain which turned the paths into quagmires through which the force had to wade sometimes up to their breasts in water; no horse transport; all goods carried by native carriers, who had to be fed, doctored and protected from attack; no maps; much of the track in dense forest through which a path had to be hacked; insanitary conditions; diseases such as smallpox prevalent, and persistent attacks of malaria which prostrated all Europeans in turn; such are some of the conditions under which small groups of officers and men evolved some sort of order out of chaos and, by the development of roads, railways and telegraphs, brought peace and security into some of the most miserable areas of the continent.

The Gambia (see map opposite)

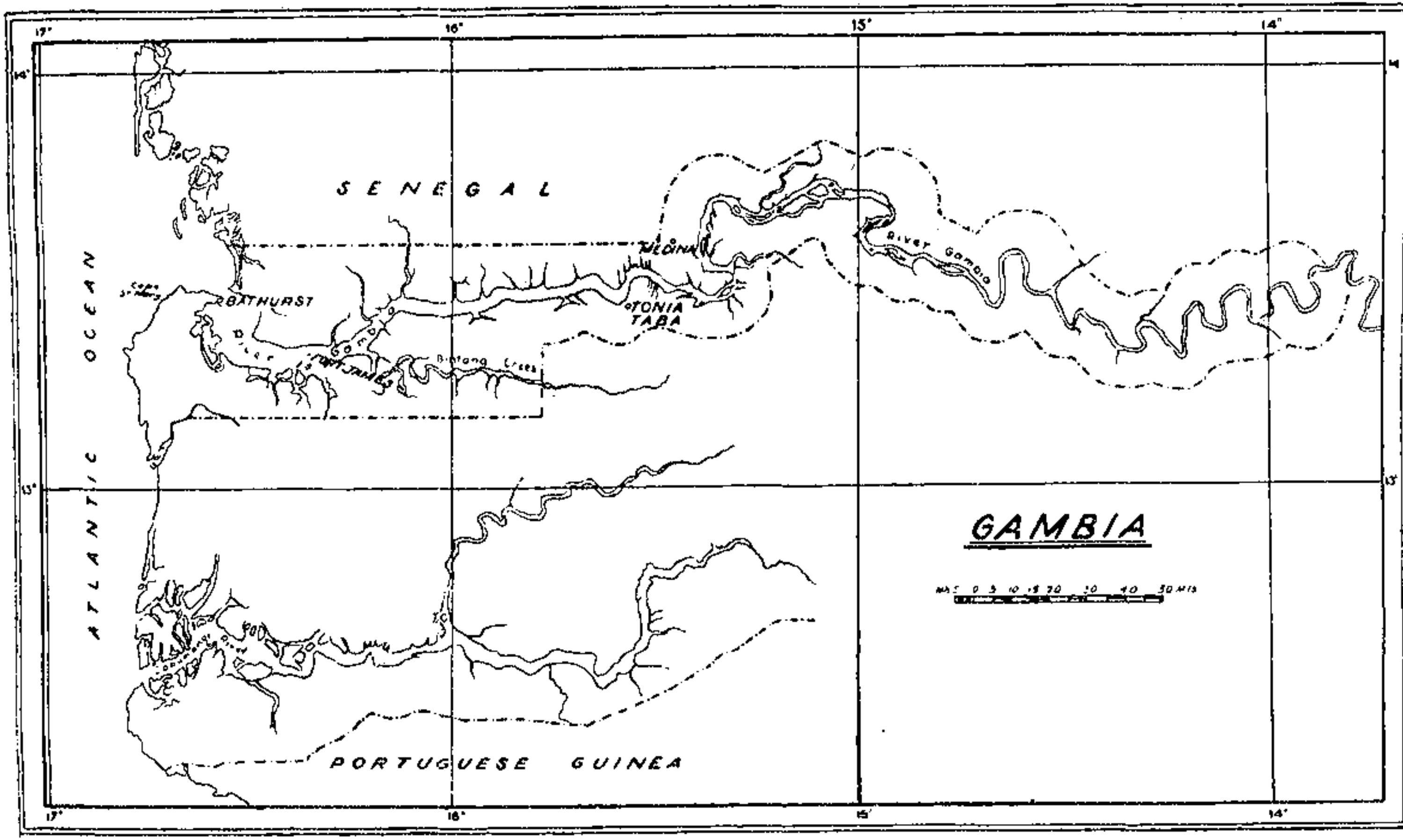
The first opening of British trade on the Gambia occurred in 1553 and, in 1618, a Charter was granted to the "Company of Adventurers of London trading in Africa." In 1664 a fort called Fort James was built on an island in the mouth of the river. During the seventeenth and eighteenth centuries there was intermittent fighting with the French, until in 1783, by the Treaty of Versailles, the British rights to Fort James and the River Gambia were recognized by the French in return for a recognition by the British of the French rights in Senegal.

In 1807, on the abolition of slavery, the Chartered Company surrendered its rights and the Gambia settlements were incorporated with Sierra Leone. In 1821 the Gambia was included in a group called the "West African Settlements" but was made independent in 1843, again to form part of the West African Settlements in 1866 and again separated in 1888. Finally a protectorate of parts of the interior was declared by Great Britain in 1889. These changes of government and grouping are typical of the story of all the West African Colonies up to about 1885.

From 1843 the settlements began to expand and there was trouble with the native inhabitants. In 1853 to 1854 there were numerous expeditions, carried out by the garrison of the capital—Bathurst—which was composed of two companies of the West Indian Regiment. From 1861 to 1887 there was unrest in the hinterland where the French were gradually getting control of the area at the back of our settlements.

In 1890 the first of a series of Boundary Commissions was assembled to demarcate the boundaries between ourselves and the French. Captain A. H. Kenney, R.E., was the British Commissioner.

In 1891 a definite effort was made to control the inhabitants in a part of the British area which, under a chief called Fodi-Kabba, had given trouble for some years to both the French and ourselves. A party of the West Indian Regiment was sent to the Gambia and in April, 1892, an expedition was dispatched, under Lieut.-Colonel Ellis, 1st West Indian Regiment, to a place called Tonia Taba. The composition of this force was typical of similar expeditions, it included three officers and fifty-seven men of the Royal Navy, ten officers and 308 men of the West Indian Regiment, one officer of the Royal Engineers—Lieutenant G. H. Boileau—with ten native Sappers from Sierra Leone, two officers of the A.S.C. and



GAMBIA
SENEGAL
ATLANTIC OCEAN
PORTUGUESE GUINEA
BATHURST
TONIA
TABA
River Gambia
Bintang Creek
17°
16°
15°
14°
13°

two of the A.M.S. The force had three 7-pr. guns and a rocket trough.

Captain Sloggett, R.E., commanding R.E. at Sierra Leone, should have accompanied the column but he was down with fever, so Lieutenant G. H. Boileau, who had only just returned from the Tambi expedition (see page 91), had to take his place. The party of ten native Sappers were drawn from the section of the West Indian Fortress Company at Sierra Leone. The R.E. were in charge of the rockets and carried about 200 lb. of gun-cotton ; the natives allotted to the R.E. carried a local cutting tool called the " machete."

The force reached Bathurst, 500 miles north from Freetown, by sea and transferred there to a gunboat which took them 200 miles up the Gambia River. They landed in canoes through a grove of mangroves and after a march of some miles in tropical heat through a fairly open country, reached their objective about midday. The country was unsurveyed and there were no maps, so they were dependent on native guides. Fodi-Kabba's capital was found to consist of two towns defended by a fence and stockade with a fort with mud walls 15 ft. high and 4 ft. thick. The enemy was armed with " Dane " guns, using black powder and loaded with slugs and iron scrap. The force deployed just out of range of the enemy's musketry and opened fire with the 7-pr. guns, but these made no impression on the stockade. The R.E. rockets were then brought into action and were more successful, as one of them skimmed the stockade and set fire to the grass huts inside. The West Indian Regiment then charged and occupied part of the town, when the enemy's resistence broke and they streamed out of the town pursued by " friendlies " from neighbouring villages. The R.E. destroyed the corner towers with gun-cotton and the force withdrew, taking many prisoners, and returned to Bathurst, on their gunboat. During the fighting one British officer was killed and one officer and four other ranks injured.

In 1894 similar expeditions were sent againt a chief named Fodi Sila who had been giving trouble for over twenty years.

There were further military operations on the Gambia in 1900, against Fodi-Kabba, during which the French occupied the native capital, Medina, and Fodi-Kabba was killed in the fighting.

Sierra Leone (see map facing page 92)

The port of Freetown in the Colony of Sierra Leone was known, like the Gambia River, to the early navigators as far back as the

Carthaginians and Phoenicians. The first British settlement was established in the latter part of the eighteenth century and in 1791 a Charter was issued to the "Sierra Leone Company." In 1808 the Colony was transferred to the Crown and the area of the Colony was extended to provide a home for slaves repatriated from England, Canada and the West Indies.

In 1822 the Governor of Sierra Leone was made Governor-in-Chief of the West Africa Settlements. There followed various changes of organization, until, in 1874, Sierra Leone was separated from the others and constituted a separate Government.

The port of Freetown was first fortified in 1885 as one of the coaling stations for the Navy (see Chapter XI). The work was commenced by Lieutenant M. Nathan, R.E., who had been sent out to Sierra Leone in December, 1883, to make the preliminary schemes and returned in December, 1885, when the war scare of that year caused defence work to be pushed on at all stations abroad. Nathan was assisted by Lieutenant H. B. MacKay, who took charge of the work in 1887, and continued in charge till 1889, when he was replaced by Captain W. H. Robinson. There was generally a second officer of the R.E. at the station and a small staff of European foremen of works and engineer clerks. There were no contractors and all work was done by locally engaged labour, some 3,000 to 4,000 men being employed. In the course of the next few years the harbour was fortified and barracks constructed on the high ground to the east of the harbour. The sanitorium was at a height of 2,000 ft. above the sea, necessitating the construction of a long and difficult road.

There were, during the early period, numerous small operations by the police, but the first military operation of importance was the Yonni expedition of 1887–8. This was necessitated by fighting between the local chiefs, which menaced the security of the British towns of Songo Town and Waterloo. Colonel Sir Francis de Winton, K.C.M.G., was sent out to take charge of a force of eighteen officers and 266 other ranks of regular troops (West Indian Regiment and others), one officer and sixty-four men of the Sierra Leone Police with about 1,000 carriers. The force included one 7-pr. gun, one maxim and a rocket trough, and there was a detachment of the Royal Engineers under Lieutenant (local Captain) H. B. MacKay and Lieutenant W. du C. Luard. In November, 1887, the force moved secretly by sea to Maufengbe on the Ribbi River, whence they had to cut their way through dense forest for twelve miles to

Robarri, the chief Yonni town. The advance was hotly contested, but Robarri was occupied on the 15th December and after terms had been imposed the force withdrew on the 15th January, 1888. The bush fighting was typical of many expeditions. The method adopted by our troops was to string the force in a long line, in single file, with advance and rear guards and troops distributed between parties of carriers. When attacked the latter lay down and the Infantry, facing right and left, fired volleys into the bush in the direction of the hostile firing. Such a method involved a heavy expenditure of ammunition, but it was not till 1900, during the advance on Kumasi, that a different method was adopted.

Following this expedition there were others, in one of which, against Chief Mackiah, Captain H. B. MacKay, R.E., who was in command of the rocket party, led the attack on the town of Tanina and was the first to climb the stockade and mud wall. For this service he was Mentioned in Despatches and received the D.S.O.

The boundary between Sierra Leone and the area controlled by the French was first discussed by a Boundary Commission in 1891 to 1892, Captain Kenney, R.E., being at the head of the British representatives. By this time the French area touched the Colony on the north and east, while on the south the British area joined the settlement of Liberia, occupied and governed by freed slaves from America ; but the boundaries on the east and south had not been defined and were little more than a dotted line on the map.

In 1892 an expedition was sent to Tambi, about 150 miles from Freetown, on the north-west frontier, where rebels under a chief Karium of Moria, had formed war camps and menaced both the French and British. A force of seven officers and 168 men, drawn mainly from the local police, attacked Tambi and was repulsed, one officer, Captain W. H. Robinson, R.E., being killed while trying to blow in the only entrance.

It was feared that this failure might lead to a native rising, so a larger force of about 600 men under Colonel Ellis, West Indian Regiment, was dispatched by sea from Freetown on the 28th March and disembarked at Robat on the Great Skerries River. The force had two old pattern 7-pr. guns and a rocket trough manned by the R.E. The R.E. were represented by Lieutenant G. H. Boileau, R.E., who had with him four British N.C.Os. and twenty native Sappers. They took with them 200 lb. of gun-cotton and fifty Hales war rockets, with a few tools, rope, etc., all equipment being transported by local carriers. The force, after landing,

had a very trying march in single file for over fifty miles through the thick forest, during which Boileau, with a prismatic compass and a note book, had to do his best to map the route, a job which was very difficult as the path bent every fifty yards and there was no possibility of getting cross bearings. Tambi was reached after five days. The town was defended by a strong stockade and a clearing about 300 yds. wide had been made all round, covered with an entanglement of bamboos. The force deployed on the edge of the clearing, where they were just out of range of the trade guns with which the defenders were armed. Here they were joined by a crowd of "friendlies"—naked savages from neighbouring villages who had suffered from raids and were eager for revenge or loot. Led by one of the English police officers, the friendlies attempted to cut down the bamboo entanglement, but a volley from the defences drove them off in confusion. Meanwhile the fire of the small guns and rifles had made no impression on the defence, so the R.E. were instructed to try the rockets. These were rather erratic, having been some years in store, but one or two cleared the stockade and set the town on fire. At the same time Boileau got permission from Colonel Ellis to try to blow in the main gate. Four 10-lb. charges of gun-cotton had been prepared and Boileau, with one British Sergeant and a party of Sappers, advanced to the gate under cover of the confusion caused by the fire and laid the charges, the firing of which was to be the signal for a general assault. But before these could be fired, a large party of friendlies reached the stockade, actually upsetting some of the charges, and commenced a fierce hand-to-hand fight inside the town. Boileau then dispatched his Sergeant to report the situation and himself climbed over the stockade into the town. Meanwhile the troops were waiting for the explosion as a signal to attack, and the Sergeant was ordered to return and ignite the charge. This he did, but unfortunately only one 10-lb. charge exploded. This knocked over Boileau who was just inside the stockade and the Sergeant, who was injured, but the troops advanced with a rush and the town was captured. The capture of this troublesome stronghold had a good effect, many of the local chiefs gave in their submission and the country was gradually pacified. During the fighting at Tambi the troops suffered only nine men wounded, but of the friendlies five were killed and thirty-two wounded. The enemy were estimated to have suffered 1,500 casualties, of whom 200 were killed. The troops returned to their base at once, only to find on arrival at Freetown that they were required

for the operation on the Gambia described previously. Tambi was taken on the 7th April, 1892, and Toniatala on the Gambia, 700 miles away, was captured on the 22nd April, 1892 (see page 87). For his services Boileau was twice Mentioned in Despatches and received the West African Medal and the thanks of the C.-in-C.

In 1893–4 there was another expedition against the Sofas in the north-east portion of our Protectorate. The French, in their consolidation of the territory occupied by them, had roused the opposition of Samory, an important Mohammedan chief who had imposed his authority on a considerable area and was in control of an army of 30,000 men which he quartered on the local tribes. These troops were called Sofas (not a tribe). Some of his troops having moved into a part of our Protectorate to get in touch with arms smuggled through Sierra Leone, expeditions were dispatched into the interior to clear them out and protect the inhabitants. The most important of these expeditions, about 450 strong, under Colonel Ellis, landed secretly at Bendo on the Sherbro Inlet on the 28th November, 1893, and marched 139 miles to Panguma near the eastern frontier, which was reached on the 13th December. Ellis then moved on to Waima, passing through an area which had been devastated by the Sofas and some allied tribes. He reached Waima on the 22nd December, but the camp was heavily attacked the next night and the attackers were only driven off after the British force had lost three officers and seven men killed and eighteen wounded. From a wounded prisoner it was then found that the attackers were a French force and a few hours later, the French Commander, Lieutenant Maritz, was brought into the British camp. He was badly wounded and in spite of every care died that morning, but not before he had taken the responsibility for the mistake.

Ellis followed the trail of the Sofas through the devastated area and eventually coming on them from behind completely surprised them, wiping out nearly the whole party of several hundred men. The force then withdrew, with some difficulty owing to lack of carriers, and marched back to Freetown by the shortest route through the centre of the Protectorate. The Royal Engineers were represented in these operations by Lieutenant (local Captain) H. Sloggett and Lieutenant C. W. Gwynn. They had with them a party of a few English N.C.Os. with native Sappers of the Sierra Leone Company. These, under the command of Captain Sloggett, accompanied the main body and carried out the ordinary R.E. work of bridging and improving the track and water supply, while

each night a clearing had to be made for a camp and the whole force surrounded by a zariba of the local bush. Lieutenant C. W. Gwynn accompanied the force as Intelligence Officer and had the special duty of acting as guide with an advance party which preceded the main body by about a day's march. The boundary between the British and French Protectorates had not been defined and it was very important that the force should not encroach on the area claimed by the French. Fortunately Gwynn's calculations proved correct and subsequent more accurate survey showed that Waima was well inside the boundary of the British Protectorate. For his services in these operations Gwynn, who had been wounded in the last fight against the Sofas, was Mentioned in Despatches and awarded the D.S.O. He was also recommended for a Brevet Majority on promotion to the rank of Captain, an honour which he received on the 16th February, 1900.

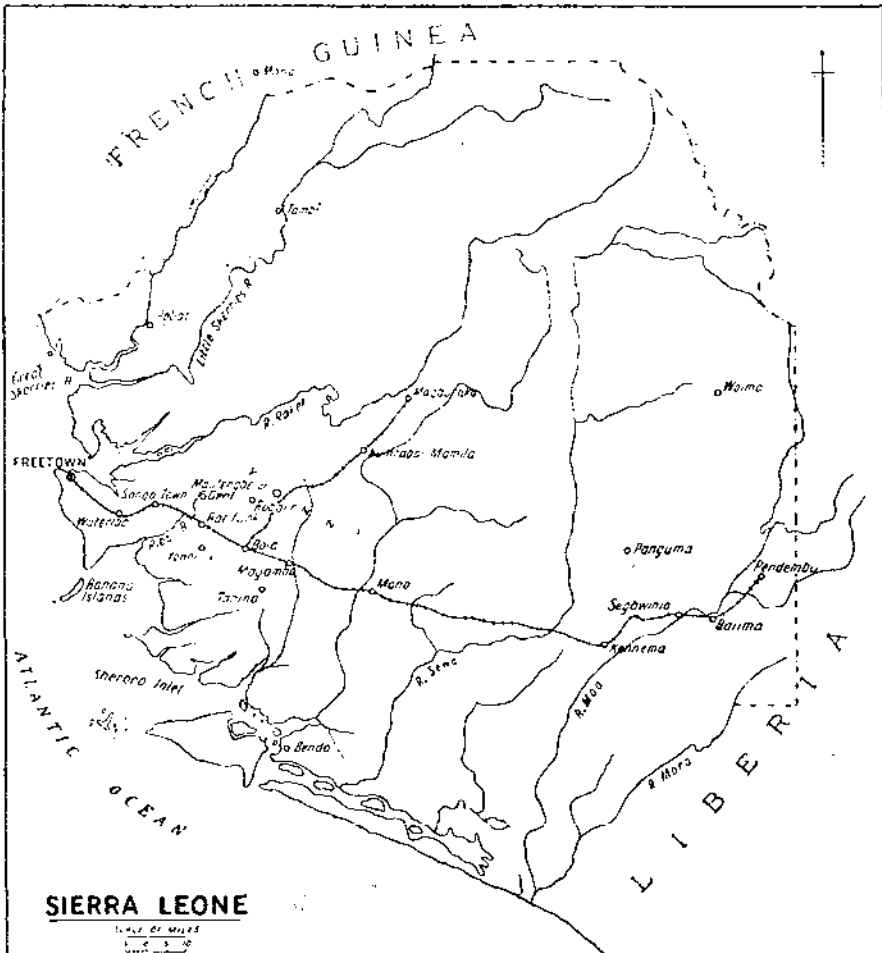
With the spread of more orderly government, the expenses of governing increased and a house-tax was imposed on the native tribes, to be collected by the chiefs. This led, in January, 1898, to an organized rebellion which lasted some months, in the course of which over 1,000 British subjects, including some British missionaries, were killed. The rebellion was quelled by a series of military expeditions under Colonel E. Woodgate and Colonel Cunningham, in the course of which the British lost 161 killed. The operations were completed by the march of armed columns through the Protectorate, these covered 800 miles in eighty-four days and returned to Freetown by March, 1899.

The Royal Engineers were represented in these operations by Lieutenants A. H. Tyler, C. H. Foulkes, J. P. Mackesy and R. H. Thomas.

The only other important military operation in this Colony occurred in 1905 when raids were made on the Protectorate by a chief named Kafura from the hinterland of Liberia. A column comprising thirteen officers, with 311 of the Sierra Leone Battalion W.A.F.F., left on the 25th March for Kissi and after considerable fighting compelled the chief to accept terms on the 17th May.

In 1895 there was a Boundary Commission to define the northern boundary of the British area and in 1896 the hinterland was declared a Protectorate, but the eastern boundary was not clearly defined till 1911. There was, however, much progress with official surveys of the Colony carried out by the Royal Engineers. (Vol. III, p. 197.)

The first railway was started in 1899 and contributed to the successful transport of the expedition in 1905.


FRENCH GUINEA
FREETOWN
Waterloo
Songo Town
Little Skarcies R
R. Rokel
Bo
Moyamba
Mano
Pangumo
Pendembu
Segbwema
Kenema
R. Sewa
R. Moa
Bendu
Banana Islands
Sherbro Inlet
ATLANTIC OCEAN
LIBERIA
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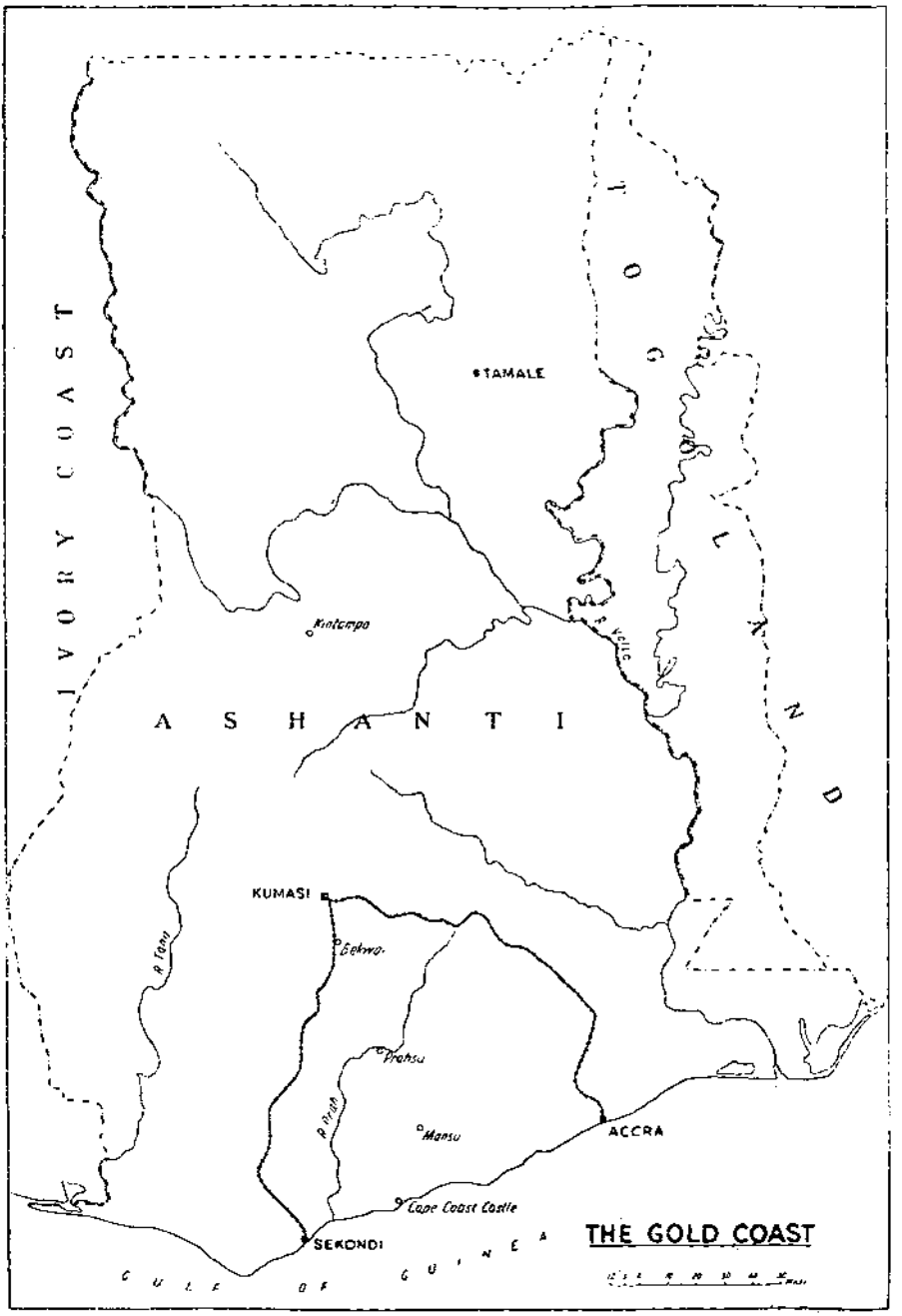

IVORY COAST
TOGOLAND
TAMALE
Kintampo
ASHANTI
KUMASI
Gekwo
Prahsu
Mansu
ACCRA
Cape Coast Castle
SEKONDI
GULF OF GUINEA
THE GOLD COAST

GOLD COAST (see map opposite)

The early story of the Colony of the Gold Coast followed much the same course as at Gambia and Sierra Leone, except that the growth of the gold industry seems to have attracted a larger number of different nations. The first British company called "The Company of Adventurers of London trading into Africa" was granted a Charter in 1618, and in 1752 a new company was formed called "The African Company of Merchants." Meanwhile, the Portuguese, Dutch, Swedes, Prussians and Danes had all established trading centres and the Danes built a castle which gave its name to Capecoast Castle. In 1821 the rights of the company were handed over to the Crown, but were transferred back to the company in 1830. In 1843 the Crown resumed control and, in 1850, the Danish possessions were purchased for a sum of £10,000 while, in 1871, the Dutch possessions were transferred to Great Britain.

Up to this time, the European settlements had been limited to a strip of country near the coast inhabited by a people called the Fantis. Inland of this area, and covering all routes to the interior, were a number of native states of which the chief was that of Ashanti, to which a varying number of the others were tributary. The King of Ashanti had his capital at Kumasi about 143 miles inland from Capecoast Castle. The Ashantis first came in contact with the British in 1806 and in 1824 defeated a British force, killing the Governor of the West African settlements and eight other British officers. Peace was arranged in 1831 but was broken in 1853 and 1863 when the Ashantis invaded the Colony. In 1873, following the withdrawal of the Dutch, the Ashantis attacked the British settlements in force, fearing that the British would interfere with their domestic slavery and slave raiding which had been acquiesced by the Dutch. The garrison then consisted of a detachment of the West Indian Regiment from Sierra Leone and some local police and volunteers.

On the news of the rising reaching England, assistance was given by ships of the Navy, who landed parties of Marines and Naval ratings. The 2nd Battalion of the West Indian Regiment from Barbados was dispatched at once to West Africa, arriving on the Gold Coast in July, 1873. With this addition the local forces were able to prevent the enemy from reaching the coast but the Marines and Naval detachments suffered severely from fever.

Meanwhile the possibility of the dispatch of a force from England had been discussed and, in August, Colonel Sir Garnet Wolseley was appointed Governor and High Commissioner and sent out in October to report on the feasibility of military operations. On his recommendation a force of about 1,500 men was dispatched from England. This included two battalions of Infantry—the 23rd Royal Welch Fusiliers, and the 2nd Battalion Rifle Brigade, a detachment of Royal Artillery with four guns and part of the 28th Company, Royal Engineers, including a detachment for Telegraph work. Major R. Home, R.E., was the C.R.E. and there were seven other R.E. officers. Details of the work of the R.E. are given in Volume II, Chapter 23.

Kumasi was occupied by the 5th February and all troops re-embarked by the 4th March, 1874. By the 15th of the month the Ashantis had agreed to terms of peace; under these they retained their independence but had to pay a heavy fine in gold dust, and give promise of good behaviour.

On the conclusion of Wolseley's campaign, the Gold Coast and Lagos settlements were separated from Sierra Leone and put under a Governor with headquarters on the Gold Coast. In 1886 the area of the Gold Coast between the Ashanti territory and the sea was formed into the Colony of the Gold Coast, Lagos being separated.

In 1893 a survey for a railway was made by Captain J. I. Lang, R.E., but no action was taken till later.

In 1890 there began the scramble for Africa, the French from the Ivory Coast on the west and the Germans from Togoland on the east beginning to make treaties with the native kings and chiefs. To prevent encroachment to the north of the British settlements, the Ashantis were approached with the suggestion that a British Resident should be stationed at Kumasi and that the British would control the foreign relations of the country which would thus become a British Protectorate. King Prempeh, however, refused to accept a Protectorate. In October, 1895, it was decided to send a second military expedition to Kumasi to establish a protectorate and to put a stop to various practices, such as domestic slavery and raiding for slaves from neighbouring tribes, which were creating trouble among tribes friendly to the British. The expedition was commanded by Colonel Sir Francis Scott, K.C.M.G., the Inspector-General of Constabulary on the Gold Coast, who had had considerable experience in the Crimea and the Indian Mutiny and after retirement had been employed for some years in West Africa.

The troops composing the expedition were the 2nd West Yorkshire Regiment and a Special Service Battalion made up of contingents from several regiments. There was also a wing of the 2nd West India Regiment and a strong body of local constabulary with a battery of four 7-pr. guns. There was also a body of local scouts, organized and commanded by Major Baden Powell, who covered the advance of the main body. Major H. M. Sinclair, R.E., was C.R.E. of the expedition with Captain G. E. Phillips and Lieutenant H. L. Pritchard, who were joined later by Lieutenant C. E. G. Vesey and Lieutenant S. G. Faber, all R.E. They had with them a small party of thirty N.C.Os. drawn from R.E. units at Aldershot. There was in addition a detachment of the R.E. Telegraph Battalion under Captain R. S. Curtis, R.E., and Lieutenant D. S. McInnes. The R.E. were allotted about 500 native labourers who had been recruited by the Civil Government and organized in groups of twenty each under a head man. They were equipped with the local tool, the machete, and a small amount of cutting tools and cordage.

The route to be followed was divided into two parts, each of about seventy miles long, by the river Prah. This river consisted of a series of rapids which made navigation impossible, and was usually crossed in canoes. The local Government maintained a fair track from Capecoast Castle to the town of Prahsu on the south bank, and there was a Government telegraph line up to Mahsu which was about thirty-five miles from the coast. North of the Prah the road to Kumasi, which the Ashanti had promised to keep clear, had degenerated to a track. Immediately on arrival, Major Sinclair started the construction of a floating bridge over the Prah, using casks which were transported with some difficulty, and that bridge was ready for the troops, but all along the route there was much work for the R.E. in bridging streams, making corduroy roads and in collecting, boiling and filtering water. At each halting place hutting was provided of bamboos thatched with leaves.

The strength of the Telegraph detachment was 32 N.C.Os. and men, of whom 21 were from the 1st Division Telegraph Battalion and 11 from the 2nd Division employed with the General Post Office. They took out 60 miles of field cable and 100 miles of air line, packed in loads not exceeding 45-lb. each. The field cable could be laid as fast as men could march, permanent communication by buzzer and telephone being maintained with the head of the column. The air line, fastened to trees or improvised poles, followed at the rate of about three miles a day and as the air line advanced the

cable was picked up and used again in the front. There were three regular telegraph offices, but others were formed by connecting on buzzers to the line as required. The detachment reached Capecoast Castle on the 13th December, and Mahsu (36 miles) on the 18th, where they started from the end of the Government line. Prahsu, 36 miles farther, was reached on the 22nd with a cable line and the air line reached Prahsu on the 1st January. The head of the cable line entered Kumasi with the advanced troops on the 17th January and communication with the coast and England, which was delayed by heavy thunderstorms, was established on the 19th January, 1896. The maintenance of the line involved much hard work, especially as all ranks suffered severely from malaria. On the retirement of the force, the line and offices were handed over to the Colonial Telegraph Department. The detachment re-embarked on the 7th February. During the time it was in R.E. control the number of messages dispatched totalled 13,192. Traces of the telegraph line erected by Lieutenant H. Jekyll in 1873 were found in places and some coils of wire left at Prahsu in 1873 were found and utilized, a rather striking testimony to the quality of the British material.

The advance of the force was not opposed, but the troops suffered severely from fever. King Prempeh fled at the advance of our troops and was deposed, a Resident was appointed and a British Protectorate declared over the country. Prempeh continued to give trouble but later surrendered to the British and was exiled to the Seychelles. Among other terms of the settlement, the Ashantis were required to hand over to the British the Golden Stool, a symbol of authority to which the Ashantis attached a superstitious importance. This was, however, removed by the natives and hidden.

For their services in this campaign, Major H. M. Sinclair was made Brevet Lieut.-Colonel, and Captain R. S. Curtis, who had been invalided before the force actually reached Kumasi, a Brevet Major.

The following year, Lieutenant McInnes returned to the Colony and built the fort at Kumasi, which figured so prominently in the fighting in 1900. It was built of stone, and was rectangular in form with flanking towers at the four corners. It contained a house for the Resident and barracks for the guard.

In October, 1897, an expedition was sent north through Kumasi to establish British control over the hinterland to the north of Ashanti, where parties of French were believed to be encroaching; it was commanded by Colonel Northcott whose party included Major

R. A. P. O'Shee, R.E. This party made contact with the French and a provisional agreement was made for the delimitation of the frontier. Northcott was appointed the first High Commissioner of the Northern Territory, but O'Shee was invalided and had to return to England.

In 1900 further trouble arose and Sir F. M. Hodgson, the Governor of the Gold Coast, was besieged with his wife in Kumasi. A relief force was organized under Colonel J. Wilcocks. Owing to the South African War no Sappers were sent out from England, but Wilcocks obtained the services of Lieutenant R. S. McClintock, R.E., who was about to return home from Nigeria, and who was appointed D.A.A.G. to the force. Captain F. P. S. Roupell, who had been an R.E. Militia Officer, also accompanied the force and was wounded.

Lieut. R. S. McClintock remained with the force till August when he was invalided. For his services he was Mentioned in Despatches and noted for advancement to Brevet Major on promotion to Captain, which was gazetted in August 1904. For his services on the Staff he was noted as "q.s." in the Army List and later received a nomination to the Staff College. Captain Roupell was awarded the D.S.O.

To close the story it may be stated that the Golden Stool was not found till 1921, when the British Government announced that the Stool would not be removed to England but could remain at Kumasi, thus closing a perennial source of friction.

In 1900 Major M. Nathan, R.E., was appointed Governor of the Gold Coast and in 1901 Ashanti was incorporated in the Colony. There was no further fighting and under Nathan's guidance good work was done in the pacification of the country, which was completed by the construction of railways, commenced in 1900, from Sekondi and Accra, joining at Kumasi.

In 1900 a Boundary Commission under Captain A. F. G. Watherston, R.E., surveyed the northern boundary between the French and the British, and the western boundary was surveyed in 1902. In July, 1901, Major Watherston was appointed Director of Surveys for the Gold Coast and was especially charged to organize and define the areas of the gold-mining concessions. For his work on the boundary he received the C.M.G. and in 1905 was made Chief Commissioner of the Northern Territories of the Gold Coast. In this he was very successful, but he overtaxed his strength and died at Tamale in December, 1909. He was succeeded in 1905 as Director

of Surveys by Major F. G. Guggisberg, R.E., who was later to be a successful Governor of the Colony. The east boundary between the Germans and the British was surveyed from 1901 to 1904 by a Commission on which Captain W. J. Johnston, R.E., was the senior British representative.

Of other R.E. officers, Major W. E. Lees became Director of Public Works on the Gold Coast in 1904 and held the appointment till 1910. He was in charge of all roads and building works excluding railways and harbours. During his period of employment he carried out big schemes of town planning at Accra and Sekondi, including the design and construction of Government buildings and a water supply for each town, costing £1¼ million for each centre. Captain E. F. W. Lees and Lieutenant H. A. L. Hall were employed on the Survey of the Colony. In 1909 Major G. A. J. Leslie, R.E., was put in charge of a special organization for the construction of roads and bridges, assisted by Captain A. B. Cunningham and Lieutenant J. B. H. Ouchterlony for Ashanti and the Northern Territory, and Lieutenant J. G. Hearson in the Gold Coast.

The Oil Rivers—Lagos (see map facing page 102)

The mouths of the Niger were known to the early navigators, the first British contact occurring in 1553.

In 1851 Lagos, which was the centre of the Portuguese slavers, was occupied by the British Consul from Fernando Po with a Naval force and in 1861 it was annexed by Great Britain and garrisoned by a detachment of the West Indian Regiment. The town of Lagos which gave its name to the Colony of that name was situated on an island at the west end of a series of lagoons and creeks which stretched from Lagos to the mouth of the Oil Rivers. This system of waterways was the principal means of communication throughout the Colony. Between Lagos and the Niger numerous rivers and streams joined the system of waterways, of which one of the largest was the Benin River.

Lagos formed one of the West African settlements until it was made a separate Colony in 1886. At the same time an official Protectorate was proclaimed over the settlements on the Oil Rivers, the name being changed to the Niger Coast Protectorate, in 1893.

The Governor of Lagos was also the High Commissioner in Nigeria up to 1900. Lieut.-Colonel H. E. MacCallum, R.E., was appointed Governor and Commander-in-Chief of the Colony and Protectorate in 1897.

NIGERIA (see map facing page 102)

Although there had been a number of expeditions on the coast of this colony it was not till 1897 that it was decided to open up the hinterland and to organize a military force under Lieut.-Colonel F. J. Lugard consisting of two local battalions of the West African Frontier Force, which were later formed into the North and South Nigerian Regiments. The headquarters of this Force was at Jebba, 200 miles from Lagos, with a second centre at Lokoja at the junction of the Niger and Benue rivers.

At the end of 1897 Lugard decided to provide telegraphic communication from Lagos to Jebba, and at the end of November, Lieutenant (local Captain) E. V. Turner, R.E., with twenty N.C.Os. of the Telegraph Battalion, R.E., was placed at the disposal of the Colonial Office and ordered to Nigeria to construct and work the line. The party arrived at Lagos in December with all the stores required, except poles (which were cut locally), packed in 40-lb. loads. One hundred Yoruba carriers were employed. The line was run through Abeokuta, Oyo, Iseyin and Ilorin to Jebba, a distance of over 200 miles, and communication was established by June, 1898. Later the line was prolonged north for 30 miles to Fort Goldie and a further line was commenced to Lokoja, the headquarters of the 2nd Battalion, W.A.F.F. In March, 1899, Captain Turner handed over to Lieutenant R. S. McClintock, R.E. For his services Turner was Mentioned in Despatches and recommended for Brevet of Major on promotion to Captain, which was gazetted in July, 1903.

Captain Turner had started a School of Instruction for native operators, recruited from the native clerk type, and McClintock detached a N.C.O. to Ilorin to take charge of this school. The students made reasonably good operators and could carry on work in a climate in which the average European could only work for nine months before breaking down with fever. McClintock and his detachment completed the line to Lokoja, at first using makeshift poles cut locally, but a little later the Colonial Office sent out sectional iron poles to replace the wooden ones. Transport was mainly by water and goods were landed at temporary landing places, from which they were carried to the new line. There were no maps and the line ran in many places through country where the natives had never seen a white man, so that the officer in charge had first to make a personal reconnaissance before he could determine the route of the

line. The pay of the local natives employed was at the rate of 1s. 3d. per day but later, when working up the Benue, money was unknown and payment was made in a currency which included looking-glasses, knives or handkerchiefs, demanding some ingenuity on the part of the N.C.Os. in charge.

The line reached Lokoja on the 4th August. It was then decided to run a line up the river Benue to Ibi, which was under the control of the Niger Company but had not been penetrated by a white man ; a military escort of a company of W.A.F.F. was therefore provided. When 90 miles had been completed the party entered the country of the Mintchi, a tribe of cannibals, who attacked the escort and inflicted some casualties with their poisoned arrows. Further advance was then checked till a larger expedition could be organized in the following April. Meanwhile the line was completed up to the edge of the Mintchi country and communication with headquarters was completed by a cable laid across the Niger, which was 740 yds. wide. The working and maintenance of the line was handed over to the Telegraph department of the new Northern Nigeria Government and the R.E. detachment started for home on the 12th May, 1900.

Another job proposed by Colonel Lugard was the clearing of a navigable channel on the River Niger. This was obstructed by snags which could only be broken up by explosives. He again asked for the assistance of an R.E. officer and was given the services of Lieutenant R. L. McClintock, R.E. (a cousin of R. S. McClintock mentioned above), who had been trained in Submarine Mining. McClintock left for Nigeria in January, 1898, taking with him a party of five N.C.Os. selected from the 4th and 22nd (S.M.) Companies, R.E. The snags removed, McClintock remained in Nigeria to complete his term of twelve months in the country, carrying out much miscellaneous R.E. work, including the erection of hutments for the headquarters of the W.A.F.F. He also raised a Company of Engineers composed of twenty-five Yorubas, who were joined in August, 1898, by thirty men of the Madras Sappers and Miners from Bangalore, and in December, 1898, he took part in the Illah expedition in the Benin hinterland. He completed his year's engagement in March, 1899. For his services in Nigeria, he was Mentioned in Despatches, received the 1898 West African medal and was recommended for a Brevet Majority, which he received in January, 1904.

Lieutenant G. W. Denison, R.E., was employed with the W.A.F.F. during 1903–4 and Captain J. P. Moir, R.E., was employed on tele-

graph construction in 1907. Several of the officers employed on the Survey work described in Volume III, Chapter VI, also took part in some of the military operations, including Captain A. J. Woodroffe and Lieutenant L. N. F. I. King with the Aro expedition in 1901 and 1902, and Lieut.-Colonel G. S. McD. Elliot and Lieutenants C. H. Foulkes and G. R. Frith with the Kano-Sokoto force in 1903. Captain Woodroffe also served with an expedition carried out by the South Nigeria Regiment in 1905–6.

Meanwhile the question of railway extension in this vast area was engaging attention. In Lagos the construction of a railway to Jebba had started in 1896 and, in 1907, Sir Percy Girouard, R.E., who had gained a reputation as a railway engineer in the Sudan and in South Africa, was appointed High Commissioner for Northern Nigeria to push on the railway development. In 1908 the status of this appointment was raised to that of Governor. In 1909 Girouard started the railway from Baro on the Niger to Kano which had been made the capital of Northern Nigeria. This line was completed in 1912 and extended to join the line from Lagos on the west, while a branch was run to Port Harcourt at the mouth of the river. For carrying out this work Girouard had the assistance of three R.E. officers, Captain H. O. Mance, Captain F. D. Hammond and Lieutenant G. A. P. Maxwell. As was the case in the older Colonies of West Africa, the railway proved a great civilizer and gave an important impetus to trade.

To complete the history of Nigeria, a reference is necessary to the various Boundary Commissions and Survey work on which many officers of the Royal Engineers were employed. Details of their work are given in Volume III, Chapter VI.

As early as 1891 Lieutenant R. U. H. Buckland, R.E., had been employed on Survey work at Lagos. The boundary between Lagos and Dahomey was delimitated by a Commission under Major J. I. Lang, R.E. (afterwards Lang-Hyde), in 1900. The long northern boundary between the Niger and Lake Chad, 860 miles, was surveyed during 1902–4 by a Commission under Lieut.-Colonel G. S. McD. Elliot, R.E., and a further Commission under Major R. A. P. O'Shee, R.E., continued this work in 1906.

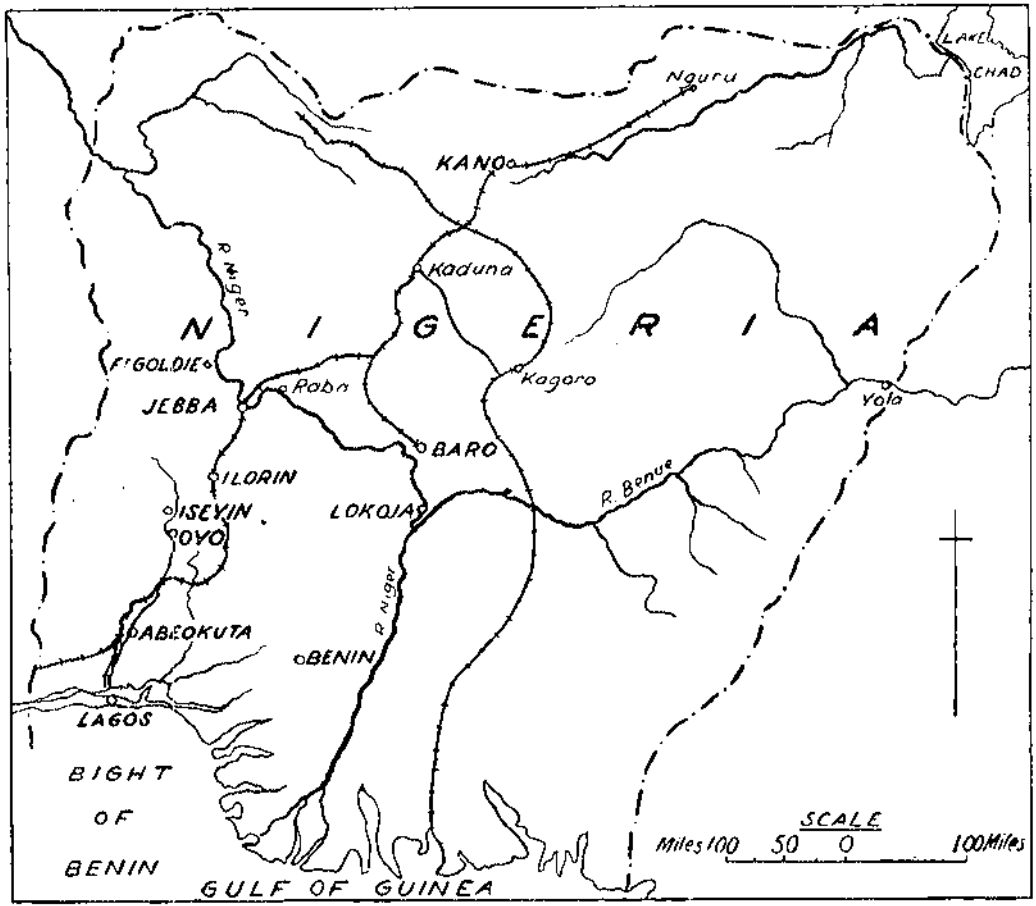
In 1903 a Commission under Lieut.-Colonel Louis C. Jackson, R.E., was sent to delimit and survey the Anglo-German frontier from Yola to Lake Chad. This boundary had been the subject of considerable discussion with the German authorities. To reach their objective the party had a long canoe journey up the tributaries

of the Niger. The eastern boundary of the Niger Coast Protectorate was first surveyed by a party under Captain C. F. Close*, R.E., in 1895, and in 1905 the boundary was delimited by a party under Captain A. J. Woodroffe, R.E.

The remainder of the eastern boundary up to Yola was surveyed in 1907 to 1909 by a party under Major (local Lieut.-Colonel) G. P. A. Whitlock, R.E. About eighty miles north of the Cross River, the combined British and German parties were attacked by natives, but the two escorts, fighting side by side, under the command of Lieut.-Colonel Whitlock, drove off the attackers with a loss of five killed and nineteen wounded.

In 1912 the question of a further consolidation of Northern and Southern Nigeria to form one Colony came to a head and Sir Frederic Lugard, who had been appointed Governor of Hong Kong, was recalled to the West Coast and appointed Governor of both Northern and Southern Nigeria. On his advice the two Governments were amalgamated on the 1st January, 1914.

* Later Colonel Sir Charles F. Arden-Close.


LAKE CHAD
Nguru
KANO
Kaduna
R. Niger
N I G E R I A
Kagoro
Yola
JEBBA
Rabn
BARO
R. Benue
ILORIN
ISEYIN
OYO
LOKOJA
R. Niger
ABEOKUTA
BENIN
LAGOS
BIGHT
OF
BENIN
GULF OF GUINEA
SCALE
Miles 100 50 0 100 Miles

CHAPTER VI

THE ROYAL ENGINEERS IN THE COLONIES—SOUTH AND EAST AFRICA—SOMALILAND—CYPRUS—CRETE

South Africa—Zululand—Transvaal—R.E. employed after South African War—Matabeleland—Expedition against Makoni—43rd Company R.E. joined expedition—Captain Haynes killed—Survey work in South and South-east Africa.

East Africa—Emin Pasha at Wadelai—Stanley's relief expedition—Lieutenant W. G. Stairs—At Fort Bodo—Explores Ruwenzori—Death of Stairs—Lieutenant H. G. C. Swayne employed.

Uganda—Railway survey under Captain Macdonald—Macdonald reaches the capital—Survey party returns accompanied by Lugard—Macdonald ordered to report on recent disturbances—Pringle brings railway party to England—Expedition against Wavuma—Sir Gerald Portal—Macdonald quells mutiny—Arrest and trial of Selim Bey—End of third Mohammedan war—Sudanese moved into Uganda and Usoga—Colonel Colville takes command—Declares war on Unyoro—Macdonald appointed senior Staff Officer—War with Unyoro—Macdonald returns to England—Brevet Major—Uganda made a British Protectorate—Railway approved December 1896—Captain B. L. Sclater constructed cart road to Lake Albert—Macdonald sent out at head of secret mission to join hands with Kitchener on the Nile—Lieutenant H. H. Austin—Arrive Ngare Nyuki—Mutiny of Sudanese escort who return to capital—Followed by Jackson and Macdonald—Mutiny at Lubwa—Macdonald's force occupies hill near Lubwa—Repels attacks—Murder of Thruston by mutineers—Operations led by Macdonald quelled mutiny—Macdonald resumes his expedition—Reached Latuka country and Lake Rudolph—Kitchener's success at Fashoda—Expedition withdrawn—Medal and honours granted for the campaign—Further history of Uganda—Formation of B.C.A. Regiment and King's African Rifles—Survey and Boundary Commissions—Extension of railway—Sir Percy Girouard appointed Governor of the East Africa Protectorate.

Somaliland—Early history—Lieutenant H. G. C. Swayne visits country—Constructs defences at Bulhar and maps caravan routes—Abyssinians seize Harar—Boundaries agreed—Swayne maps Somaliland for Indian Government and explores Gallaland—Sir Rennell Rodd's expedition to Addis Ababa—Swayne acts as guide—Expedition to Zeila 1890—Rebellion of Mad Mullah 1899—Local force raised under Captain Eric J. E. Swayne—Captain G. E. Phillips and Lieutenant D. A. Friederichs joined force—Swayne

attacks—Captain Friederichs killed—Second expedition under E. J. E. Swayne in 1902—Major Phillips again volunteers—Swayne's force attacked near Erigo—Square broken and Phillips killed—Third expedition under Brig.-General W. A. Manning—17th Company Bombay Sappers and Miners and detachment 19th Company join force, also Telegraph detachment—Force landed at Obbia—Reconnaissance under Colonel Cobbe—Company detached from this column annihilated—Column under Major G. E. Gough attacked and retreated with loss—Fourth expedition under Major-General Sir Charles Egerton—Two Infantry Brigades from India—Battle of Jidbali—Mullah defeated and takes refuge in Italian Somaliland—Details of Engineer work—Lieutenant F. E. Harward dies of fever—Garrisons withdrawn to coast—Fighting among the tribes—Further operations delayed by Great War—Mullah's defeat in 1919.

Cyprus—Crete—Colonel H. M. Chermside in command of troops—Made K.C.M.G. and promoted Major-General—R.E. work in Crete.

This chapter links up with Vol. II, Chap. XXII (Abyssinia), Chap. XXIV (South Africa), also Vol. III, Chaps. III and IV and Chap. VI, pp. 180, 182–94 and 200–1 (Survey) and 210–16 (Boundary Commissions), also with *The Military Engineer in India*, Vol. I, p. 411 and pp. 415–17 (Somaliland) and *The Royal Engineers in Egypt and Sudan*, Chap. XVIII (Survey).

South Africa

The work of the Royal Engineers in Cape Colony, Natal, Zululand, the Transvaal and Bechuanaland is described in Volume II, Chapter XXIV, up to the successful but bloodless expedition to Bechuanaland under Sir Charles Warren in 1885. By this date Cape Colony and Natal had settled down, though a small permanent garrison was maintained in both Colonies, and the bay of Simonstown was being fortified as a base for our Fleet. North of Natal, Zululand was still disturbed until in May, 1887, it was declared a British possession. In 1888 the Zulus under Dinizulu rebelled and repulsed an attack by a mixed force of police and troops, but additional troops succeeded in breaking up the rebel organization and peace was secured by British columns moving through the country. Major W. H. Rathbone, R.E., and Lieutenant R. L. C. Brooker, R.E., took part in these operations.

Military operations against the Boers had ended in 1881, after the fighting at Laings Nek and Majuba Hill, by the recognition of most of the Boer claims to what amounted to independence under

a shadowy British suzerainty. The discovery of gold in 1885 led to an influx of British and other miners into the Boer territory and the founding of the cities of Johannesburg and Barberton. This influx produced increasing friction between the two nationalities, which came to a head in the Jameson raid of 1895 and brought about the Boer War of 1899. A description of the war up to May, 1902, is given in Volume III, Chapter IV.

Following the peace, a considerable garrison was left in the conquered provinces and the country was administered by the system of Crown Colony government under Lord Milner, who drew many officers from the Army to help to form his temporary Civil Service; among these were several Royal Engineers. Lieut.-Colonel Girouard, who had been Director of Railways during the war, remained as Commissioner of Railways at Johannesburg and had ten R.E. officers under him in various capacities. Colonel Hippisley was in charge of Telegraphs till November, 1902, when they were handed over to the Civil Staff. Lieut.-Colonel G. H. Fowke became Director of Public Works in the Transvaal, and Lieut.-Colonel R. S. Curtis was in charge of the Works Department of the South African Constabulary, of which he became Inspector-General in 1903. Lieut.-Colonel J. E. Edmonds, Major H. G. Joly de Lotbinière and Lieutenant B. H. O. Armstrong were also employed under the South African Government. Most of the Royal Engineer officers returned home when the Transvaal and Orange Free State were handed over to the South African Government at the end of 1905.

Colonel W. G. Morris, who had been Chief Engineer at Cape Town during the war, returned to the South African Survey, of which he had been in charge from 1883 to 1892, and continued in charge of the Trigonometrical branch on retirement a few years later.

Rhodesia and Nyasaland

While South Africa was growing to manhood, the genius of Rhodes had pushed out tentacles into the areas now known as Rhodesia and Nyasaland in the hope of establishing communication from north to south down the east side of the continent of Africa.

In Matabeleland, in 1896, a group of native tribes akin to the Zulus resisted British domination and an expedition under Colonel Anderson was dispatched in July against a turbulent chief called Makoni. The R.E. were represented by the right half of the 43rd Company, R.E., commanded by Captain A. E. Haynes, R.E., who

had served under Warren in Sinai in 1882 and in Bechuanaland in 1884.

The company on its way to Mauritius for Garrison duty in that Colony, arrived at Capetown just before the expedition was starting and Haynes volunteered their services. This being approved the company was sent round by sea to Beira in Portuguese East Africa, which was the sea base of the expedition, where Haynes collected local transport (donkeys) and equipment and produced a small unit of R.E. suitable for Field service. The officer with the company was Lieutenant C. St.B. Sladen, R.E., but Lieutenant C. B. Thomson and a few N.C.Os., who were on their way to join the Mauritius Submarine Mining Company, were attached to the 43rd Company for this expedition. The total strength of the R.E. was about forty. The main body of Colonel Anderson's force consisted of 250 M.I. (his own command), part of the York and Lancaster Regiment and a few 7-pr. guns. The party crossed the Portuguese territory by railway and by 26th July were concentrated at Umtali from which they could see a line of mountains about thirty-five miles distant, with a pass called the Devil's Gap, said to be occupied by the insurgents. By the 5th August the force had moved round the flank of the enemy's position and was in a laager about forty-four miles from Umtali and seven miles behind the Devil's Pass. The day after they arrived the force was dispatched on a night march to attack Makoni's main kraal which was about fifteen miles from the laager and which was said to be strongly held. The natives of Matabeleland had a reputation for possessing good fighting qualities, while the country was very broken and difficult for military operations. It was hoped, therefore, by a surprise attack on their principal settlement, to compel them to submit to terms. The force reached the kraal at 5.30 a.m., surprising the enemy who put up a stout resistance. A loopholed wall was captured by assault by the part of the force to which the R.E. were attached and, after a confused mêlée inside the walls, the enemy broke and dispersed, taking refuge in caves on the mountain side and leaving their kraals and families in possession of the British. In the mêlée, Haynes was shot in the forehead and killed instantly.

The dislodgement of the enemy from their caves proved a difficult operation, as the caves were of vast extent and supplied with water from inland lakes, and the entrances were covered by the fire of defenders who were quite invisible to the attack. To drive out the defenders, explosive charges were thrown into the mouths of the

caves, and eventually, partly by force and partly by negotiation, the natives surrendered. Makoni's cave had been made untenable by explosives so that he was forced to surrender and, after trial, was shot. Smaller parties of British then visited various native kraals while the main body moved on to Fort Salisbury, then occupied by about 1,500 people, now the capital of Southern Rhodesia; on the 23rd August, the 43rd Company was recalled by the War Office, and continued their journey to Mauritius.

There were many other expeditions before the whole area could be opened up for occupation, but the R.E. were not represented. The period of fighting was followed by much work by Boundary Commissions and Survey parties, which are described in Volume III, Chapter VI. Prominent among the R.E. in charge of expeditions were Lieut.-Colonel H. D. Laffan, Major J. J. Leverson, Major R. A. P. O'Shee, Captain C. F. Close, Major R. A. Gillam and Captain R. Walker. Good work was also done by Captain B. L. Sclater in the survey and construction of the first road in Nyasaland, and in the opening up of that country.

British East Africa

The story can now be shifted to what became known as British East Africa, based on the ports of Zanzibar and Mombasa.

The connexion of the Corps of Royal Engineers with East Africa started with the appointment of Gordon as Governor of the Equatorial Province of the Sudan, which stretched from the south of the Sudan to the native kingdoms of Uganda and Unyoro at the north-west of Victoria Nyanza. When Gordon was promoted Governor General of the Sudan in 1878 he appointed a German Jew, later known as Emin Pasha, to be Governor of Equatoria. Gordon resigned in 1879 and his subsequent history ended in his tragic death at Khartoum in January, 1885. These events in Egypt and the Sudan are described in Volumes II and III, also in *The Royal Engineers in Egypt and the Sudan*, by Lieut.-Colonel Sandes, R.E. Meanwhile the southern provinces had been attacked by the Mahdi, and Emin Pasha, though he made a determined resistance, had to withdraw with the remainder of his forces to Wadelai on the Nile, 150 miles north of the northern end of Albert Nyanza. For a time no news came through to the outside world, but at last a letter from Emin, dated 31st December, 1885, reached the coast and was published in *The Times*. This led to the organization by public subscription of the Emin Relief Expedition, led by Mr. H. M. Stanley,

in which the Corps was represented by Lieutenant W. G. Stairs, R.E. Stanley was by this time well known to the public, first by his expedition to relieve Livingstone and then by his exploration of the Congo. There was considerable discussion as to whether Wadelai could be best reached from the east coast, starting from Zanzibar, or from the west coast up the Congo. But Stanley was at the time under contract to King Leopold of the Belgians to develop the Congo territory and the King declined to release him from his contract unless the expedition started up the Congo. So the route finally decided on was up the Congo to Yambuya, in the neighbourhood of Stanley Falls, and then to follow a tributary, the Aruwimi, through about 500 miles of unknown country to the south-west of the Albert Nyanza and then, by a steel boat, which was to be carried with the expedition, up the lake to Wadelai. Among the ten officers who were chosen for the expedition from a host of applicants, was Lieutenant W. G. Stairs of the Royal Engineers, described by Stanley as a splendid fellow, painstaking, ready, thoughtful and industrious. Stairs had been educated at the Kingston College in Canada, and had afterwards been employed on the railways in New Zealand. He was given a commission in the Royal Engineers at the head of the batch of Canadian cadets commissioned in June, 1885, when he was 22 years of age. At the time of his selection by Stanley at the end of 1886, Stairs had only just completed the first part of his course at the S.M.E. The full story of the relief expedition cannot be told here, but a short reference to Stairs's share in the story may be attempted. Yambuya was reached in June, 1887, but deficiency of carriers compelled Stanley to leave a party behind with many of his stores, while he himself led an advance party to Kavalli, at the south-west end of Albert Nyanza, about 550 miles due east from Yambuya. Major Barttelot, the second-in-command of the expedition, was left in charge of the rear party and from this time Stairs became the next in command under Stanley with the advance party. Stanley had calculated that he would reach Kavalli at the end of August, 1887, but he did not then know of the dark inhospitable forest through which he had to force a way, and it was not till nearly five months had elapsed that he came out into open country and reached the shores of the Albert Nyanza on 13th December, 1887. By this time, owing to death and desertion, the 384 men who had started from Yambuya had been reduced to 173. Emin had two steamers on the lake but had made no attempt to keep in touch with the south end and Stanley had had

to leave his steel boat at an Arab settlement in the forest. The column therefore withdrew to Ibwiri on the edge of the forest where a fort, called Fort Bodo, was built. Stairs was dispatched with a party to bring up the boat and then to round up other men left sick on the route. Stanley with two of his officers then returned to the lake, where they found a letter from Emin, and a little later the Governor himself arrived on a steamer. Emin was, however, very reluctant to leave Africa, but eventually, after three weeks of negotiation, agreed that if his men wished to go he would accompany them and Stanley sent one of his officers with Emin to Wadelai to discuss this arrangement.

Eleven months had now elapsed since leaving Yambuya and no news had been received of the rear column, so Stanley, leaving Stairs in command at Fort Bodo, went off himself with a small escort to fetch them. On reaching the rear column, he found everything in confusion, Barttelot had been murdered, two officers had been invalided, one had died of fever, and the only officer left was the medical assistant. Of the 271 men left with the column only sixty serviceable men remained. After interminable delays for want of carriers, the rear column had made a start on 11th June, 1888, eleven months after Stanley had started up the Aruwimi, but after thirteen days' march had only traversed sixty-five miles when further progress was stopped by the murder of Major Barttelot.

Stanley reorganized the column and by 20th December, 1888, had again traversed the forest to find that everything at Fort Bodo, under the care of Stairs, was in perfect order; the men sleek and well fed, ten days rations of corn in the granary, plantains and vegetable gardens in full bearing. Nothing had been heard of Emin, but on the way to the lake for the second time letters were received from Emin saying that his troops had mutinied and that Emin and Stanley's officer were prisoners. The situation was cleared by the advance of the Mahdi's forces from the north which frightened the mutineers, and on the 10th April, 1889, Stanley started on a 1,200-mile journey to the east coast with 570 of Emin's people; but most of the mutinous Sudanese soldiers, with their families, remained in the country near Kavalli under the leadership of Selim Bey. Seven months later, in November, 1889, Stanley reached Bagamoyo on the coast near Zanzibar.

On leaving the Albert Nyanza, the expedition made two geographical discoveries, first the great mountain mass of Ruwenzori, known to the ancients as the Mountains of the Moon, and then the

lake Albert Edward Nyanza, so finally solving the problem of the sources of the Nile. Ruwenzori is about 17,000 ft. high and Stairs, who had all through the expedition made notes of distances and places, climbed the mountain to a height of 10,000 ft. and also partly explored the Semliki river which joined the Albert Edward to the Albert Nyanza.

On returning from the expedition, Stairs was appointed Adjutant R.E. at Aldershot, but the lure of Africa was in his blood and, after he had been promoted to Captain in March, 1891, on transfer to the Royal Welsh Regiment, he took charge of another expedition to Africa to explore the South Congo territory and, while returning, died of fever at Chinde on the Shire river, Zambesia, in June, 1892.

Towards the end of 1888, when no news had been received from Stanley, the Imperial British East African Company obtained the services of Lieutenant H. G. C. Swayne, R.E., who had recently completed exploratory work in Somaliland (see page 132), to lead an expedition from the east coast. This was to be about 900 strong with a dozen Europeans and was to attempt to drive cattle up to Kavalli to relieve Emin. But on the day the party left London, news arrived of the arrival of Stanley and Emin in German East Africa and Swayne was employed on Survey and other work in the British sphere.

UGANDA (see map facing page 130).

When the Imperial British East Africa Company began to push expeditions into the interior, their progress was seriously hampered by the tsetse fly which attacked all transport animals, only a small breed of donkeys being able to survive. The Company was therefore anxious to commence the construction of a railway from the coast to the lake and asked for assistance from the War Office. So, in August, 1891, Captain J. R. L. Macdonald, R.E., who was at Bombay on the point of embarking for England after seven years' service in India, was offered the post of Chief Engineer of the proposed railway survey from Mombasa to the Victoria Nyanza. With his acceptance of this appointment there opens a new chapter in the history of the R.E.

Macdonald had joined the R.E. in February, 1882, and went out to India two years later. While in India he had worked on the construction of one railway, the survey of two others and on the defences of the north-west Frontier, and had spent, in all, three years among the independent Pathan tribes across the border. On

arrival home he was sent on by the Foreign Office to the Imperial British East Africa Company who asked him to prepare a scheme of operations, to be carried out in about nine months, with an estimate of the cost. Macdonald was fortunate in obtaining the advice and assistance of Mr. Gedge, recently returned from Uganda. For escort the Directors had suggested a company of native Infantry with a maxim gun, but as such an escort required a great deal of transport and would add immensely to the cost, Macdonald suggested the employment of forty Survey Khalassies from the North-West Frontier of India. These men are employed as chainmen and are accustomed to survey work ; they come of fighting races and, if armed, could be employed for the double purpose of chainmen and guard. The maxim gun was dispensed with as it required special ammunition. To get the work done in the time, Macdonald decided that it might be necessary to work in two distinct parties ; so he asked for the services of three other R.E. officers accustomed to railway survey work, and obtained the assistance of Captain J. W. Pringle as second-in-command and Lieutenants P. G. Twining and H. H. Austin. The total of the subordinate establishment was forty-six, including surveyors, draughtsmen, hospital assistants and Khalassies.

Two of the Company's local officers were detailed for charge of the transport, which included local porters and donkeys. Some of the porters were armed with Snider carbines. The estimate prepared by Macdonald included the cost of passages, instruments, the working out of reports and plans and all other details, and it may be mentioned here that the actual cost of the survey to the Company came out at a little less than the estimate. Also it is satisfactory to note that with the exception of one man, who died of fever, all the Khalassies returned safely to their homes in India.

The starting point of the expedition was Mombasa, which had been selected by the Directors as the terminus of the railway on account of its fine natural harbour. The country inland, though quite unsurveyed, had been traversed by many trading caravans, and trading posts had been established up to 200 or 300 miles from the coast, and there were occasional mission stations. The country passed through was very broken, rising to about 3,000 ft. above the sea soon after leaving the coast and then rising slowly, through beautiful and well-watered country, to 8,000 ft., north-east of the Victoria Nyanza. It was well wooded, too much so to make a triangulation possible, so that the survey had to be carried on by a series

of traverses, checked by frequent observations for latitude and when possible for longitude. The total length of the proposed railway from Mombasa to the north-east corner of the lake was about 650 miles. The details of the survey work, which was diversified by attacks by bees and red ants and by an occasional hunt after big game when lions or hippopotamus crossed the track and also by occasional bouts of fever, are given in Major Macdonald's book *Soldiering and Surveying in British East Africa*. The principal difficulty in selecting the line for the railway was the crossing of the Mau escarpment, a wide crack in the earth's surface, forming part of the Great Rift which runs from the Dead Sea Valley in Palestine to the neighbourhood of Tanganyika. This involved the survey of alternative routes and the survey parties, which normally worked in two groups, often split off into subsidiary parties so that Twining and Austin both had experience in the charge of detached explorations. At intervals, when the various parties met, surveys were compared, the best route for the railway was selected and a report with plans and estimates dispatched to the Directors in London.

There was no telegraph line in the country and, of course, no regular mail services, so that all letters were carried by trading or missionary parties or by special parties which had to be detached to take invalids to the coast. The natives of the country, though very varied in race and language, lived in fairly settled communities where they had considerable land under cultivation. Food was, therefore, obtainable locally in exchange for trade goods, but rice and butter and other articles had to be sent up by caravan from the coast. The normal routine was sometimes interrupted by raids of Masai warriors from the Masai country, which lay to the north of the route of the railway, and occasionally the party had to stand to arms and repel an attack by these warriors. The Masai when encountered demanded *hongo*, or transit dues, which however were always refused.

On reaching the neighbourhood of Lake Naivasha (6,000 ft.), 400 miles from the coast, the survey party met a caravan who brought the disturbing news that there had been severe fighting in Uganda, that communication between that country and the coast was completely severed and that Captain R. J. Lugard (later Lord Lugard), who had been in charge of the Imperial British East Africa Company's affairs in Uganda since December, 1890, was besieged in the Fort at Kampala. Macdonald estimated that his expedition could not reach Uganda for two months, but he deter-

mined to push on, taking with him all the spare ammunition they could carry. A company was also formed and drilled from volunteers among the porters and askaris. From Naivasha the two parts of the survey party separated, Macdonald following the ordinary route through Guash Ngisha, and Pringle, who had to cross the Mau escarpment at a level of 10,000 ft., following a more southerly line through Sotik and Lumbwa. The two parties were to meet at Mumia's in the country of Kavirondo, near the terminus of the survey on the Lake. Kavirondo itself and the neighbouring country of Usoga were very fertile and thickly cultivated by their occupants, who were of true negro tribes.

Macdonald now left Twining and Austin to complete the survey and find a terminus for the railway on the lake, and, with Pringle and the larger part of his party, marched to Mengo, the capital of Uganda, to join hands with Lugard and to hand over letters, ammunition and other stores which they had brought up from the coast. He found the capital very disturbed after a civil war and that Lugard was anxious to proceed to the coast with the survey party, so that he could return to England, where he was afraid the Directors of the Company, possibly misled by the reports from Roman Catholic sources in Uganda, were considering the abandonment of the country.

When Macdonald and his party reached Kampala, Lugard asked him to leave an officer and one hundred men in the capital. This Macdonald could not agree to, as his men were under contract for the survey only, but he left as much spare arms, ammunition and trade goods as possible and, after a stay of seven days, left to return to the coast. Transport was short, but by leaving the less essential loads behind, the main body was able to retrace its route, detaching parties to survey on each side, and taking every opportunity of checking previous measurements. By the 7th August they had reached Fort Smith in Kikuyu, 330 miles from the sea. The survey was continued to Kibwezi, 180 miles from the coast, when a mail was received giving Macdonald the unwelcome news that he was to return to Uganda to report on the recent disturbances. By this time 2,700 miles of route had been surveyed, and a practical line had been selected for the railway. A few days of hard work on the plans and reports were sufficient to enable Macdonald to hand over to Pringle the outline of his scheme, which was taken by the latter to London and eventually approved by the authorities.

On 10th September, 1892, Macdonald started again up country

and, after some delays, reached Mengo at the end of the year to find that in the six months of his absence, Captain Williams, R.A., who had been left in charge, had worked wonders. By January, 1893, Macdonald had completed his report on Lugard's operations, which was forwarded to Sir Gerald Portal, the Consul General at Zanzibar, for transmission to England. This completed, Macdonald was asked by Williams to accompany him in an expedition against the Wavuma, who occupied a group of islands in the Victoria Lake opposite the eastern portion of Uganda ; the largest of these islands has an area of 170 square miles. In 1893 the islanders, who were expert watermen, were making frequent raids on Uganda territory, carrying off women and doing much damage. They were also carrying on a slave trade with Arabs in German territory and interfering with the water routes along the northern coast of the lake. After negotiations which were met with an absolute defiance, Williams decided to attack. He collected an army of 100 Sudanese soldiers, 2,000 Waganda armed with guns, 3,000 spearmen and two maxims. Also a fleet of two sailing boats and 230 canoes which, with their crews, brought his force to the respectable total of 10,000 men. Williams was assisted by Macdonald and Lieutenant G. E. Smith, R.E., who had just arrived from England.

The campaign which followed lasted about ten days, during which various islands were captured ; there was an exciting naval engagement, resulting in a loss of about seventy canoes to the enemy, and a landing on the main island, which ended the fighting. Williams imposed a fine in cattle and produce and liberated any Waganda slaves, but on a promise of good behaviour he left the Wavuma in possession of their islands and allowed them to retain their independence. This clemency was amply justified later by the friendly behaviour of the islanders.

Early in 1893 Macdonald was recalled to the capital to meet Mr. Gedge, who brought the news that Sir Gerald Portal, the Consul-General at Zanzibar and senior British official on the coast, had been appointed Imperial Commissioner, and ordered to proceed to Uganda and report on the situation.

There were two main questions : firstly whether the British Government should take over the country from the British East Africa Company, and secondly to try and settle the constant disputes and fighting between the Protestants, Catholics, Mohammedans and Sudanese. The latter were under the command of an Egyptian, Selim Bey, who had previously been expelled from Egypt.

Selim Bey tried to combine with the Mohammedans against the British and on 16th June, 1893, he wrote a letter from Port Alice, which amounted to rank mutiny, and Macdonald realized that prompt action was necessary if the situation was to be saved. He also realized that the Sudanese troops could not be trusted and that he must rely mainly on the Protestant party at the capital. He was the only Military officer in Uganda, where he had two civilian assistants and a doctor. In Usoga, to the east, there was Captain Arthur with one civil assistant and in Unyoro was Major Owen with another civil assistant, Mr. Grant. At Port Alice were Messrs. Reddie and Gedge with a small party of Swahili. Meanwhile the Mohammedans at the capital had been gradually reinforced till they numbered 1,200 guns.

Macdonald decided on prompt action before Selim Bey and the Mohammedans in the capital could combine. He warned Owen that trouble was likely to break out, ordered Arthur from Usoga to join him by forced marches and ordered Messrs. Reddie and Gedge from Port Alice to march at once to Kampala with their small force of Swahilis. He also notified privately the Protestant chiefs and asked them to collect quietly as many fighting men as possible in the capital, and warned both the Catholic and Protestant missionaries.

Macdonald also sent messengers to Sir Gerald Portal, who was by now three weeks' march away, and asked him to return to the capital as, though he could render no immediate assistance, Macdonald thought that the report that the Zanzibari were returning would help to steady the situation.

On the morning of the 17th, Macdonald himself visited the headquarters of the Protestant and Catholic missions, explained his plans and asked for their co-operation. He also interviewed the leader of the Protestant chiefs and found they had quietly assembled a force of 2,000 guns in the town. Mbogo, the old chief and titular head of the Mohammedans, and a young prince were brought into Kampala, and Juma, the Commander-in-Chief of the Mohammedans, and another chief were arrested and brought into the fort under guard. Macdonald also interviewed the officers of the Sudanese Company at Kampala, but found they were not prepared to take a further oath of allegiance to Her Majesty and must be considered as doubtful, if Selim Bey openly joined the malcontents.

The party from Port Alice had been delayed and, as no definite action could be taken till they arrived, Macdonald determined on a

bold move. Escorted by eight Sudanese soldiers picked out as most reliable, and accompanied by the chief Juma, in chains, in charge of two Sudanese with loaded guns, he marched into the Mohammedan headquarters at Natete and, seated on a small anthill, sent for the Mohammedan leaders, and ordered them to lay down their arms and retire from the capital, also that their leading General and another chief should be surrendered as hostages. It was clearly explained that a refusal meant war. The chiefs, unable to communicate with Selim Bey, promised compliance and that the hostages would be sent in next day. With these promises Macdonald returned to Kampala, in the faint hope that hostilities might be averted.

The party from Port Alice had been delayed by the necessity of arranging transport for their sick, so that the column did not start till the afternoon. Mr. Reddie had an interview with Selim Bey who announced that if the Protestants attacked the Mohammedans, the Sudanese would join with the latter. The column arrived at Kampala early in the morning of the 18th. Mr. Gedge had with him a well-disciplined column of seventy men which he placed at Macdonald's disposal, raising the total in the fort to 120 Swahilis. During the night, Selim Bey had been in communication with the insurgents and the latter had been further reinforced by parties from the provinces.

On the arrival of Mr. Reddie, Macdonald determined on immediate action so as to forestall the enemy. Messages were sent to both missions to come into the fort at once. The Protestant party complied but the Catholic missionaries had left the capital during the night to try to join their co-religionists in Buddu. Arms and ammunition had, meanwhile, been got ready, two maxim guns mounted on the parapet and all Europeans and the Swahilis detailed to posts. The Sudanese company, who lived in huts outside the fort, were ordered to parade at once ; the guard on the gate was relieved by Swahilis, and Macdonald, at the head of the old guard, marched it outside and took command of the parade. Simultaneously the Swahilis and Europeans manned the parapet overlooking the parade ground and both maxims were run out. Macdonald then informed the parade that Selim Bey had mutinied and asked if they meant to obey orders, and, when they protested their loyalty, he said it was necessary to disarm them for a time until the troubles were settled. The order " Ground arms " followed at once and was obeyed. The men were then turned about and marched under the parapet, while a party of porters swooped on the arms and secured them.

Side arms and ammunition were then secured without trouble and the men were ordered to return to their quarters. Their officers, who were allowed to retain their arms, were made responsible for their good behaviour. The Europeans had thus won the first move.

Macdonald now proceeded against the Mohammedans in the capital. Selim Bey and his soldiers could not reach the capital till the night of the 18th, so there was an interval of twelve hours before a combined attack could be made, and Macdonald at once summoned the Mohammedans at Natete to surrender and lay down their arms, giving them till 1 p.m. to comply. Meanwhile the Protestant army of about 1,500 guns occupied a crescent of hills in the middle of the town facing Natete, with 500 more in support in the centre, and the Europeans and Swahilis forming a general reserve at Kampala, with their maxims. Just after one o'clock the Mohammedans, headed by their commander, the Mujasi, attacked the left of the Protestant position. At first they were successful, but the Protestants brought up the reserves, the Mujasi fell fighting and the enemy retired in disorder. The retreat soon became a rout and the Mohammedans fled and suffered considerable loss until they were driven out of the town to the borders of their own provinces. The actual fighting had lasted only about thirty minutes. About five of the Protestant party were killed and twenty or more wounded. Their opponents had about 150 casualties.

The next day, Captain Arthur from Usoga arrived at Kampala and part of the army, having returned from their pursuit of the Mohammedans, Macdonald was able to organize an expedition against Port Alice. He left Arthur with a sufficient garrison at Kampala and, taking most of the Europeans, forty Swahilis with a maxim and a Waganda contingent of 700 guns and 1,400 spearmen, he moved out on the 20th June against Selim Bey. By 4 p.m. he reached the Sudanese lines and, extending his force in battle order, with the maxim in a prominent position in the centre, advanced with a small escort and sent orders to the Sudanese to parade on a small hill which was covered by the maxim. By now the Sudanese had decided to surrender and obeyed the order to ground arms. These were at once secured by a body of porters, which had been in readiness, and Macdonald then arrested Selim Bey and disarmed his followers. Selim was tried by court-martial the next day and sentenced to degradation and deportation to the coast. The following day he was taken to an island in the lake, while Macdonald returned to the capital.

Macdonald at once wrote to the Mohammedan chiefs that, if they remained in the provinces allotted to them, they would be left in peace, but armed Mohammedans found outside their provinces would be treated as enemies. Many of the chiefs accepted these terms, but a party remained hostile and pressed on towards the west to attack Owen in South Unyoro. Meanwhile Sir Gerald Portal, on receiving the first report of the situation, had turned back with an escort, sending about two-thirds of his party on to the coast. On receiving the further report of Macdonald's success, however, he wrote officially and unofficially to congratulate all concerned and to say that he was sending Lieutenant Villiers back to Uganda, with twenty Swahilis to assist. Villiers completed the distance of 180 miles in nine days. Portal was detained by the illness of Colonel Rhodes, and when the latter recovered sufficiently, the whole of his party continued their journey to the coast.

The move of the Mohammedans against Owen started alarming rumours that Owen and his assistant, Mr. Grant, had been massacred. This, happily, was not the case, but Macdonald dispatched a Protestant army 7,000 strong, under their own General, to follow up the rebels and called on the Roman Catholics in Buddu to assemble a force to join the Protestants. Captain Arthur with a small armed force and a maxim was sent to Buddu by canoe to restore confidence.

On the 7th July, the Sudanese were re-armed and, a few days later, Mr. Gedge, who had given most loyal assistance, left for the coast, taking with him Mbogo and a young prince who were to be kept at Zanzibar, and Juma, the Mohammedan General, who however escaped on the way. They also took with them Selim Bey and a small following, but Selim, who was an old man and overwhelmed by his misfortunes, died on the way. His death eased the situation and the Sudanese troops not only rendered loyal service, but Macdonald succeeded in forming a reserve from among the Sudanese who had not enlisted. The men of this reserve were paid a small regular amount which sufficed to keep their families and followers, and enabled them to live on their holdings, thus stopping looting and the robbing of plantations.

Owen, in command of the forts in the west, was in a very difficult position; he was in charge of a large body of 1,200 Sudanese and their followers, in addition to his Sudanese garrisons, and various rumours of disaster to the British reached the latter. Owen took the risk of placing in command of Fort de Winton the leader of the mutinous Sudanese, named Bilal. This officer promptly abandoned

the Mohammedan cause and joined the British. The arrival of the Protestant army added to the serious food shortage and an attempt at reconciliation was ended by the Mohammedans breaking away to the west, hotly pursued by Owen with the Protestants. A sharp battle followed in which the Mohammedans were dispersed with about 500 casualties. Following this, the rebels surrendered and were allowed to return to their provinces under their own chiefs, while Owen was able to join hands with Macdonald. The latter was then able to rearrange the areas allotted to the different sections by allotting one of the three Mohammedan provinces to the Roman Catholic chiefs. This led to further threats of rebellion, but some rapid movements of small columns, led by Macdonald, Owen and Villiers, persuaded the malcontents that opposition was hopeless and by September, 1893, the third Mohammedan War was ended.

Macdonald had now to consider the future of the western forts and, though naturally averse to withdrawal in any form, decided, after consulting Owen, to bring the whole of the Sudanese and their followers into Uganda and Usoga, where there was land available for settlement. An offer was made to loyal natives in the west to move into Uganda, but the chief of Toru thought he could hold his own if given a few more guns. The large movement of people required careful organization, but was carried out without a hitch. A party of old Sudanese officers with their families were located at Lubwa's in Usoga, two forts were built on the eastern frontier of Unyoro with a garrison of seventy men each, the numbers at Port Alice were increased by 500 and others were distributed to centres, all within call of Kampala. By Sir Gerald Portal's instructions, the number of enlisted Sudanese was limited to 600, but to this was added the reserve of 300 which had been authorized. This was little enough to keep order in a population of 400,000!

Macdonald also helped to develop the arts of peace. At Port Alice he taught selected natives how to make bricks and how to build them into houses, laying the first bricks himself. A keen yachtsman, he managed to improve the rig and sailing qualities of the boats on the lake. He also took steps to check the slave parties which, starting in the Congo area, used to cross the lake and reach the coast in the German Protectorate. He was successful in arranging the release of the Lembu, or domestic slaves, owned by the Sudanese and settled them on suitable land near Lubwa. It must be noted that, throughout all this time, Macdonald was limited by an estimate of cost laid down by Sir Gerald Portal.

UNYORO (see map facing page 130).

Before his departure, Portal had promised to arrange for four Arabic-speaking officers to command the Sudanese. Macdonald and Owen had planned, on the arrival of these officers, to move against Kabarega with about 400 Sudanese and a contingent of Waganda. They did not propose to occupy the country, but to overthrow Kabarega's forces, drive him from his capital and compel him to make peace, receive a British Agent at his capital, open the country to trade and give a secure passage to Lake Albert. But instead of the expected officers, in November, 1893, Colonel Colville arrived to take charge in Uganda. Colville approved all Macdonald's arrangements, appointed Owen to command the Sudanese Battalion and made Macdonald his senior Staff Officer. The final crisis was precipitated by attacks from Unyoro and, in December, Colville declared war and commenced operations. Unyoro was a large kingdom lying north and west of Uganda, on an elevated plateau between the equatorial lakes and the Victoria Nile. At one time tributary to Uganda, it was now independent and had extended its influence as far north as Wadelai and to the west of the Albert Nyanza. It did considerable trade with Arabs and Swahili passing north of Uganda and was thus able to obtain a large supply of arms and ammunition. Kabarega had organized a standing army of 3,000 men, who were located in districts near his capital. He had been consistently hostile to the British from the time when Lugard established the Sudanese troops in forts on his south border.

Colville contemplated more extended operations than had been proposed by Macdonald and intended to use his whole strength in an attack on Kabarega's capital. His force was organized in two divisions. The Headquarter Division consisted of eight Europeans, 450 Sudanese troops, two maxims, 450 porters, half of whom were armed, and a Waganda contingent of 400 guns and 1,200 spears. The second division was entirely of Waganda, under their own General, and numbered 3,000 guns and 9,000 spears. By the 28th December the force had reached the Kufu River where it was 1,000 yds. wide and Macdonald had the task of constructing three bridges and causeways across this obstacle, using a working party of 7,000 men!

Fortunately they were unopposed and the enemy's capital was reached in two short marches without serious fighting. Kabarega had made the mistake of dividing his force into four columns and,

misled by the rapid advance of Colville's force, he had only one of these at the capital. He, therefore, instead of resisting, retreated north-east towards the Budongo forest, where he had concealed supplies. Here it was found impossible to bring him to battle. Keeping the enemy blockaded in the forest, Colville moved on to Kibero, on the lake, where a fort was built, with other forts at various centres in support. A steel boat was launched on the lake and a number of canoes captured, and with these Owen was sent to the north end of the lake to get in touch with Wadelai, Emin's old station. Meanwhile the Waganda division had been sent into the forest against Kabarega and succeeded in defeating him and dispersing his following. On the completion of the forts, Colville withdrew his main force, leaving Captain Thruston in command with three and a half companies of Sudanese, while the chiefs in the southern part of Unyoro were formed into a confederacy friendly to the British, under the leadership of the King of Toru. This ended the Unyoro campaign of 1893–4.

Macdonald remained for a few weeks to assist Colonel Colville and left Zanzibar for England in June, 1894, after two and a half years in East Africa.

For his services, Macdonald received the thanks of the Government, was promoted Brevet Major, earned two medals and was given the Brilliant Star of Zanzibar, second class.

Some subsequent history may briefly be noted. On the 19th June, 1894, Uganda and the neighbouring territories were proclaimed a British Protectorate and Mr. Berkeley was appointed Commissioner. Later in the year Kabarega again rebelled and, after further fighting, the Kingdom of Unyoro was incorporated in the British area.

The trouble between the Catholics and Protestants was settled by the appointment of a Roman Catholic Bishop of British nationality, the French Bishop moving into the German area.

The report of the railway survey, carried out by Macdonald, had been completed at home by Pringle and submitted to the Home Government. It proposed a railway about 657 miles long, at an estimated cost of £2½ to £3½ million, according to the standard of construction adopted. After much discussion a vote of £3 million was passed by Parliament and work began in December, 1896. It was carried out by a corps of Indian coolies.

In 1895 Captain B. L. Sclater, R.E., who had been working in Nyasaland, was sent to Mombasa to survey and construct a cart

road from the coast, through Mumia, to Lake Albert. He was accompanied by Lieutenant G. E. Smith, R.E., and four N.C.Os. After two years' work a road suitable for bullock carts was constructed from the coast to the shores of the lake. One result of this survey was to suggest a better line for the railway across the Mau escarpment, by which the total length of railway was reduced to 562 miles. In 1900 Parliament voted a further sum of £1,930,000 and the railway was completed in 1901.

The Expedition to the Nile

In 1897, events farther north in Africa brought Macdonald again out to Uganda on a secret mission. In 1895 Kitchener began his move up the Nile to Dongola, which was to culminate two years later in the overthrow of the Mahdi and the reconquest of the Egyptian Sudan. The French, who at this time were keen rivals with the British in the Colonial field, formed a plan to cut off Egypt from the Great Lakes by occupying a belt of territory right across Africa, from their West African territory to the French territory round Jibuti on the Somali coast, and in pursuance of his plan an expedition under Captain Marchand was dispatched to Fashoda to meet a similar expedition from French Somaliland. The British Government protested, but without avail, so that the British, besides warning Kitchener, decided to dispatch an expedition from Mombasa, through East Africa, to reach Fashoda before Marchand if possible.

Macdonald, still only a Captain in the Corps, was selected for the command of this important undertaking and he landed at Mombasa in July, 1897, at the head of a force consisting of ten British officers, thirty Sikhs from India and some locally enlisted Swahili porters.

It was intended that he should be supplied with an escort of three companies of the Sudanese stationed in Uganda. His Staff included Captain E. M. Woodward of the Leicestershire Regiment as Second-in-Command, his younger brother, Lieutenant N. A. Macdonald, 14th Sikhs, and Lieutenant H. H. Austin, R.E., who had accompanied Macdonald in his railway survey of 1890–1. The following details are taken mostly from Austin's account of the expedition called *With Macdonald in Uganda.*

The party landed at Mombasa, which had been made the starting point of the railway and was much changed from the quiet harbour it had been in 1890. The work on the railway was in hand and the railhead was now some sixty-eight miles from the coast. The ex-

pedition was met on arrival by Captain B. L. Sclater, R.E., who was on his way home and wished to hand over all his carts and oxen, which had been left up country in charge of Corporal Simmons, R.E. Sclater was very ill but had waited at Mombasa so that he could personally inform Macdonald of the arrangements he had made. Unfortunately the delay proved fatal and Sclater succumbed to dysentery at Zanzibar, just before he intended sailing for England, a severe loss to his Corps and to the country. The journey up country was not free from difficulty though the party had the benefit of Sclater's road and the use of some cart transport, also there were, on the road, parties employed on the railway and occasional traders with well-stocked stores at the larger centres. Even the warlike Masai had settled down and proved expert in handling herds and stocks.

Mutiny of the Sudanese

On the 15th September the expedition was concentrated about 350 miles from the coast at Ngare Nyuki, which was to form their advanced base. Here they were formed into three columns. No. 1 under Austin, with three other Europeans, was to lead the march to the northward into the Suk country. No. 2 column, under the younger Macdonald with one other officer, was to follow lightly equipped, ready to branch off to any point of interest, and the third column, which formed the main body, under the elder Macdonald with three other officers, was to follow at a short distance. As the country to be traversed was largely unknown, each column was to have an escort of Sudanese soldiers from Uganda. Mr. F. J. Jackson, who had served with Macdonald during the latter's first visit to Uganda and who was just taking up the appointment of Acting Commissioner from Mr. Berkeley, was making the arrangements for the Sudanese troops to join the expedition. Unfortunately there was at this time a good deal of unrest among these troops, mainly because they had been almost continuously employed in various expeditions to Unyoro and elsewhere. Also the men had not forgotten the events of their attempted mutiny, only three years before, and the death of their leader, Selim Bey. There was still a heated rivalry between the Christian and Mohammedan parties in Uganda, and the Sudanese, being Mohammedan, sympathized secretly with that party.

By the efforts of Mr. Jackson, 220 men were collected at the base and the balance of 113 men were on the road. They had with them their wives and families, who were to have accompanied the

columns for at least part of their march, but on the urgent representations of the senior Sudanese officer, Mabruk Effendi, this arrangement was cancelled. Many of the men had individual grievances and Macdonald spent much time in hearing complaints. He was not now in any position of authority, but with great patience gave everyone a hearing and by the late evening it was thought that everthing was ready for an early start the next day. No. 1 column, under Austin, did actually start on the 21st, with an escort of sixty-nine men, but when No. 2 column should have started, on the 22nd, the Sudanese consented to march only on the personal intervention of Major Macdonald, and deserted the same night. On the following day the remainder of the escort left the camp, threatening the British officers when they tried to intervene. Macdonald sent a messenger to Austin to push on as arranged, pending further instructions, and, in conjunction with Jackson, followed the route of the mutineers. Communication with these latter was opened at several points and every effort was made to persuade them to return to duty. No attack was made on them, but an attempt was made to throw Macdonald's force across their route and so prevent their return. This was unsuccessful and the mutineers pressed on to the capital, looting and foraging for food and killing any natives who resisted. All the various officials along the route had been warned, but party by party all the Sudanese garrisons deserted, as did also, on the 26th, Austin's sixty-nine men. The commanding officer in Uganda at this time was Major Thruston, who had served on the Unyoro expedition in 1894, and news was received that he was proceeding to the fort at Lubwa where there were 160 Sudanese on whose fidelity Thruston trusted implicitly. The mutineers, numbering about 320, were a day's march distant and Macdonald's column of ten Europeans, seventeen Sikhs, two maxims and 341 armed Swahilis, were one day in rear of them. Unfortunately the Sudanese at Lubwa treacherously seized Thruston and Wilson, who were made close prisoners, and also captured a steam launch on the lake which had come from Kampala under Mr. Scott ; from the launch they got thirty more mutineers and a maxim.

Fighting at Lubwa

The fort at Kampala and all the other posts were still held by the British officials, who began to collect a large force of Waganda Christians to support the authorities, but 200 Waganda Mohammedans from Usogo had joined the rebels. On the morning of 18th

October, the pursuing party under Jackson and Macdonald were able to occupy a low hill, 500 ft. above the lake, and about 3,000 yds. from the fort. Here they were able to communicate with the rebels and received a letter from Thruston saying, "Don't fight unless attacked." At daybreak the next day about 300 of the mutineers, accompanied by 200 Wanga Mohammedans, advanced in attack formation against the hill. Jackson and Macdonald endeavoured to parley with the leader, Suliman Effendi, but while the parley was proceeding, Suliman himself gave the order to attack and, seizing a rifle, commenced to shoot. He was promptly knocked over and, after a struggle, was shot in the mêlée. The action became general, the Europeans and the party of Sikhs with their maxims forming the backbone of the defence, but they were well backed by the Swahili. The action commenced at 6 a.m. and lasted for five hours, during which eight desperate attacks were repulsed. Ammunition began to run short, but a successful counter-attack by 140 Swahilis, led by Kirkpatrick, gained the victory. In this desperate battle, on which the future fate of Uganda depended, the enemy lost at least a hundred killed and wounded, of whom forty were left dead on the field. The Government party lost Fielding killed, while Mr. Jackson was dangerously wounded, the total casualties being sixteen killed and thirty wounded. The position of the small force was still critical as their ammunition supply was short, but a defended camp was formed and urgent messages were sent to Kampala. During the next few days, a Waganda army of 1,600 guns arrived, accompanied by Mr. Pilkington and Dr. Cook of the C.M.S., with a supply of ammunition, and later they were joined by other Europeans.

Meanwhile, at Lubwa, the Sudanese who had taken part in the fight began to talk of surrendering, but their officers, who had little to hope for, sent for the three English officers, and two of the rebel leaders, Bilal and Rehan, shot the officers on the spot. Following this terrible deed the Sudanese in Lubwa fought most desperately, the officers adopting barbarous measures to check desertion, and, in the absence of artillery, the fort proved a most difficult nut to crack. As reinforcements of Waganda arrived and ammunition was collected, a close investment was organized. But the general situation was very critical, as the Sudanese troops in all parts of the country were ripe for mutiny, in the hope of forming the Mohammedan Kingdom which had been their dream for some years.

On the outbreak of the mutiny, urgent messages had been sent

to the coast for reinforcements and the first of these, a party of one hundred men of the East African Rifles, commanded by Captain Harrison, arrived on the 7th December, and on the 10th December Austin and his column reached Lubwa. Austin had been joined by Norman Macdonald with his column and had, as ordered, continued his survey work to the east of Mount Elgon, but was recalled by his chief when the situation became serious. Further reinforcements, from the 27th Bombay Light Infantry, were on their way from India and detachments of the East African Indian contingent were moving up from the coast in small parties.

On the arrival of the first reinforcements, attempts were made to construct an advanced post on the peninsula to restrict the mutineers to their fort, all access from the lake having been blocked by a fleet of canoes organized by Macdonald and Wilson, now acting Commissioner. On the 11th the enemy made a desperate flank attack on the working parties, during which Norman Macdonald, while rallying his Swahilis, was killed and Mr. Pilkington, the C.M.S. Missionary, who was helping in charge of working parties, was also killed. A few days later, news was received from Buddu that the 200 Sudanese there intended to mutiny and Macdonald himself started with about 200 men in canoes. Meanwhile King Mwanga, who a few months before had been driven into German territory by Major Ternan, escaped from his German escort, put himself at the head of the Mohammedan party, and with a force of 2,000 guns advanced into Buddu. Macdonald, on arrival at Buddu, disarmed 150 of the Sudanese and with fifty that remained loyal and his own party, completely defeated the ex-King on the 15th January, 1898. The departure of Macdonald's force had left the British force at Lubwa too weak to carry on active operations, but on the 9th the rebels, who were getting short of ammunition, left the fort by boat and started marching to join the Sudanese in Unyoro. It was evident that if such a combination took place the situation might be very dangerous.

On the 14th January the first party of Indian troops arrived, but the 27th Bombay Regiment, who had been ordered from India, could not arrive till the beginning of March. Macdonald's return on the 26th January did much to raise the spirits of the Waganda, and from this date till the 3rd May there was a series of small operations, directed against one or other of the groups of rebels, designed to prevent any combination between the different parties. During these operations all the British officers and men performed

prodigies of hard marching, severe fighting and physical endurance, of which details cannot be given in this volume. It is no detraction to them to say that the whole series of operations centred round the person of Macdonald, whose extraordinary knowledge of the country and his personal influence with the natives, coupled with his own fertility of resource, earned him the unbounded confidence of his officers and men.

It is sufficient to say here that the garrison of Unyoro joined the mutineers and for some weeks the situation was highly critical, but as further parties of reinforcements arrived from the coast the initiative shifted to the British and Macdonald may be said to have saved Uganda for the Empire for the second time.

Macdonald Resumes His Mission to the Nile

On 11th April, Mr. Berkeley arrived to take control at Kampala and, on his arrival, Macdonald began to consider the resumption of his interrupted mission to the north. On the 3rd May, he handed over the command of the troops in Uganda to Major Martyr and began to reorganize his expedition. It was at first intended that he should be escorted by strong parties of Indian and Sudanese troops, but a recrudescence of hostilities in Unyoro made it impossible to spare them. On the 3rd June, Macdonald left the capital and, moving west of Mount Elgon, marched through beautiful country which had not previously been penetrated by a white man. Eventually the main body reached the Latuka country about 350 miles from their base at Mumia's, while a second column under Austin explored the western border of Lake Rudolph, an immense stretch of water which had been discovered by an Austrian expedition in 1894. Before they could penetrate further, the secret object of their expedition had been rendered unnecessary by Kitchener's success at Fashoda, and it was decided to withdraw the expedition, which reached the coast on the 4th March, 1899.

After Macdonald left the capital in June, 1898, the Mohammedan parties succeeded in combining under the Kings Mwanga and Kabarega, until they were decisively defeated by Lieut.-Colonel Evatt early in 1899, when both Mwanga and Kabarega were captured and were deported, first to the coast and then to the Seychelles, where Mwanga died in 1903.

Before leaving Kampala, Macdonald submitted an official dispatch on the operations carried out under his orders from September,

1897, to May, 1898, and asked that a medal and clasps might be issued for this campaign. This was granted.

In this final dispatch Macdonald gives a summary of the casualties suffered by the Government forces; these included 280 killed and 555 wounded. Of the small group of Europeans, military and civil, seven officers were killed and five were wounded. Macdonald also brought to notice the assistance he had received from both the Protestant and Catholic missions, mentioning seven ladies of the Church Missionary Society who had assisted in nursing the wounded.

A list of honours and awards was published in the Gazette of 24th January, 1899, in which Macdonald was promoted to the brevet rank of Lieut.-Colonel (his regimental rank was only that of Captain), he was made a Companion of the Bath and received the medal with two clasps. He also received the formal thanks of the Government for his services.

Captain H. H. Austin was promoted Brevet Major in this Gazette and 2nd Corporal W. M. Brodie, R.E., who had done excellent service during the fighting in command of parties of local troops, was granted the Medal for Distinguished Conduct in the Field.

The maps and reports of his expedition were completed in London and a crowded meeting of the Royal Geographical Society was addressed by Macdonald on the geographical results of his travels.

Press Attacks on Macdonald

During the operations in Uganda, Macdonald was attacked by certain sections of the Press in a manner which caused him great distress. He was charged with contributing to the mutiny in Uganda by his harsh treatment of the Sudanese under Selim Bey. Actually Macdonald was most careful and considerate in all such questions, and while in emergency he could act with decision, he always endeavoured to gain his ends by peaceful methods. He was thoroughly trusted by his native allies in Uganda and made many friends among the tribes through whom his expedition passed.

Subsequent History

With the capture of Mwanga and Kabarega the power of the Mohammedan party was broken but operations against the Sudanese continued till 1901, when they were finally dispersed.

There was a rising of the natives in the Nandi country in 1900,

which produced some sharp fighting, and again in 1905–6, and there was a rising farther north in Jubaland, near the border of Somaliland, in 1899.

In 1899 the British Central African Regiment was raised for operations in East Africa with a strength of nineteen British officers and 1,000 men, and in 1901 all the local forces in British Central Africa, East Africa, Uganda and Somaliland were combined to form the King's African Rifles, which at one time had a strength of six battalions. This force was under the general control of the Inspector W.A.F.F., in the Colonial Office.

Employment of R.E.

As the country came under control, increasing demands were made on the R.E. In 1892 Lieutenant G. E. Smith, R.E., was a member of a party which began the delimitation of the northern boundary of German East Africa. This was completed by later expeditions in 1902 and 1904, in which G. E. Smith, now Captain, was appointed Commissioner with the local rank of Lieut.-Colonel, and Lieutenant T. T. Behrens, R.E., was Assistant Commissioner, and a further expedition to define the Anglo-German-Belgian boundary was sent out in 1911 under Captain E. M. Jack, R.E. There was also a series of expeditions on the northern boundary, linking up with the Sudan-Abyssinian frontier, under Captain P. Maud, R.E., Major C. W. Gwynn, R.E., and Captain R. L. Waller, R.E.

In 1900, Major H. H. Austin made an exploratory survey along the western and southern borders of Abyssinia, as far as Lake Rudolph, thus joining up with his expedition from Uganda in 1898.

In 1905, G. E. Smith, now Major, was appointed Director of the Survey Department for East Africa, in which were also employed Captain G. S. Knox, Lieutenant E. W. Cox, Captain G. C. Williams, Captain A. M. Coode, Lieutenant G. A. P. Maxwell, Captain L. N. F. I. King and Lieutenant D. Cree, all R.E. Details are given in Volume III, Chapter VI.

A topographical survey of Uganda was carried out from 1908 to 1910 by Captain W. C. Macfie and Lieutenant H. L. D. Pennington of the R.E.; towards the end of which Lieutenant Pennington died of fever in July, 1910.

In 1907, Captain A. G. Stevenson was sent to Uganda to carry out survey work in connexion with the extension of the railway, assisted by Lieutenant H. A. L. Hall and Lieutenant C. E. Fish-

bourne. In the same year Captain P. O. G. Osborne was appointed Chief Engineer, P.W.D., Uganda, which he held till 1910. In 1911 Captain J. E. E. Craster carried out a survey of the Island of Pemba, where cloves come from, while Brevet Major E. A. M. Leggett, D.S.O., was employed under the British East Africa Corporation, Limited, from 1907 to the opening of the Great War.

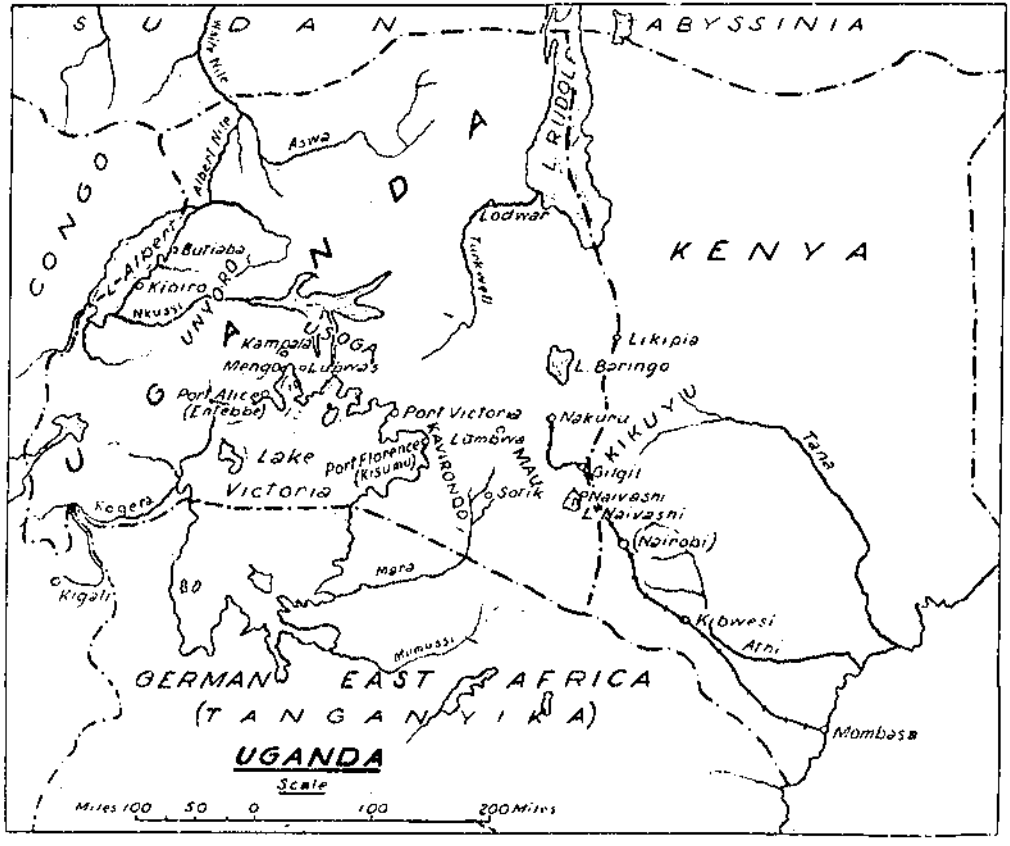
In November, 1909, Brevet Colonel Sir E. P. Girouard, K.C.M.G., was appointed Governor of the East Africa Protectorate. Girouard was instrumental in putting the finances of the Colony into order, with a balanced budget, thus getting rid of grants in aid and the consequent control by the Imperial Treasury. He was also successful in concentrating the Masai in the Southern Masai Reserve, thus releasing for development by Europeans a large area of land which had been wastefully used for grazing by the Masai.

Girouard held the appointment until September, 1912, when he resigned to take up the position of Managing Director of the great armament firm of Armstrong, Whitworth & Co.

SOMALILAND (see map facing page 140).

North of British East Africa lie the two contrasting countries known as Abyssinia and Somaliland. The former came into the story of the Royal Engineers by the military expedition of 1867, under Lord Napier of Magdala, but after the withdrawal of the British force, Abyssinia was left to develop its own remarkable history, which, it was said, could be traced back to the time of Solomon. The Abyssinians officially professed a form of Christianity. East of Abyssinia, and stretching some hundreds of miles along the south coast of the Gulf of Aden to the "Horn of Africa," lies the country known as Somaliland. All along the coast there is a narrow strip of desert, but inland the level rises to a mountainous district 4,000 to 7,000 ft. above sea level. On the western side, which is well watered, there are large forests and deep valleys, but on the east side there is a high plateau where water is scarce, except during the rainy season. The land is inhabited by a mixed population, the remains of a series of waves of immigration from Arabia, which, mixing with the Gallas and the earlier negroes, has produced a brave if excitable race with good fighting qualities. They are Mohammedan by religion and split up into a number of separate tribes.

The principal interest of the British in this country was that it acted as a supply centre to Aden, which was and is a very important


SUDAN
ABYSSINIA
White Nile
Albert Nile
Aswa
L. Rudolf
CONGO
UGANDA
Lodwar
Turkwell
KENYA
Butiaba
Kibiro
Nkusssi
L. Albert
UNYORO
Kampala
USOGA
Mengo
Luzira's
Likipia
L. Baringo
Port Alice (Entebbe)
Port Victoria
Nakuru
KIKUYU
Lake Victoria
Port Florence (Kisumu)
KAVIRONDO
Lumbwa
MAUK
Tana
Gilgil
Naivasni
L. Naivasni
Sotik
Kagera
(Nairobi)
Kigali
BU
Mara
Kibwesi
Athi
Mumuassi
GERMAN EAST AFRICA
(TANGANYIKA)
Mombasa
UGANDA
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pivot in our system of sea communications. Somaliland was a good grazing country, and the natives owned large herds of camel, whose milk formed the principal item of their diet, and also flocks of sheep, of which some 60,000 were exported yearly to feed the town and garrison of Aden. There was also a considerable local trade in hides, coffee and other products, which were brought down from the interior by caravans to the coast ports.

Up to 1884 the Egyptian Government exercised a general supervision over the country and had a garrison of half a battalion with a few guns at Harar, a small town in the hills, 180 miles from the coast and 6,000 ft. above the sea. But the unrest in Egypt in 1884 made it necessary to withdraw this garrison. The garrison of Aden on the other side of the Gulf, which was administered by the Indian Government, was drawn from the Bombay Presidency of India and included a company of Sappers and Miners and about six R.E. officers.

To assist in the withdrawal of the Egyptians, the Aden garrison sent a party of officers and men, including Lieutenant F. D. Fullerton, R.E., to Harar. The withdrawal proceeded quietly through the coast town of Zeila and the Indian Government then took over the control of the coast. A consul was placed at Zeila and a British Resident at Berbera to control, with a few Indian policemen, the small ports of Berbera and Bulhar. This transfer of control encouraged various civilian and British parties to visit the country, mainly for reasons of sport, and among the first visitors was Lieutenant H. G. C. Swayne, who had been commissioned in the R.E. in 1880. Swayne made his first trip in 1885, thus beginning a close connexion with the country, which lasted till 1897. In May, 1885, Swayne was ordered to Bulhar with a party of Indian Sappers to construct a defensible hutment for a small garrison and, as the senior military officer, had to lead the escort of twenty-five Indian Cavalry against an attack of 120 native horsemen who were threatening Bulhar. In December of the same year he was sent out on a survey trip, to map the caravan routes and to get some idea of the interior. This was followed by another expedition in 1887.

In all these trips Swayne carried out a rapid reconnaissance of his route, and his maps, which covered many hundreds of miles of route and reached 200 miles from the coast, were completed and printed by the Indian Survey.

Meanwhile an important change occurred in the political situation, as, in 1887, an Abyssinian General, Ras Makonnen, a nephew of

King Menelik, invaded Harar, deposed the Arab Emir who had succeeded the Egyptian Government, and established an Abyssinian garrison. This garrison, in order to obtain food, began to raid the Somali tribes in the neighbourhood. These tribes, who had not been allowed to import arms through ports under British control, appealed to the British for assistance, which was given as far as possible by diplomatic action from Aden. In 1893 Swayne passed to the British Foreign Office a dramatic request for protection, from the native tribes bordering on Abyssinia.

At the end of his expedition in 1887, Swayne, while on leave, was asked to lead an expedition to relieve Emin Pasha, and spent part of 1888 in East Africa, returning from there to India and to the Lushai campaign in Burma. At the end of this campaign Swayne, then a Captain, was asked to undertake to map the whole of Somaliland for the Government of India. This occupied him till 1892. He was assisted by his brother, Lieutenant Eric J. E. Swayne of the 16th Bengal Infantry, and had a party of about thirty local Somali, whom he had engaged, armed and trained. The country was much disturbed by robber bands and inter-tribal feuds. This survey was carried out with a series of traverses with prismatic compass, connected by a triangulation with theodolite and some measured bases, the whole carefully fitted into a series of points of which the latitude and longitude had been fixed. Though this reconnaissance survey was not based on a preliminary triangulation it constituted a complete record of the country, and was treated as such by the Government of India and still forms the basis of the topographical map of Somaliland. No record of this important work is given in Chapter VI of Volume III of our *History*, which deals with Survey work under the Home Government, and as Somaliland was transferred in 1898 from the control of the Indian Government to that of the British Foreign Office, no mention of this Survey is made in *The Military Engineer in India*, by Lieut.-Colonel E. W. C. Sandes.

During the course of this work over 8,000 miles of route were covered and there were thousands of observations.

In 1892, during the course of the Survey work, Swayne had reached Gildessa near Harar, where he and his party had been practically arrested by the Abyssinian Governor. An appeal to Ras Makonnen had resulted in his release and a cordial invitation to visit the Ras at Harar. On the completion of the Survey, Swayne spent his leave in a long expedition, 500 miles inland, to explore Gallaland and the sources of the Juba river. He first called on

Ras Makonnen at Harar, spending some days there, and receiving, among other presents, a grey riding mule and embroidered equipment. The details of the trip cannot be given here, it is sufficient to say that Swayne reached the Webbe Shabeleh River, 400 miles from the coast, which had not been previously explored. Although these trips were primarily for sport, full reports of all such excursions into unknown country were sent home by Swayne, who received the thanks of the Indian and Foreign Offices for his work.

An account of this and his previous journeys was written by Captain Harald G. C. Swayne in a book published in 1895, called *Seventeen Trips through Somaliland*. This book, which was for some years the only detailed record of the country, ran to three editions, the last being published in 1903.

In 1897 an important diplomatic mission, under Sir Rennell Rodd, was sent to interview the King of Abyssinia at Addis Ababa, and Swayne was selected as the representative of the Indian Government and guide to the mission. The main object of the mission was to get in better diplomatic touch with Abyssinia, which the previous year had defeated the Italians at the battle of Adowa. Another object was to define more closely the relative boundaries of the French, British and Abyssinian territories at the north-west frontier of Somaliland. The mission started from the port of Zeila and marched through Gildessa and Harar, on to Addis Ababa, a total distance there and back of some 960 miles. There were seven officers in all and a small escort including some Indian Cavalry and some armed Somalis. The picturesque details of their reception by the King are given in Swayne's book. Swayne took every opportunity of increasing our geographical knowledge, spending part of each night in observation of stars, which enabled him to fix very closely the latitude and longitude of the capital and of important points on the route.

Up to 1897 the relations between the British and Somalis had been very friendly. There was constant fighting in Somaliland itself between the different tribes, who in some cases carried on a form of blood-feud, and the British had sometimes to intervene in self-defence, or to prevent the fighting spreading. In 1890 an expedition had been sent to Zeila in which the R.E. were represented by Captain B. B. Russell and Lieutenant R. E. Picton Jones*, with seventy men of the 4th Company, Bombay Sappers and Miners. Picton Jones was also employed later in improving the defences of Berbera.

* Later changed his name to Picton (see p. 156).

Expeditions against the Mad Mullah

In March, 1899, the Mullah definitely broke off relations with the Vice-Consul and by August, 1899, he was in open rebellion with a force estimated at 5,000, of whom 1,500 were mounted. He had 200 modern rifles, the remainder of his force being armed with spears.

In March, 1900, he came into conflict with the Abyssinians and during this year he became so troublesome that an arrangement was made to raise a local force which should co-operate with an Abyssinian expedition. It was put under the command of Captain (local Lieut.-Colonel) Eric J. E. Swayne, Indian Army, who had assisted his brother, Captain Harald G. Swayne, R.E., in the Survey of Somaliland in 1890–2. On completion of the survey, Eric Swayne had served with distinction in Uganda. There was in the Protectorate a small force of the 2nd Battalion King's African Rifles, but these were being withdrawn for service in Ashanti, so Eric Swayne's first job on arrival in November, 1900, was to raise a force of about 1,500 natives, of which 100 were to be mounted on camels, 400 on ponies or mules, and 1,000 were to be infantry. A mixed body of twenty-one British officers from England and India were seconded for this force. Among these were Captain G. E. Phillips, R.E., and Lieutenant D. A. Friedrichs, R.E. These two officers, in addition to advising on engineer questions, also acted as officers of the native levy. The Abyssinians were to contribute a force of about 15,000 men, and a British officer was attached to this force to ensure co-operation. The Dervishes were by now estimated at 5,000 with 600 rifles. The advance of the British force commenced on 22nd May, 1900, and an advanced base established at Samala was attacked on the 31st May and again on the following day ; both attacks were repulsed with heavy losses to the enemy. The Mullah then retreated over the frontier, followed by Eric Swayne, with considerable difficulty owing to the shortage of water and the dense scrub. On 16th June, Swayne caught up with the enemy, who were in some thick jungle on the slopes of a mountainous ridge. Swayne ordered one of his Infantry companies, commanded by Phillips, to clear the ridge on his right, while a second company was sent round the left flank, and he himself attacked in the centre. The thick scrub prevented any view of the enemy, and the leading party of the centre column fell into an ambush in which Captain D. A. Friedrichs, R.E., who had been Adjutant of the Infantry force, was killed while

assisting a wounded Havildar to mount. The pressure of Phillips's force on the right, however, was successful in overcoming the enemy's resistance, with the result that the Mullah's force was completely broken and he and a few followers had to flee for their lives. Swayne could not continue the pursuit, but succeeding in withdrawing his whole force, with sick and wounded, returned to his base. The British losses were one British officer and twenty-one other ranks killed, and one British officer and twenty-three other ranks wounded. The enemy was estimated to have lost 1,200 killed and 800 wounded.

But though the Mullah was temporarily worsted, it was not possible to make any effective occupation of the territory from which he had been driven, and by October, 1901, he had reassembled his riflemen and by January, 1902, had collected a force of 12,000 men, of which 10,000 were mounted and which included 1,000 rifles, the balance being spearmen.

Eric Swayne was again appointed to command and his small force was increased by 500 Infantry and 100 Cavalry with three maxims and two 7-pr. guns. There was also a reinforcement of 3rd King's African Rifles. Major Phillips, R.E., who had returned to England at the close of the first expedition, again volunteered his services. Eric Swayne advanced on 1st June, but the enemy was elusive. In September, Swayne received reinforcements of 250 2nd Battalion King's African Rifles, from service in Ashanti and Gambia, and a small detachment of Sikhs. The latter were sent to strengthen the Garrison at the advanced base at Bohotle. He then followed the Mullah in the direction of Mudug, an area in the Abyssinian portion of the Haud, which was covered in dense bush. Eric Swayne had with him a train of about 4,000 camels carrying water and supplies, and, as he neared the enemy's camp, formed his men in a square covering his transport. The enemy attacked at a place called Erigo, where the bush was so dense that the two sides were firing at a range of only 20 yds. The front of the square held its own and even advanced, driving back the enemy, but the left face of the square, composed of some of the more recently formed levies, broke before the attack, and Phillips, who was in command on this side, was killed while rallying his men. Meanwhile the transport had scattered in the bush. The enemy captured a machine-gun, but their losses were very heavy and eventually Swayne succeeded in reforming the square and the enemy were driven off. Swayne could have followed them but his officers advised him that the morale of the Somali

levies, who had up to then fought bravely, had been shaken, so Swayne felt compelled to again return to his advanced base at Bohotle. In this fight the British lost two British officers killed, also fifty of the levy and forty-three transport spearmen, and two officers and eighty-four others wounded.

On the conclusion of this campaign, Lieut.-Colonel Eric Swayne had a severe attack of fever and was invalided to England, returning some months later to take up the appointment of Consul-General and Commander-in-Chief at Berbera.

This unsatisfactory end of the second expedition compelled the Home authorities to take action, and it was decided to form a regular military force under Brigadier-General W. H. Manning, then Inspector-General of the West African Frontier Force. This force included the 17th Company and a detachment of the 19th Company (Bombay) Sappers and Miners, also a detachment of Telegraph Engineers from England commanded by Captain G. B. Roberts; there were also infantry reinforcements from India, while a great mass of camel transport was collected. The force operated in two columns, the smaller, commanded by Colonel J. E. Swann, had its headquarters at Berbera and formed and occupied a chain of posts stretching to Bohotle on the southern boundary of the British territory, 201 miles from Berbera. The second column, commanded by Brigadier-General Manning, by an arrangement with the Italian authorities, landed on the east coast of Italian Somaliland at the small town of Obbia. The intention was that while the British forces held the wells to the north and east of the Mullah's headquarters, a much larger Abyssinian army should advance from the south and west. The Obbia force landed with some difficulty and established a line of posts across Italian Somaliland to Gulkayer, 159 miles from Obbia.

The Mullah's forces were estimated at 2,500 mounted riflemen, with 5,000 horsemen and 16,000 others armed with spears.

On the 10th April a strong reconnaissance was sent out, under Colonel Cobbe, to locate the main body of the Mullah's army and a detachment from this force, coming in contact with a party of Dervishes near Gumburu, were drawn on to the main body and practically annihilated, all the nine British officers and 187 others being killed and twenty-nine wounded. The remainder of Cobbe's force retired without molestation. Meanwhile the Bohotle force had sent out a reconnoitring party to get in touch with the Obbia force in the neighbourhood of Wardier. This party was 550 strong

with twenty British officers and was commanded by Major G. E. Gough. This force was also attacked and had to return to Bohotle, with the loss of two British officers killed and four wounded, twelve other ranks killed and twenty-five wounded. As was usual in these fights, the enemy losses were very heavy.

These successive retirements caused considerable discussion at home and Lord Roberts, then Commander-in-Chief, insisted that a more serious attempt should be made by a larger force. Major-General Sir Charles Egerton was therefore appointed to the Command, which was raised to the strength of two Infantry Brigades and one mounted Infantry Battalion. Additional Indian troops were dispatched, among whom were the remainder of the 19th Company, Bombay Sappers and Miners, and a Field Park from Madras.

Meanwhile a large Abyssinian force had advanced from the south towards Wardier, the headquarters of the Mullah, who adopted the bold course of moving north-east, between the two British columns, into the Nogal Valley in the south-east of British Somaliland. This valley was fairly well watered and gave good grazing for his animals.

Major-General Sir C. Egerton landed at Berbera in July, 1903. He was instructed by the Home Government that the operations were to be limited, as formerly, to an attempt to break up the Mullah's following and, if possible, to capture his person. Egerton therefore made a plan under which an Abyssinian army, 4,000 strong, would advance from the south and occupy Wardier, while a small detached force from Bohotle would occupy the wells at Galadi, and a Naval demonstration on the east coast would threaten a move of troops from this direction. With the Mullah thus cut off from the south, the main body was to advance in two columns into the Nogal valley and attack the Dervishes. The total strength of the force under Major-General Egerton included 310 British officers, 963 British and 6,099 native troops, with other details, and 9,700 followers with 13,200 animals. Many of the troops had to be used to garrison the base and the posts on the Line of Communications to Bohotle. The advance of the main force began in January, and on the 9th the two British columns joined near Jidbali where the main force of the enemy had been located. Egerton formed his Infantry into a square, with his transport in the centre, and sent his mounted troops round his left flank to cut off the retreat, but before he could advance the square was attacked vigorously by the Dervishes. The result was not in doubt in the face of the British

fire and, after some fierce attacks, the enemy broke and fled, pursued for eighteen miles by our mounted force. The British losses were, three British officers killed and nine wounded, with twenty-four other ranks killed and twenty-eight wounded. The enemy's losses were estimated at 1,400. The Mullah was followed to the border of Italian Somaliland where he took refuge with some of the tribes in the neighbourhood of Illig. With the permission of the Italian authorities, the Navy occupied Illig in April, 1904, and eventually, by an arrangement with the Italians, the Mullah and his household were allowed to remain with some of the tribes in Italian Somaliland. The British force was withdrawn in March, 1904.

The Engineers with the third and fourth Expeditions were :—

C.R.E. : Captain W. B. Lesslie for the third and Major R. F. Allen for the fourth expedition.

Telegraph Detachment : Captain G. B. Roberts, Lieutenants H. L. Mackworth, H. G. Gandy and F. E. Harward.

17th Company Sappers and Miners : Captain W. Bovet, Lieutenants E. D. Tillard, A. S. Holme, and W. H. Evans. 19th Company Sappers and Miners : Captain W. H. Chaldecott. Lieutenants A. L. Paris, T. Gracey, A. S. Evans.

Field Park : Major S. P. Johnson.

Survey : Captain G. A. Beazeley.

Water Boring Section : Brevet Major H. G. Joly de Lotbinière.

General duty : Captain P. G. Grant, Captain C. G. W. Hunter, Lieutenants D. Ogilvy, R. F. A. Hobbs, D.S.O., W. E. Edgeworth, W. Ommaney, F. R. P. O'Callaghan, P. O. L. Jordan, B. C. Battye, S. Boyd.

The work of the Engineers in these various campaigns centred round two main questions, water supply and defensive posts. The water question was always troublesome, as there were few definite rivers or streams. Water was found in small pockets in the ravines on the top of impervious strata. The latter was not often very thick and care had to be taken not to dig too deep. The boring plant was not successful in finding water, though the geological conditions seemed favourable. A line of defensible posts was constructed along the road from Berbera to Bohotle, some being built of masonry, some of earth protected by zaribas of thorn bush. The latter had to be at least 15 yds. wide as the Dervishes, using their long spears as leaping poles, would jump over a narrower obstacle. The Telegraph Section laid an air line from Berbera to Bohotle, 201 miles, and ran cables from the latter place 47 miles farther.

There were various branch lines. In addition to these special services, there were a number of the usual Engineer jobs, of which the most important were the sanitation of camps and bivouacs.

Of the British officers, Lieutenant F. E. Harward died of fever after only a few months in the country. He had been specially selected to report on the possible use of mechanical transport.

In the Despatches for these various campaigns, which were published in the *London Gazette* of 2nd September, 1904, Major G. E. Phillips was mentioned by Lieut.-Colonel Swayne for his services in 1902. For the campaign of 1903, Brigadier-General Manning mentioned Captain G. B. Roberts for Telegraph work, Captain W. B. Lesslie for work as C.R.E. in 1903, and Lieutenant W. H. Evans for reconnaissance and intelligence duties. In his final Despatch, Major-General Sir Charles Egerton alluded to the great exertion of the Engineer Staff in connexion with water supply and brought to notice the services of Major R. F. Allen, the C.R.E. in 1904, Captain W. B. Lesslie, the Assistant to the C.R.E., Captain G. B. Roberts for Telegraph duty, Lieutenant W. Bovet, 17th Company Sappers and Miners, for Engineer work, Captain G. A. Beazeley for Survey work, and Captain P. G. Grant for work on the Line of Communications, especially in the improvement of wharves and camps at Berbera. For their services Major R. F. Allen received the D.S.O. and Captain W. B. Lesslie was promoted to Brevet Major.

Subsequent History

Following these campaigns, various attempts were made to develop the country.

In 1903 Major S. L. Craster and Captain C. G. W. Hunter were sent out to make a survey of a railway from Berbera to Harar, and in December, 1904, Captain A. G. Stevenson and Lieutenant G. W. Denison made a railway survey from Berbera to Argan.

In 1904 Major H. G. C. Swayne, who had been unable, through illness, to take part in the previous campaigns, was in the country for a few months. And in 1905, Lieutenant B. A. Fox was employed on Telegraph duties. In the same year a steam tractor was sent out in R.E. charge, in the hope of solving the transport problem, but proved unsuitable. Meanwhile there was considerable unrest among the tribes and demands were made on the Home Government to increase the Garrison. In April, 1909, General Sir Reginald Wingate and General Sir Rudolf Slater visited Somaliland to report

on the situation and, on their report, the British Government decided to withdraw the garrisons from the interior and to retain control only of the coast ports. The tribes were supplied with arms and ammunition. Following this decision, there was considerable local fighting, in the course of which it is estimated that one-third of the male population perished. Further military operations were then contemplated against the Mullah, but these were delayed by the outbreak of the Great War and it was not till 1919 that, with the assistance of an air force, the Mullah's force was dispersed, and shortly after, the death of the Mullah brought the unrest to an end.

The story of the work of the R.E. in Egypt and the Sudan has already been fully dealt with by Lieut.-Colonel E. W. C. Sandes in *The Royal Engineers in Egypt and the Sudan* and also in Volume II and Volume III of our *History*.

This account of the operations in Somaliland thus completes the work of the R.E. in the development of Africa up to the outbreak of the Great War in 1914. While much of this work consisted of small operations, in the aggregate it deserves record among the wars of the British Empire, whether measured by the number of R.E. employed, the results obtained, the honours granted or the number of officers who laid down their lives either by enemy action, or the victims of a treacherous climate.

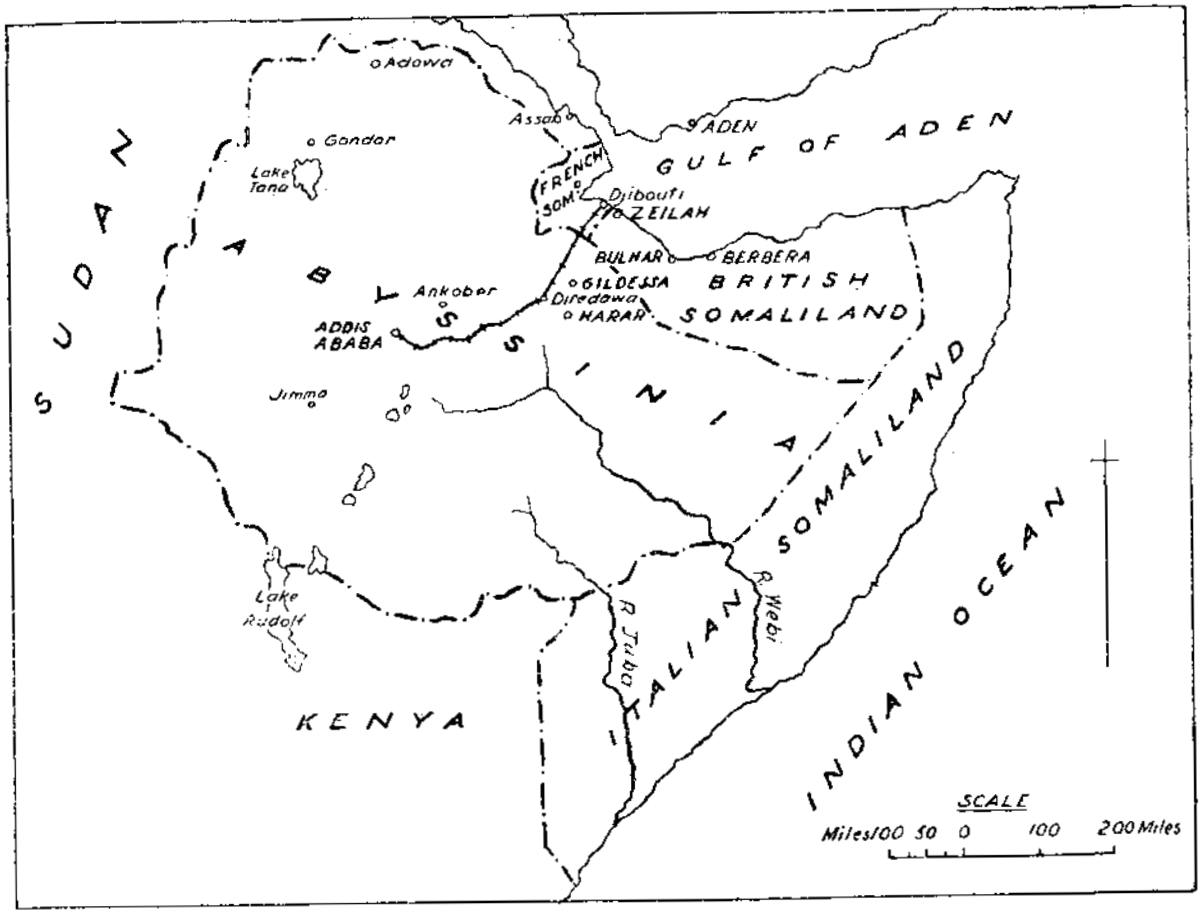
Cyprus

Leaving Africa, mention seems necessary of two islands in the Mediterranean, Cyprus and Crete, where useful work was done by the R.E.

Cyprus was first occupied by Indian troops in 1878, but when these were withdrawn a Garrison of British troops was maintained. In 1882 Lieutenant Kitchener was in charge of the Survey of the island and went from there to join the Egyptian Army in the campaign against Arabi, see *The Royal Engineers in Egypt and the Sudan*, Chapter II. In 1885 there were five R.E. officers stationed in the island, employed in constructing barracks, offices and stores for the garrison. The troops were later reduced to a small detachment and Cyprus came under the C.R.E. in Egypt, an R.E. officer being sent over for temporary duty as required.

Crete

The story of Crete is quite different. This island was first occupied by the Turks, but local risings compelled the European nations to


Adowa
Assab
ADEN
GULF OF ADEN
Gondor
Lake Tana
FRENCH SOM.
Djibouti
ZEILAH
BULHAR
BERBERA
GILDESSA
BRITISH
Ankober
Diredawa
HARAR
SOMALILAND
ADDIS ABABA
ABYSSINIA
Jimma
SUDAN
ITALIAN SOMALILAND
Lake Rudolf
R. Webi
R. Juba
KENYA
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intervene and, in 1898, a mixed force of detachments from various European powers was sent to keep order, pending a decision as to its future sovereignty. In November, 1896, Colonel H. C. Chermside, R.E., who had been employed on political work at Constantinople, was sent to Crete in connexion with an International Commission for the reorganization of the Cretan Gendarmerie. On the outbreak of the disturbances, Chermside was appointed Colonel on the Staff to command the troops in Crete, an appointment which he held till August, 1899. There were several " incidents " of a military nature, in one of which the British troops in Kandia were attacked on the 6th September, 1898. Chermside, who had been made K.C.M.G. in the Honours Gazette on Queen Victoria's sixtieth Anniversay, 22nd June, 1897, was gazetted to the Grand Cross of the Order in January, 1899, for distinguished service in Crete. He was promoted Major-General in November, 1898.

In April, 1898, a detachment of the 24th Company from Malta was sent to Crete under the command of Lieutenant M. R. Kennedy, R.E., and Lieutenant H. L. G. Bell, R.E., and A. S. Evans, R.E., subsequently served with this detachment. No medal was issued for these operations but Lieutenant M. R. Kennedy was Mentioned in Despatches for his services during the attack on Kandia.

Further trouble at Crete occurred in 1908 and a detachment of the 24th Company from Malta was again employed on the island.

CHAPTER VII

THE ROYAL ENGINEERS IN THE COLONIES—ADEN—BURMA—CEYLON—MAURITIUS—SINGAPORE—HONG KONG—WEI-HAI-WEI—NORTH CHINA

Indian Ocean—Aden—Ceylon—Mauritius—Singapore—China—First and Second Chinese War—Chinese Gordon—Ever Victorious Army—Slow political development—Hong Kong—Centre of British Navy in the Far East—Area taken over—Survey—Revision of defences of Hong Kong—Wei-hai-wei—Survey—Barracks for Chinese Regiment—Colonel A. R. F. Dorward in command of troops—44th Company R.E. formed—Revolution in China—Boxers—Murder of Captain Watts-Jones—May, 1900, Legations at Peking call for guards from the Fleets—Unrest in Peking—German Minister murdered—Siege of Legations started 20th June—Account of Siege—Casualties—First relief expedition under Admiral Seymour—Held up at Yang T'sun—Expedition retires—Captures Chinese Arsenal at Hsi-Ku—Attacked by Chinese Army—Relieved from Tientsin—Siege of Tientsin—J. Watts carries dispatches—Foreign powers send reinforcements—Troops from Hong Kong and Wei-hai-wei—Include detachments of R.E.—Taku forts captured—Relief of Tientsin—Colonel Dorward takes command of British force—Chinese positions attacked and native city stormed—Relief of Peking—General Gaselee arrives from India—Lieut.-Colonel Scott-Moncrieff, C.R.E. of British force—Other R.E. with force—Indian Sappers and Miners delayed—Battle at Peitsang—Attack on Peking—British troops enter Legation—Subsequent operations—Three companies Indian Sappers and Miners arrive—British Sappers leave—General Dorward clears vicinity of Tientsin of rebels—Bombay Sappers in action—Indian troops at Shanghai—Hong Kong and Wei-hai-wei bases for British force—Major Prendergast Commissioner at Wei-hai-wei—Brig.-General W. T. Shone, C.R.E. British force—Housing British troops for the winter—Lieut.-Colonel Macdonald in charge of railway—Rebuilding of Legations—Brevet Major J. E. Dickie—Honours for the campaign—Tientsin to be Headquarters of British force in North China—Fortification of Wei-hai-wei stopped—44th Company returns home—Increase of Hong Kong garrison—Russo-Japanese War—Lieut.-General Sir William Nicholson—Lieut.-Colonel F. W. Fowke and Major Sir A. Bannerman.

This chapter links up with Vol. I, Chap. XXI, also with *The Military Engineer in India*, Vol. I, Chap. XV, p. 280 (first China War), Chap. XVI, p. 313 (second China War) and Chap. XX (third China War).

INDIAN OCEAN

LEAVING Africa, the story now shifts to the countries bordering the Indian Ocean, dominated by the two great Empires of India and China. The story of the R.E. in India has been told by Lieut.-Colonel Sandes in *The Military Engineer in India* and this story touches that of the Colonies in many points, when units or individuals of the Indian Army have been called on for assistance in garrisoning the coaling stations, which punctuate the trade routes to China and Australia; or when India has been asked to provide expeditionary forces for military operations in the neighbouring countries.

In the previous chapter some account has been given of the assistance received from India in the development of Africa and a reference has been made to the port of Aden, which dominates the western entrance of the Indian Ocean from the Red Sea. Aden was captured from the Arabs in 1840, but did not, of course, become of importance as a coaling station until the opening of the Suez Canal. For political and military control Aden was under the Government of India, but it had its own frontier troubles, see *The Military Engineer in India*, Volume I, page 415.

East of Aden the first port of call is in Ceylon, which was captured by a force from India in 1796 (see *The Military Engineer in India*, page 171); but the administration of Ceylon later came under the Home Government, which also provided the garrison for the two defended ports of Colombo and Trincomalee. The command of the garrison was held by Major-General Sir W. O. Lennox (late R.E.), in 1887–8, and Colonel Sir H. E. McCallum was Governor of the Colony from 1907 to 1913.

In the south of the Indian ocean lies the island of Mauritius, captured by the English during the Napoleonic Wars. Lying midway between the Cape and India, it was an important port of call in the days of sailing ships and had a large garrison, supplied by the Indian Army. The opening of the Suez Canal diverted the trade and the outbreak of malarial fever, in a very virulent form, in the 60's caused the removal of most of the garrison, which was increased again in 1889, when the capital, Port Louis, was refortified as a coaling station. Major-General Sir J. R. L. Macdonald was in command of the garrison from 1909 to 1912 and Major Sir J. R. Chancellor was Governor of the Colony in 1911.

East of Ceylon, passing the great province of Burma, administered

till recently by the Indian Government, the trade route reaches the Malay Peninsula, with its numerous trading posts known as the Straits Settlements. There was a campaign in 1875 in Perak, one of the Malay States, which was carried out by a force from India, see *The Military Engineer in India*, Volume I, page 400.

The port of Singapore, at the southern extremity of the peninsula, is one of the busiest trading ports in the world. Up to 1885 it had only a small garrison which was under the order of the General Commanding at Hong Kong, but about 1888 it began to be developed as a coaling station. From 1889 to 1893 Colonel Sir Charles Warren was in command of the garrison and did good work in organizing the local defences, and Colonel (local Brigadier-General) Sir Arthur Dorward commanded the troops from 1902 to 1905. But perhaps the most noteworthy connexion of the Corps with the Straits Settlements was in the work of H. E. McCallum at Singapore and M. A. Cameron at Penang. McCallum went to Singapore in 1880 as Deputy Colonial Engineer and was promoted to Colonial Engineer in 1884, when he was also an official member of the Legislative and Executive Councils. He held this appointment till he was made Governor of Lagos in 1897. During his term of office he was mainly responsible for the layout of the town of Singapore and the design and construction of many public buildings, including the English Cathedral. M. A. Cameron went out to Singapore for military duty in 1883 and in the same year was appointed Deputy Colonial Engineer and Surveyor-General at Penang, where he served till 1892, later becoming third Crown Agent in the Colonial Office in London. Cameron was succeeded as Colonial Engineer, Penang, by Captain F. J. Anderson, R.E.

Following the trade route, the next port of call on the Asiatic continent is Hong Kong, at the southern extremity of the great country of China. A short account of the development of this country seems necessary to explain the part taken by Great Britain during the period covered by this volume.

China (see map facing page 162).

Inhabited by what is numerically the greatest group of peoples on the face of the earth, China had long been a source of interest and wonder to the nations of Europe, and many attempts had been made to open trade relations with such a promising customer. At first such trade as existed was carried on by caravans across Asia

to the shores of the Mediterranean or Black Sea, but as shipping developed and navigation improved, the bulk of the trade was transferred, during the fifteenth and sixteenth centuries, to the sea routes, at first in Arab ships, followed by Portuguese, Dutch, French and British, each eager to establish trading relations with the swarming multitudes of the Chinese Empire. But the Chinese, though excellent traders themselves, refused to admit the foreigners as equals, and kept all foreign shipping outside the Chinese ports. As this shipping required some secure anchorage, they were by degrees allowed to use certain harbours, where they could erect shore establishments, and where goods could be accumulated pending the arrival of the annual fleet.

The first clash between the British and Chinese occurred in 1840, when an expeditionary force was dispatched from India in support of British trade. The events are described in Chapter XV of *The Military Engineer in India*, Volume I. In the course of this campaign, the British occupied the island of Hong Kong at the beginning of 1841.

The second Chinese War occurred in 1857–60 ; it is described in the *History of the Corps of Royal Engineers*, Volume I, Chapter XXI, and in *The Military Engineer in India*, Volume I, Chapter XVI.

It was during this campaign that Charles George Gordon began his connexion with Chinese affairs, which was to earn him the well-known title of " Chinese Gordon." Gordon had joined the R.E. in 1852 and served in the Crimean War. In the middle of 1860, with the rank of Second Captain, he was ordered to join the force in China. He arrived in time to be present at the capture of Pekin and the destruction of the Summer Palace, and then retired with the army into winter quarters at Tientsin, where he filled the post of Commanding Royal Engineer. He was promoted Brevet Major in December, 1862, for his services in the Pekin campaign. During his time at Tientsin he made many excursions into neighbouring districts and acquired that knowledge of the Chinese which was so useful later on.

In April, 1862, it was found necessary to send a force to Shanghai, under General Sir Charles Staveley, to clear the country of rebels for a radius of 30 miles round that city. Gordon was appointed Commanding Royal Engineer of this force and distinguished himself by the daring with which he reconnoitred the enemy's defences and organized the ladder parties for the attacks on several towns defended by high walls and deep wet ditches.

Meanwhile the Taiping rebels, who had been cleared from the vicinity of Shanghai, were quite beyond the control of the Chinese Imperial Government and the latter appealed to the British and French Governments to help. The rebel leader, who had established a control partly based on superstition and partly on a doctrine of universal plunder, had captured and occupied the great city of Nanking and dominated an area, south of the Yang-tse-kiang, with a depth of 150 miles and stretching for a distance of 200 miles from Nanking to Shanghai. The European inhabitants of Shanghai, to protect themselves against attack, had arranged to raise a local force and at the request of the Chinese Imperialist Governor of the province, Li-Hung-Chang, Major Gordon was sent by Sir Charles Staveley to take the command of this force. It was composed of about 3,000 Chinese, enlisted locally, officered by about 150 foreigners of many nationalities; these included a number of adventurers, described as being utterly heedless of control. This was the nucleus of the force which Gordon so successfully organized and led, and which was called afterwards the "Ever Victorious Army." Gordon took command in March, 1863, and during the next sixteen months was almost continuously engaged in military operations, during which he fought many battles, took four cities and a dozen other strong places, and was himself severely wounded. The details are given in the biographical notice of Gordon in Volume II of our *History*. Throughout the campaign Gordon had consistently refused any presents in money from the Chinese Government, but on its conclusion, he was gazetted by the Chinese Emperor to the rank of Ti-Tu, the highest in the Chinese Army, and was also given the Yellow Jacket and the Peacock's Feather, distinctions which are only bestowed on merit of the very highest class. He was promoted by the British Government to the rank of Brevet Lieut.-Colonel and awarded the C.B.

For many years after this the story of the Chinese Empire was one of very slow political development under European and American pressure, and attacks from her neighbours, Russia on one side and Japan on the other.

The strength of the British Navy in eastern waters had been gradually augmented and by 1898 it was second only to the British Fleet in the Mediterranean. Another growth of some importance was that on the Yang-tse and on the West River at Canton, fleets of shallow draft British gunboats had been established to protect local trade. These boats, with the consent of the Chinese Government,

penetrated more than 1,000 miles from the sea in the course of their duty. All this naval force was based on the port of Hong Kong, where supplies of all kinds were maintained and where all vessels had to resort for their annual overhaul.

For all these reasons it was vital for the British to obtain control of as much of the hinterland of the port as would ensure its security. The area taken over was about twenty miles in depth and the northern boundary was about twenty miles long, terminating on either side on inlets of the sea known as Mirs Bay and Deep Water Bay ; about 600 islands of various sizes were included in the transfer.

The occupation of this territory did not pass without incident, as the local Chinese bitterly resented the surrender of their land to the foreigner and the authorities of the walled city of Kowloon refused to surrender the town. On the approach of a British force the municipal authorities and inhabitants left for China, leaving the city vacant and the gates locked. On the border of the new territory it was necessary to maintain a small military column, which for some months during 1899 was commanded by Major T. J. W. Prendergast, R.E. The hostile feeling relaxed when the British announced that they were prepared to recognize all ownership of property and though the members of the upper classes did not return to their estates, there was a rush of claimants for land and houses. Asked to submit plans in support of their claims, it was found that the totals claimed far exceeded the land available. It was therefore found necessary to make a more accurate survey of the whole territory and this was begun by the local R.E. who carried out a trigonometrical survey of the principal peaks ; this was completed and extended by a party lent from the Indian Survey under Mr. Tate.

Once possession was obtained it became necessary to consider a revision of the defences both by land and sea. It was decided to abandon the inner defences and to make the Lyemun pass, on the east, and the line from Stonecutters Island to Belcher's Point on the west, the main lines of defence against over-sea attack. The land defences were to be located along the lines of hills to the north and south, which were to be connected by roads to the towns. The execution of the greater part of this work fell on the District Engineer (later called Chief Engineer) Colonel L. F. Brown, who had succeeded Colonel H. Elsdale at the beginning of 1900, while Major R. P. Littledale, R.E., and four junior R.E. officers were added to the garrison to carry out the necessary works. The garrison of Hong

Kong at this time included one battalion of British Infantry, and the Hong Kong Regiment, recruited from India, in addition to R.G. Artillery both British and Indian. The R.E. units were the 25th Fortress Company, the Hong Kong Submarine Mining Company (which included sixty enlisted Chinese) and the usual staff.

Wei-hai-wei was a Chinese town in the north-east corner of Shantung province, which gave its name to a splendid harbour. This harbour had been fortified as a base for the Chinese Fleet, and, during the Sino-Japanese War, was captured and occupied by the Japanese, who dismantled and partially destroyed the forts. The harbour is protected by the island of Leu Kung, which is about two miles long and three-quaters of a mile wide, with a ridge of hills down the centre rising to a height of 500 ft. above the sea. Wei-hai-wei was handed over to the British on the 1st April, 1898, and was garrisoned by a company of Marines, the first Commissioner being Commander Gaunt, R.N. The island was made the Head-quarters and contained all the Naval establishments. On the mainland the area to be taken over had a frontage to the bay of about thirty miles and an average depth of twenty miles. Much of this area was covered by mountainous ridges up to 1,000 ft. high, cut up by deep gullies and fertile valleys. The small walled city of Wei-hai-wei was exempted from British control. In May, 1898, a party of Royal Engineers consisting of Colonel J. F. Lewis, Major C. Penrose and Captain W. A. Harrison, with a Survey detachment, were sent out to start the essential engineer work. Colonel Lewis, who was a recognized authority on Coast Defence, was to report on the defences required and, on the completion of his report in the autumn, left to take up the appointment of Colonel on the Staff, C.R.E., Gibraltar.

Major Penrose was appointed C.R.E. and had to begin by preparing a survey of the whole territory and making the arrangements for housing the garrison. Captain Harrison was to carry out the survey and was joined in November, 1898, by Captain R. P. Lee. These officers were busy till the autumn of 1899 in the survey operations, during which the antagonism of the local Chinese necessitated the provision of a strong guard of Marines. On the completion of the survey, Harrison returned home but Lee remained as Division Officer, R.E., and also acted as Colonial Engineer. Early in 1899 the formation of a Chinese Regiment was approved under British officers and barracks for this unit were constructed on the mainland

by Major Penrose. These were built of red ashlar granite obtained from the demolished Chinese forts. Early in 1900 Colonel A. R. F. Dorward of the Royal Engineers was appointed Colonel on the Staff to command the troops at Wei-hai-wei and was also made Civil and Military Commissioner.

In the same year a new Fortress Company R.E., the 44th, was formed and the Headquarters and right half company were sent to Wei-hai-wei. The left half of this company went to Esquimalt in British Columbia.

While these changes of territory were taking place, there were important changes in progress in the Chinese Empire. During the last thirty years there had arisen in China, among the ruling class, an intellectual development in favour of a closer study of European methods of government and the introduction into China of European ideas and such practical improvements as telegraphs and railways. Missionary enterprise, both from Europe and America, had developed on a considerable scale and flourishing Christian communities were formed in many centres in spite of periodical anti-Christian riots. In 1898 an enlightened young Emperor was in supreme control, who encouraged the new learning, the sale of modern literature and the opening up of China by the introduction of railways and telegraphs. This aroused bitter opposition among the conservative adherents of the old system and in September, 1898, the old Dowager Empress, helped by some of the older statesmen, led a revolution, which resulted in the enforced abdication of the Emperor, the execution of some of the leaders of the modern movement and the dispersion or banishment of the remainder.

Meanwhile there had been a steady growth of a movement among the lower classes directed against the foreigners and the foreign encroachments on Chinese territory. Secret societies, which are a common feature of Chinese life, sprang up in many centres ; these developed on a quasi-religious basis and put forward the claim that anyone who went through a certain process of initiation was invulnerable. It is not known exactly how the term " Boxer " originated, but this term has since been used to describe the whole of these irregular organizations.

At first the movement was opposed by the Chinese Government but, after the revolution led by the Dowager Empress, this opposition weakened and there was an increase in the disturbances. The Christian movements in China were always looked on with dislike by the Chinese authorities and there was an increasing number of

attacks on Christian centres, leading up to the murder, under particularly painful circumstances, of an English missionary, Mr. Brooks, at the end of 1899. Among the later victims of the unrest was an R.E. officer, Captain W. A. Watts-Jones, who had been lent by the Indian Government for railway survey work in Western China. On his way down the Yellow River in July, 1900, he was murdered by Chinese soldiers at Kwei-hua-cheng, about 200 miles west of Kalgan. His body was recovered in 1901 by his brother, a Lieutenant in the Royal Navy.

The European and American Legations, from their headquarters at Pekin, protested against the outrages and demanded, and sometimes obtained, the punishment of the offenders. But they do not seem to have foreseen how widespread the rising would be and no steps were taken to provide against a general attack on foreigners.

The situation greatly deteriorated and on 20th June, 1900, the Legation in Pekin was besieged by the Chinese rebels and a Naval Force was landed to go to their relief. This force left a small party at Tientsin and they also were besieged.

Dispatch of Reinforcements

Meanwhile the foreign powers had begun to dispatch reinforcements. The Russians who had 8,000 men at Port Arthur were the first on the scene, while the Japanese, who had, of course, plenty of troops available, the Germans from Tsingtao and the French from Saigon, all began to send troops. The British garrison in Hong Kong at the time was commanded by Major-General W. Gascoigne. Immediately news was received of the departure of Admiral Seymour's expedition, General Gascoigne, though his own command was threatened by disturbances on the frontier, detailed a column consisting of 300 men of the Welch Fusiliers under Major Morris, with a detachment of about thirty men of the 25th Company, R.E., under Lieutenant F. M. Browne, R.E., and ten Chinese N.C.Os. and men of the Hong Kong Submarine Mining Company. This party left at once on H.M.S. *Terrible* and reached Taku on the 21st June. They were followed a few days later by two companies of the Hong Kong Regiment with one Field Battery and one Mountain Battery, manned by Indian gunners, under Major St. John, R.G.A.

At Wei-hai-wei disturbances had been caused by parties of Boxers until, on the 5th May, Major C. Penrose, R.E., while employed

on Survey work for the Boundary Commission, was attacked and severely wounded after he had accounted for four or five of the attackers. He was rescued just in time by a party of the Chinese Regiment. About the 16th June, Colonel Dorward, the Commissioner at Wei-hai-wei, received orders from the War Office to dispatch at once to Taku 200 men of the Chinese Regiment and a party of the 44th Company, R.E., under Captain R. P. Lee, and a few days later was himself ordered to proceed to Tientsin to take command of the British troops at that station. The R.E. and the detachment of the Chinese Regiment left on H.M.S. *Orlando* on the 21st June.

Attack on Taku Forts

By 16th June information reached the Admirals at Taku that the Chinese Government had ordered a reinforcement of the garrisons of the Taku Forts and the stoppage of all trains to Tientsin, and, in the absence of any news from Pekin, the Admirals at a meeting decided that the forts must be occupied at once, to keep open the communications with the interior. They therefore sent an ultimatum to the Chinese Commander calling for the temporary surrender of the forts before 2 a.m. the next day. The Chinese Commander not only refused to comply with this order but pluckily opened fire himself before the expiration of the time limit. The attack from the sea was carried out by three Russian, one British, one French, one German and one Japanese gunboats, under the orders of a Russian Captain, and continued till daybreak when the guns were silenced. The north-west fort was then attacked from the land side by a party of British and Japanese, commanded by Captain Craddock, R.N., supported by parties of Italians and Russians. Against some opposition, the attackers forced their way into the fort and this success was followed by the capture of the other forts in succession, the Chinese garrisons abandoning their charge. In this operation the attackers lost twenty-one killed and fifty-seven wounded.

It has been suggested that this attack was practically equivalent to a declaration of war against the Chinese nation and it certainly aggravated the hostile feeling of the Chinese against all foreigners. But it is now clear that the attacks of the Chinese on Admiral Seymour's force and on Tientsin had preceded by several days the action at Taku and that if the forts had not been occupied the lives of all Europeans between Pekin and the sea might have been sacrificed.

Relief of Tientsin

Immediately on the occupation of the forts, the railway from Tangku was repaired and attempts were made to push reinforcements into Tientsin ; on the 20th June, a column of 136 Americans and 400 Russians was held up about fourteen miles short of that city. Early on the 21st the *Terrible* arrived off Taku and the Hong Kong contingent of R.E. and Infantry, under Major Morris, landed at once and moved by train to join the party in front, and on the 22nd the advanced column was joined by a second Russian contingent, 1,200 strong with four guns. With this reinforcement the advance was continued early on the 23rd, the Russians on the right and the British and Americans on the left. Both parties came in contact with the enemy about six miles out of Tientsin and succeeded in forcing their way in, the British and Americans capturing the Military School, which was held by the Chinese, and the Russians, after some fighting, joining their compatriots at the railway station. Further reinforcements, including the R.E. and a detachment of the Chinese Regiment from Wei-hai-wei and 250 British seamen and marines, under Captain Craddock, R.N., reached railhead just in time to see the start of the force in front, and this party and also small parties of Germans, Austrians, Italians and Japanese reached Tientsin in the afternoon of the same day, raising the strength of the garrison to 4,450 ; the second detachment from Hong Kong arrived the next day.

On the 25th a mixed force was dispatched to the relief of Admiral Seymour, and his column was withdrawn without further loss on the 26th. This further increase in numbers made the place practically secure from assault, but the siege was continued with undiminished vigour, the well-served Chinese guns and also some very effective Chinese snipers continuing to pour shells and bullets into the constricted area of the settlements. Colonel (local Brigadier-General) Dorward arrived on the 26th to command the British troops, the supreme command in the settlements having been assumed by Admiral Seymour on the return of his column. Captain R. P. Lee was appointed C.R.E. and with Lieutenant F. M. Browne and his detachments of Royal Engineers, totalling about seventy in all, and with such local labour as could be secured, was engaged on the defences, the battery positions, naval gun mountings, water supply and a variety of useful work, including the improvement of telegraph and telephone communications. The railway station was the

object of persistent attack and was gallantly defended by the Russians who also guarded the floating bridge. During the whole siege, communication by river with Taku remained open and on the 5th July it was found possible to evacuate the remainder of the women and children to Tangku. On the 6th July F. M. Browne was wounded by a shell, which hit the Temperance Hall where General Dorward had his headquarters.

Reinforcements continued to arrive, including 800 Japanese under General Fukushima and 340 French Marines, and these enabled the allies to attack the Chinese position, which now formed a semi-circle round the settlements, with the native city in the centre of the line. The allies had been much hampered by the want of efficient guns to counter the well-served Chinese batteries but two naval 12-pr. guns from the *Terrible* and two 9-pr. Krupp taken from the Taku Forts, manned by marine detachments, arrived on the 4th July.

A Chinese arsenal to the N.E. was attacked and destroyed on the 27th June by a joint party of Russians, Germans, British and Americans and, on the 8th July, a mixed force of 2,400 men, under General Fukushima, moved out towards the western arsenal, which was captured and burnt, but further advance was impossible on account of flooding. In this engagement the bulk of the fighting fell to the Japanese who had about fifty casualties. It was hoped that this success would cause a retirement of the Chinese, but on the 11th about 2,000 Chinese made a vigorous attack on the railway station, and penetrated the defence nearly up to the station itself. The fighting lasted three hours, during which the allies had 150 casualties.

On the 10th July Admiral Seymour returned to his flagship, taking with him the Naval detachments from his ship; the command then devolved on the Japanese General, Fukushima. The allied forces in Tientsin on this date totalled 12,170, of which the Russians had contributed 4,450, the Japanese 3,090, French 2,160, British 1,420, American 560, Germans 400, Austrians 50 and Italians 40. The enemy were supposed to number at least 20,000, including the regular troops of General Nieh, who were well armed and drilled; but Nieh himself was reported killed on the 9th July. A strong body of American troops under Colonel Liscum, about 1,300 strong, arrived on the evening of the 10th.

The allies now found themselves strong enough to carry out an attack on the native city, which had been under consideration for some time. This operation was commenced on the 13th July, when it was arranged that the Russians and Germans on the right should

make an independent attack on the city from the north-east, while the French, Japanese, British and Americans should attack from the south. The combined force was under the control of General Fukushima, while General Dorward commanded the left column composed of British and Americans. The Naval guns in positions round the concession, under Captain Bayley, R.N., were to co-operate with the attack. The French, on the right of the left attack, were to clear out a network of Chinese houses between the city and the concessions, the Japanese in the centre were to attack the south gate, while General Dorward was to protect the left flank, which was threatened by mounted Chinese from the direction of the Western Arsenal. The troops moved into position by 4 a.m. and at 1 p.m. began a concerted attack on the city, but the fire from the walls was severe and the troops had to halt while the guns took up the fight. During the night of the 13th the Japanese sappers threw a bridge over a canal which was obstructing their progress and at 3 a.m. on the 14th they blew in the south gate and then entered the city almost unopposed.

Meanwhile, on the north side, the Russians and Germans had captured and exploded a Chinese magazine, but were stopped by a strong outlying fort which could not be taken without artillery. With the assistance of the Japanese, after they had entered the gates, this was taken by noon on the 14th ; the allies then occupied the whole of the city and its suburbs, capturing 200 junks which proved must useful for the advance on Peking. During this action the allied casualties totalled 750, of which 104 were British.

This successful operation ended the siege of Tientsin, which had lasted for thirty-four days, during which time the concessions had been under continuous bombardment by guns and rifles, and enormous damage had been done. As a military operation the fighting, while it lasted, had been more strenuous, and the strain on individuals probably greater, than during the fighting round the Legations in Peking. The final attack on a large walled town, carried out with inadequate artillery support, reflected the greatest credit on the Japanese who bore the brunt of the attack, and on all the nationalities who supported them.

The Relief of Peking

Once Tientsin was freed, the thoughts of everyone turned to the preparations for the relief of the Legations. The uncertain factor

was the strength of the Chinese armies between Peking and the sea. Estimates placed these as high as 50,000, with an indefinite number of Boxers, and from the way in which the Chinese had fought at Tientsin it was evident that their troops had benefited from their instruction by foreign military advisers and as a fighting force would be found superior to any previously encountered in China.

As the British contribution to the attacking force a small division was being organized in India, under the command of Lieut.-General Sir A. Gaselee, of 10,000 of all ranks with 7,000 followers. The British Army was at the time fully engaged with the war in South Africa and could only assist with details; among these was a Balloon Section from England commanded first by Lieut.-Colonel J. R. L. Macdonald, R.E., but handed over to Captain A. H. B. Hume later.

The French and German Governments were each preparing reinforcements, which would bring their individual numbers up to about 15,000 men, while the Japanese and Russians were arranging to increase their contingents. Altogether the combined force would exceed 70,000 men.

By the 23rd July the railway from Tangku had been opened to Tientsin but beyond that place the line had been so damaged that there was no possibility of immediate repair. The Chinese roads were merely tracks, so the use of road transport was limited, and reliance had to be placed on boat transport for the bulk of the stores required. Immediately following the capture of the native city, Captain R. P. Lee concentrated a large part of his little command on the preparation of a fleet of junks to accompany the force; the leading junks were fitted with an improvised bridge equipment sufficient to provide 60 yds. of bridge.

The contingent from India began to arrive on the 18th July and Sir Arthur Gaselee and his Headquarters Staff arrived on the 27th, accompanied by Major (local Lieut.-Colonel) G. K. Scott-Moncrieff, the C.R.E. of the force, who had with him four R.E. officers. Senior officers also arrived to command the American and Japanese forces.

Opinion was divided on whether another dash should be made for Peking with the numbers available or whether it would not be better to wait till a larger force could be assembled, so that there could be no doubt of the result. But finally the Japanese, American and British Commanders decided on an early attempt and after some demur the Russians agreed to co-operate.

The approximate strength of the relieving force was :—

Japanese 10,000 men with 24 guns
Russians 4,000 men with 16 guns
British 3,000 men with 12 guns
Americans 2,000 men with 6 guns
French 800 men with 12 guns
Germans, Austrians and Italians 300 men

Total : 20,100 men with 70 guns ; but owing to lack of transport the German, Austrian, Italian and French contingents dropped out after the fight at Peitsang.

The British contingent included four companies of Royal Welch Fusiliers, 1st Bengal Lancers, 1st Sikhs, 250 24th Punjab Infantry, 400 7th Bengal Infantry, 400 Naval Brigade. There were also two companies of the Chinese Regiment, who were employed as escort to the Hong Kong Artillery. Owing to delay in arranging the necessary sea transport, three companies of Indian Sappers and Miners who had been detailed for the force did not arrive in time to join in the relief. The R.E. with the column thus consisted only of the little group from the 25th, 44th and Hong Kong Submarine Mining Companies. This was divided into two parties of which one, under Captain R. P. Lee, was in charge of the Junk Flotilla, and another, under Captain G. H. Griffith, equipped with such tools and equipment as they could carry with a minimum of transport, accompanied the force on the march. There were also with the force Captain R. E. Picton, who was Adjutant to the C.R.E., Captain C. H. D. Ryder for Survey work, and Lieutenant S. G. Loch. The latter was in command of a Telegraph Section from India, which, in conjunction with an American section under Lieutenant Stamford, kept the head of the column in telegraphic communication with Tientsin to within thirty miles of Peking, when the supply of stores ran short.

The country through which the force had to march was closely cultivated and intersected by creeks and canals. In places all view was obstructed by fields of maize and millet, the latter growing to a height of eight or nine feet. The marching detachment of the R.E. were in charge of four pairs of bamboo ladders 30 ft. high, which could be erected quickly to allow of observation over these crops. They were carried by coolies or Chinese prisoners, each in charge of a Sapper. The Balloon Section from England would have been most useful, but did not arrive till later. In addition to the officers

under the C.R.E. the Corps were represented on the Staff by Colonel G. H. W. O'Sullivan, who was A.A.G. of the force.

Lieutenant H. E. C. Cowie with a railway detachment had arrived with the Headquarters, but was left at Tientsin in charge of railway repairs. Brigadier-General Dorward remained at Tientsin in command of troops, with the rank of Major-General; Lieutenant F. M. Browne had not sufficiently recovered from his wound to join the column, but he was able to proceed to Pekin a little later.

The advance began on the 4th August and followed the line of the Peiho river, the Japanese, American and British, in this order, being on the right or south-west bank, the Russians and the French and others on the left bank.

On the 5th August the force came in contact with a large body of the enemy entrenched near Peitsang, occupying a position extending for about five miles across the Peiho. The bulk of the fighting fell on the Japanese, who first penetrated the right flank of the Chinese position and then broke into the position near the river under cover of the maize. The combined force of Japanese, American and British then advanced and drove the Chinese from their entrenchments. On the left bank the Russians had been hampered by inundations and could not advance until the success of the Japanese caused a general retreat of the enemy. The Japanese casualties amounted to 300 killed and wounded. The Allies occupied Peitsang that evening.

Next morning, owing to inundations, the troops on the right had to cross to the left bank on the junk bridge constructed by R. P. Lee; the force then advanced fighting and occupied Yangtsun. By the 11th the force had reached and occupied Tungchow thirteen miles from Peking, where it was necessary to leave the river.

For the attack on the city the troops were arranged by nationalities in four columns, which were ordered to make simultaneous attacks on the east walls of the Tartar and Chinese cities and to force an entrance at some of the gates. The Japanese were on the right, then the Russians, Americans and British. A small French contingent, which had joined during the advance, acted as a general reserve. The advance started on the 13th and the attacks began early on the 14th August. On the right the Japanese, who were attacking the Taikwa-men, the east gate of the Tartar City, met a stout resistance and darkness set in before they succeeded in blowing

in the gate and fighting their way into the city. Farther south the Russians attacked the Tung-pein-men, a gate of the Chinese City at the corner where it joins the Tartar City, and had a hard fight, lasting fourteen hours, before they overcame all resistance. The Americans coming up a little later, took advantage of the Russian attack to escalade the wall of the Chinese City at the north-east corner and fought their way along on the south side of the wall between the two cities, in the direction of the Legations.

The British were more fortunate. A few days before a message had been received from the Legation telling the British Commander of the opening in the wall at the back of the Legation area through which the drainage canal passed. This opening was usually closed by a grating, and was under the control of the Legation Guards. The message advised the British Commander to enter the Chinese City and to make his way through the side streets to this opening. The R.E. with the British force had prepared four explosive charges to be used for blowing in the gates, but on arrival it was found that the defenders had gone to join the fighting with the Americans and Russians and the gates were ajar, so that the British were able to enter with little opposition. Following the instructions received they crossed the Chinese City and the right wing, led by General Gaselee, entered the legation area through the Water Gate. Captain R. P. Lee was the first R.E. to enter the area.

The left wing of the British force attacked the Chien-men, the main gate in the centre of the south wall of the Tartar City. This was forced after some fighting and the British troops then turned right along Legation Street, taking the attackers in their rear. Their advance was much helped by a sortie of a party of Americans and Russians from the Legations along the city wall to the west.

After a period of negotiation and discussion, the attacks on the Legations had been resumed with vigour on the 13th and 14th August and even when Sir A. Gaselee and his Staff entered, bullets and shells were flying overhead, while a guard of the newly arrived troops, when taking up duty at the entrance of the British Legation, was seriously inconvenienced by a shower of brickbats. Some further fighting ensued in various parts of the city but the Japanese and Russians gradually overcame all resistance and on the 16th August a combined Russian, French and British force raised the siege of the Peitang, where the Roman Catholics, in spite of heavy losses, had held out gallantly under their Archbishop.

Subsequent Operations

After the successful relief of the Legations, there followed a series of detached operations in the neighbouring country, including the occupation of Shan-hai-kwan on the railway to Niuchwang, where it was possible to keep open the communication with the sea after Taku was blocked by ice.

The three companies of Sappers and Miners from India arrived just too late to take part in the relief; the 4th Bengal Sappers, commanded by Captain H. R. Stockley, reached Tientsin on the 5th August and was moved to Pekin on the 20th; the 3rd Madras Sappers and Miners, under Captain J. A. S. Tulloch, reached Tientsin on the 8th and moved later to Pekin; the 2nd Bombay Sappers, under Captain G. H. Boileau, arrived at Tientsin on the 11th. On the arrival of these units, Captain R. P. Lee, Lieutenant F. M. Browne and the detachments of the Fortress Companies rejoined their stations. It is noteworthy that while the Field engineering during the advance on Tientsin was carried out by Fortress Companies, the subsequent "Works" services for the British force were carried out by companies of the Indian Sappers and Miners.

During the advance the force at Tientsin was threatened by parties of Chinese from the south and flying columns, under the command of General Dorward, moved out in various directions to disperse the enemy.

On the 19th August, in one of these operations, the Bombay Sappers went into action with other troops against a large gathering of Boxers. The company, which was leading the advance through a field of millet, was the first to come in contact with the enemy and, on emerging from the millet, found themselves on the right of the line with the Chinese Regiment on their left. The Boxers, who carried large coloured banners, were very numerous, and at once attacked regardless of losses, but their advance was stopped by accurate rifle fire and the company, advancing in turn, drove off the enemy and captured some of their standards.

For some weeks after this the relief troops of all nations continued to arrive in China, including Field-Marshal Count von Waldersee, who had been selected for the supreme command of all the foreign armies.

Trouble being threatened at Shanghai, the 2nd Brigade from India was diverted to this city and in November, the 3rd Madras Company Sappers and Miners was sent to Shanghai to carry out

Engineer work. A third Infantry Brigade was dispatched from India. Among other arrivals from India was Colonel W. T. Shone, who had been selected as C.R.E. of the enlarged force, and other R.E. officers for work on the Survey and railways, until the number of R.E. officers employed in North China totalled forty-six. This is exclusive of the garrisons of Hong Kong and Wei-hai-wei.

The port of Hong Kong had become the base of the whole expeditionary force, where large stocks of supplies and ammunition were accumulated and where several units from India waited until they were wanted. Two Indian battalions, detailed for duty on the Line of Communications of General Gaselee's force, were detained at Hong Kong to strengthen the garrison. The Engineer services were carried out by the R.E. of the garrison.

Wei-hai-wei had been much extended as an advanced base with a garrison of one Indian Regiment and the Chinese Regiment and contained a number of miscellaneous establishments for hospitals, stores and depots, including a Balloon Gas Factory and a Printing Section Bombay Sappers and Miners. On the departure of Colonel Dorward for Tientsin, Major F. J. W. Prendergast, R.E., from Hong Kong, was appointed to the command of the troops at Wei-hai-wei and was made Civil and Military Commissioner with the local rank of Colonel. Major C. Penrose, when he recovered from his wound, joined the force in North China.

On the withdrawal of Colonel W. T. Shone in February, 1901, to take up the appointment of Director Military Works in India, Colonel P. T. N. Spratt-Bowring was appointed C.R.E. of the Force. By October, 1900, the Engineer work in North China concentrated on the arrangements for housing the troops during the winter, when the cold was so severe that even drinking troughs and sentry boxes had to be heated. This work was most successfully carried out, over 18,000 troops, 14,000 followers and 1,000 animals being provided with warm and comfortable shelter. The efficiency of the arrangements was shown by the fact that when the troops and animals emerged from their winter quarters at the beginning of March, their bill of health was as good as, if not better than, they would have had in their own cantonments in India. This was especially noteworthy as many of the troops came from warm stations.

Perhaps the most interesting Engineer work was the repair and working of the railway. This had been very badly damaged by the Boxers in the course of the fighting and the portion from Tientsin

to Pekin had to be rebuilt. Much of the rolling stock had been destroyed by fire and what remained was unfit for use. At first the Russians, who had a Railway Battalion on the spot, were disposed to take over the whole railway, but there were obvious objections to such an arrangement, so the line was divided between the British, Japanese, Germans and Russians. On the 30th August, 1900, Lieut.-Colonel Scott-Moncrieff was ordered to Fentai, which was the terminus of the railway, with a small force to clear the surrounding country, repair the railway and to extend the line into Pekin itself.

In October Lieut.-Colonel Macdonald, who had had considerable railway experience in India and East Africa, was put in charge of the British railway operations and by the 9th December the first train was able to pass into Pekin over the British line.

The divided system of control had not worked satisfactorily, so it was decided that the whole line must be put under one control. This railway had been constructed with British capital and several British were still on the staff, so it was finally decided, after some protests, that the British should control the railway from Pekin to Shan-hai-kwan,* 256 miles, leaving to Russia the control of the railway from the Great Wall into Manchuria. Lieut.-Colonel Macdonald was appointed Director of Railways with, as assistants, Major C. A. R. Browne, Captain P. J. Twining and eight other officers of the R.E.

By the end of June, 1901, the British Engineers had reconstructed fourteen miles of the old line, with 1,500 ft. of bridging, had nearly completed twenty-nine miles of absolutely new construction, with 1,000 ft. of bridging, and had strengthened and improved over a hundred miles of damaged line and some 9,000 ft. of bridging. They had repaired or rebuilt running sheds, shops, watering plants, station arrangements and quarters.

Eleven new engines had been erected and forty-six repaired, eighty new carriages and cars had been built and 940 cars repaired. The earnings of the line in May, 1901, reached a higher figure than that of the best month in peace before the outbreak.

* Shan-hai-kwan fort is the point at which the Great Wall meets the sea. The fort and walled city guard the defile through which from time immemorial have passed the many invaders of North China. During the relief operations a British force had landed there and made contact with the railway a few miles inland. Until the Japanese occupation in the late 1930s, the fort was held as a British possession—perhaps the smallest in the Empire. It and the surrounding area were used as a delightful summer training camp for the North China garrison.

The section of the Indian Survey under Major T. F. B. Renny Tailyour and Captain C. H. D. Ryder was actively engaged during the operations. Altogether 16,000 square miles of country were triangulated and 17,000 square miles of detailed survey completed with the plane table.

Many miscellaneous jobs were carried out by the Sappers: telegraphs and telephones improved and extended, electric light installed at the new Peking terminus of the railway, and sunken junks recovered from the Peiho River. At Shan-hai-kwan a pile-driven landing pier, 200 yds. long, was run out to deep water by the Kotla Sappers.

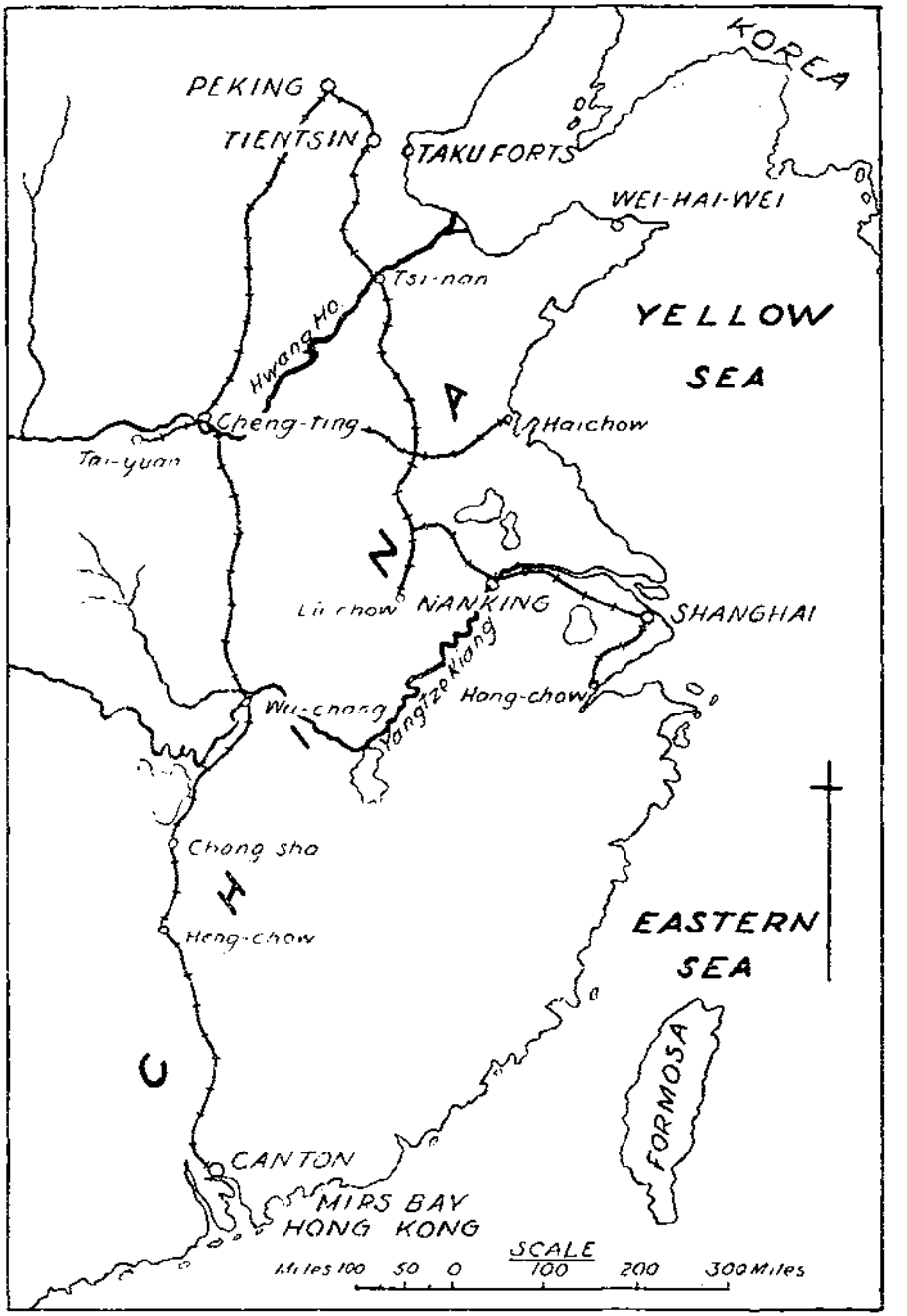
In January, 1901, a Military Commission with representatives of all the Powers, under the Presidency of Brigadier-General Shone, met at Peking to formulate plans for the various Legation areas. Under this scheme the British Legation was considerably enlarged and extended to include barrack accommodation with a parade ground for 250 men. A clear space of 100 to 150 yds. was left outside each Legation, except where they backed on to the City Wall. This work, which involved much clearing and reconstruction, was carried out by Major J. E. Dickie and three other R.E. officers.

This completed the work of the expeditionary force and, during the summer of 1901, the whole force was gradually withdrawn to India except a few troops to garrison Tientsin and Shan-hai-kwan. In January, 1902, Major-General A. R. F. Dorward was sent to command the troops in Shanghai, being ordered home when this garrison was withdrawn in June, 1902.

In the *Gazette* of 24th July, 1901, the following honours were awarded to the R.E. for this campaign :—

Colonel A. R. F. Dorward to be K.C.B.
Lieut.-Colonel G. H. W. O'Sullivan to be Brevet Colonel.
Lieut.-Colonel G. K. Scott-Moncrieff to be C.I.E.
Captain R. P. Lee to be Brevet Major.
Lieutenant S. G. Lock awarded D.S.O.

As a result of these operations, it was decided to make Tientsin the headquarters of the British forces in North China, a Major-General was appointed in command and the garrison fixed at one British and one Indian battalion. A detachment, known as the Legation Guard, was stationed at Peking. A major of R.E. was appointed O.C.R.E. at Tientsin, his duties including the engineer work at Shan-hai-kwan and Peking. Among the latter was the maintenance of a blockhouse and a piece of the bullet-riddled legation wall, inscribed with the words—" Lest we forget."


KOREA
PEKING
TIENTSIN
TAKU FORTS
WEI-HAI-WEI
Tsi-nan
YELLOW
SEA
Hwang Ho
Cheng-ting
Haichow
Tai-yuan
Li chow
NANKING
SHANGHAI
Yangtze Kiang
Wu-chang
Hong-chow
Chang sha
Heng-chow
EASTERN
SEA
FORMOSA
CANTON
MIRS BAY
HONG KONG
SCALE
Miles 100 50 0 100 200 300 Miles

The military status of Wei-hai-wei was at the same time reduced, the fortifications which had been commenced were stopped, and Captain Lee with the Headquarters of the 44th Company, R.E., was ordered home ; a Civil Servant from Hong Kong was appointed High Commissioner, and Prendergast, for a few months, joined the force in North China as C.R.E.

The successful employment of Indian troops in this campaign led to an increased use of Indian Infantry in our eastern colonies ; the Hong Kong Regiment and the Chinese Regiment were disbanded.

The garrison of Hong Kong, on the abolition of the Hong Kong Regiment, was increased by the addition of Indian units until in August, 1914, the garrison included one British and four Indian battalions.

Major-General Sir J. Bevan Edwards was in command of the troops at Hong Kong from 1889 to 1890 and Lieut.-Colonel Sir M. Nathan was Governor of the Colony from 1903 to 1907.

The subsequent events in this part of the world must be put in a few words. The fighting in North China was followed by the signing of the defensive alliance between Britain and Japan. In January, 1904, war broke out between Russia and Japan, in the course of which the Japanese defeated the Russian armies in the field and attacked and captured Port Arthur, and the Russian fleet in eastern waters which had taken refuge in that fortress. A gallant attempt by the Russian Admiral Rosjesvensky with all the available Russian fighting ships from Europe was ended by the total defeat of this force by the Japanese at the battle of Tsushima. The result of the war was to give the Japanese the control of Korea and the south half of the island of Saghalien. They also retained possession of Port Arthur. During this campaign, Lieut.-General Sir William Nicholson was sent out as the head of a special Military Mission to follow the operations. He was accompanied, among other officers, by Lieut.-Colonel G. H. Fowke, R.E., who made some valuable reports on the engineer features of the fighting, especially of the methods of the Japanese in the attack and capture of Port Arthur. Valuable reports were also received from Major Sir A. Bannerman, R.E., who was British Military Attaché at Japanese headquarters.

CHAPTER VIII

PERSONNEL—OFFICERS—STAFF—OTHER RANKS

Corps of Officers—Battalions—Amalgamation with Indian Engineers—Promotion of Officers—Abolition of purchase effects R.E.—Royal Commission under Lord Penzance—Compulsory retirement—Pensions—Regimental rank of Colonel abolished—Morley Committee—Recommends time promotion for R.E. Officers—Proportion of ranks—Sandhurst Committee—Increase of Establishment in 1888—Promotion to Colonel's and General's rank—Introduction of Engineer pay—Quartermasters—Riding Masters—Coast Battalion—Reserve List—Supplementary Reserve—Quantity Surveyors—Inspectors of Works—W.O. and N.C.Os.—Regimental Staff—Supernumerary Staff—Instructors at S.M.E.—Engineer Clerks and Draughtsmen—Assistants to Garrison Instructors—Foremen of Works—Mechanists, Steam and Hydraulic—Mechanists for S.M. Service—S.M. Storekeepers—Staff for Telegraph services—Rank and file—Growth up to 1857—Amalgamation with officers—Depot moved to Chatham—Formation of A, B and C troops—Growth of special services—Telegraphs—Submarine Mining—Field Companies—Fortress Companies—Organization—1886—1900–14—Enlistment of tradesmen—Training of recruits at trades—Engineer pay introduced 1886—Tests of qualifications—Drivers—Promotion of N.C.Os.—Separate lists for promotion—Foreign service—Roster.

This chapter links up with Vol. I, Chap. XVII and Appendix, Vol. II, Part II, Chaps. II and III and *History of Submarine Mining*, Chap. VII.

THE Corps of Royal Engineers is unique in the Army in that it has been formed by the amalgamation of two independent Corps, one of officers and one of men.

The Corps of Officers can trace its origin back to the Norman Conquest. It first received military ranks in 1757 and the title of Royal Engineers in 1787. The numbers of the different ranks varied a good deal up to the end of the Waterloo campaign. Following this, reductions took place and the establishment finally approved in 1819 took the form of four battalions of officers with one Brigade Major.

Each battalion was composed of :—

1	Colonel Commandant
2	Colonels
5	Lieut.-Colonels
8	Captains
8	Second Captains
16	First Lieutenants
8	Second Lieutenants
48	

There were in addition, as in later years, a number of officers who had been removed from the Corps on promotion to General Officers, and who remained on a separate Army List until selected for appointment as Colonel Commandant. These latter appointments carried a high annual rate of pay and were considered the prizes to which all officers looked forward. The establishment of General Officers appears to have been usually two per battalion of officers, that is, one Colonel Commandant and one other. In 1878 the establishments were eighteen on the Home list and sixteen on the Indian list. On the introduction of compulsory retirement the numbers were gradually reduced.

The grouping into " Battalions " followed a similar grouping for the Royal Artillery and was in practical use for many years, all additions to the Royal Engineers being made by battalions or half battalions, with the same proportion of ranks as above.

An additonal battalion was added in 1825 for work on the Survey and a further battalion for general duty was added in 1846. On the outbreak of the Crimean War another battalion was added, bringing the total to 336. A further half battalion (twenty-four officers) was added in 1855 and another half battalion in 1861, bringing the total to eight battalions of forty-eight officers each—384 in all.

In 1862 occurred the amalgamation of the separate Indian Armies with the British forces in India, one result of which was the gradual absorption of the three separate lists of Indian Engineer officers into the Royal Engineers. The Indian lists were composed of seven battalions, of which three were on the Bengal list and two each on the lists for Madras and Bombay. This raised the total to fifteen battalions or 720 officers in all. In 1874 two more battalions were added to supply the demand of officers for India, raising the total to 816.

of H.R.H. The Commander-in-Chief, assembled a Departmental Committee, under the chairmanship of the Earl of Morley, to report on the question. The members were Lieut.-General R. C. H. Taylor, C.B. ; Colonel W. E. M. Reilly, C.B., R.A. ; Colonel Sir John Stokes, K.C.B., R.E. ; and Mr. R. H. Knox, C.B., Deputy Accountant General. At the beginning of 1881 the Committee made their report. While recommending a system of *seconding* for the R.A., they recommended for the R.E. a system of *time promotion*, so that no officer need retire till he completed his service in the rank of Major at the age of 48, and, coupled with this, such a proportion of Lieut.-Colonels as to give all Majors a good chance of promotion before reaching that age. The numbers of the different ranks of the R.E. to include all supernumeraries, were to be Lieut.-Colonels, 110 ; Majors, 143 ; Captains, 198 ; Subalterns, 361 ; a total of 812, or practically the same as the number already existing, though the proportion of the higher ranks was raised ; should any change be made later in the total numbers, the above proportion of the different ranks should be maintained and, in particular, the proportion of Lieut.-Colonels should always be one-seventh of the total increase or decrease. The periods for time promotion were, twelve years for the rank of Captain, twenty years for the rank of Major. In putting forward these recommendations, the Committee consider " that the Corps of Royal Engineers is in an exceptional position as compared with the rest of the Army. In the first place, the officers are all, more or less, scientific men. Some of them have attained the highest distinction in the various branches of science to which they have devoted themselves. They have been trained at the School of Military Engineering at the expense of the public during the first years of their service, and they have subsequently acquired their knowledge by private study and by experience gained in the public service. It appears to us most unwise to entrust the retention or removal of such men to mere chance, which now rules compulsory retirements, provided that some other means can be devised for regulating promotion. The best men will most easily obtain employment elsewhere and, if their prospects in the service are uncertain, will most assuredly quit it. In the second place, there are no specific duties attached to the different ranks, and therefore we hold that the battalion cannot be taken as the basis for fixing the establishment of officers."

The Committee also pointed out that the extra cost of the pay of some Captains and Majors in excess of establishment will be more

than met by the saving of retired pay, by keeping officers off the Retired list. This report was approved.

Coupled with these recommendations it was decided that Lieut.-Colonels of R.A. and R.E. should serve five years in the rank, and at the end of this period should be removed from the Regimental list either to the Retired list or to half-pay pending selection for a Colonel's appointment. The corresponding period in the Cavalry and Infantry was four years, and as this would give the officers of these services, selected for Colonels, an advantage over the two other Corps, the latter were given brevet promotion to the rank of Colonel on completing four years in the rank, or were given an antedate of one year on selection for Colonel.

The first time promotions were gazetted on 1st July, 1881, thirty-three Captains and twelve Lieutenants received promotion under the new rule. In 1884 it was found that the Subaltern officers of the R.A. were receiving quicker promotion than the R.E. and from 1st January, 1885, the period of service for promotion to Captain was reduced to eleven years. These periods of twenty years for Major and eleven years for Captain remained in force during the thirty years covered by this volume, except for a short period after the South African War when promotion to Captain was after nine years.

An increase of the British Establishment of 126 officers was made by Lord Sandhurst's Committee in 1885, which is described in Chapter I of this volume, and at the same time the number of Royal Engineer officers on the Indian Establishment was fixed at 385. These additions were distributed to ranks of the scale laid down by the Morley Committee and, with subsequent additions, gave such a stimulus to promotion that, except in the case of a few promotions to Major in 1894, time promotion did not have to be applied till after 1914.

During the South African War thirty-five officers on the Indian list were transferred to the British list and additions were made until, in 1902, the numbers stood at, British 619, Indian 350. The changes in the organization of the Corps, described in Chapters II, III and IV of this volume, caused fluctuations in these numbers until, in 1914, on the eve of the Great War, the numbers were, British 687, Indian 407. In addition there were, in 1914, sixty-nine officers of Colonel's rank and thirteen General Officers employed in various capacities. When the Regimental rank of Colonel was abolished, promotion to that rank was by selection to a combined list of Colonels which was open to the whole Army. There was no

definite establishment of Engineer Colonels, sufficient officers being selected each year to fill vacancies which were anticipated as C.R.Es. of Districts. Such vacancies occurred by promotion to Major-General, by compulsory retirement at the age of 57, or by voluntary retirement. Up to 1897 the establishment of General Officers was divided up according to Corps, and ten places were allotted to the Royal Engineers, exclusive of officers promoted for distinguished service in the field. In 1897 this separate list was abolished and from that date all promotions to General Officer were made by selection from the list of Colonels irrespective of Corps. With the slow rate of promotion this alteration adversely affected the R.E.; the position was fully discussed by the Evelyn Wood Committee of 1905 (see Chapter II of this volume). 7

Pay of Officers

The pay of the officers of the Corps was determined by a series of Royal Warrants, some of which are given in Volume I of the *History*. In the last of these, dated 1819, the Regimental pay of the different ranks was almost the same as the rates in force in 1885. In a previous Warrant, dated 1802, special allowances were granted to officers of the Corps as follows :—

" To officers who shall be employed with our armies in the field or in any part of our foreign dominions, Gibraltar excepted, an allowance equal to the pay of their rank.

" To officers who shall be employed at Gibraltar or in any part of our United Kingdom an allowance equal to one half of the pay of their rank.

" To officers employed on the West Coast of Africa an allowance of twenty shillings a day."

These allowances were to include lodging, fuel and light and local travelling up to five miles from their stations.

This arrangement of double pay while abroad was retained till 1881 when the system of engineer pay was initiated and all R.E. officers came under the Allowance Regulations.

In addition to the pay and allowances described above, officers of Royal Engineers employed as Commanding Royal Engineers prior to 1881 received Command pay as under according to rank :—

Colonel	10s. per day
Lieut.-Colonel abroad	10s. per day
Lieut.-Colonel at home	8s. per day
Lower ranks	5s. per day

While Charge pay was issued to :—

Executive Officer	5s. per day
Division Officer	5s. or 3s. per day

In 1881, on the recommendation of the Committee presided over by the Earl of Morley, the rates of pay at home and abroad were equalized, the extra pay granted to the R.E. and also the Charge pay were abolished. Command pay was limited to three shillings a day for Lieut.-Colonels employed on Corps duties. In lieu of the above rates a new scale of Engineer pay was introduced for ranks from Lieutenant to Lieut.-Colonel, and all R.E. officers drew allowances for lodging, fuel and light on the same scale as for other officers, and a special allowance of one shilling a day in lieu of a soldier-servant.

It was further recommended that the Command of Engineer Districts should be held according to importance by Major-Generals, Brigadier-Generals and Colonels on the Staff, the two latter ranks to receive Engineer pay at ten shillings a day in addition to Staff pay.

Engineer officers employed at the War Office received a special rate of £1 1s. a day in addition to Regimental pay, but without allowances.

The pay and Engineer pay of R.E. officers as a result of these recommendations was fixed as below, these rates remaining in force until 1914, except that on the introduction of the rank of Second Lieutenant, this rank replaced the Lieutenants of three years and under. On the completion of three years' service, Second Lieutenants were automatically promoted Lieutenants irrespective of vacancies on the establishment.

	Regimental pay.	*Engineer Pay.*
	s. d.	s. d.
Lieut.-Colonel	18 0	14 0
Major	16 0	9 0
Captain	11 7	6 0
Captain with higher rank by brevet	13 7	6 0
Lieutenant of ten years' service	7 10	4 0
Lieutenant of three years' service	6 10	4 0
Lieutenant under three years' service	5 7	4 0
Lieutenant under instruction	5 7	2 0

On the abolition of the Regimental rank of Colonel, the pay of a Colonel on the Staff employed on Engineer duties was fixed at £1,000 a year in the War Office and £2 a day with allowances of his rank in Commands. In each case Engineer pay at ten shillings a day was added.

In 1905 these rates for Colonels' appointments were reduced to £1,000 a year, without Engineer pay. Chief Engineers with the rank of Brigadier-Generals received the same pay as Colonels.

Quartermasters

When the Corps of Royal Engineers took shape in 1856 it was provided with a Regimental Staff, following the organization of the other arms, comprising Quartermasters, Paymasters and Surgeons. The last two were removed to the Army Pay Department and the Royal Army Medical Corps, when these were formed, but the Quartermasters were retained and developed in special ways, forming a very valuable part of the organization of the Corps.

The first appointment of Quartermaster was made in 1814 (Volume II, page 142) and, as the Corps increased, further additions were made until in January, 1885, the number of Quartermasters was six in all; one was in the office of the Deputy Adjutant-General in London; two were at the School of Military Engineering; one at the Survey Headquarters at Southampton; one at the Headquarters of the Troops and Companies R.E. at Aldershot and one at the Submarine Mining School at Gillingham.

In June, 1885, as part of the large increase of the Corps referred to in Chapter I, two additional Quartermasters were added for the School of Military Engineering and St. Mary's Barracks, and a new departure was made in the promotion of six of the Warrant Officer Foremen of Works to commissioned rank as Quartermasters for Works Service; these were distributed to districts where they assisted Division Officers.

In 1886 and following years, additional Quartermasters were appointed for the Royal Monmouth Engineer Militia, the 2nd Division Telegraph Battalion and for charge of Submarine Mining Stores at Gosport and Jamaica. Further additions were made to this list in 1888, when two of the Engineer clerks employed in the Intelligence Department at the War Office, Cromie and Wall, were commissioned as Quartermasters for clerical duties.

In 1898 and following years, three clerks employed in the I.G.F's.

office were promoted to Quartermaster and, when the office was reorganized in 1904, one of these was appointed Chief Clerk in the office of the Director of Fortifications and Works.

The value of these additions to the R.E. organization soon became apparent and there were constant increases to all the four groups—Regimental duties, Clerks, Foremen and Storekeepers—until in 1914, the total of Quartermasters had reached forty-nine.

Quartermasters were given the honorary rank of Lieutenant on first appointment and were promoted Captain on completion of ten years' service. Promotion to Major was by selection to fill an establishment. They were retired at the age of 55.

The pay of Quartermasters on appointment was eight shillings a day rising on a time scale to eleven shillings and sixpence after twelve years' service as an officer. Engineer Quartermasters received Engineer pay at two shillings a day. The pay on retirement was the Regimental pay of their rank.

The appointment of Riding Master at Aldershot has already been referred to in Volume II and this appointment continued to 1914.

Coast Battalion

The Coast Battalion was formed in 1885 as one of the changes made to cope with the expansion of the Submarine Mining Service. It was formed to provide officers for charge of the Submarine Mining Defences at the commercial ports ; these officers commanded the small detachments of R.E., were in charge of the stores and vessels and acted as Adjutants of the Volunteer units at the ports. The officers were selected mainly from the senior Warrant Officers on the Regimental and Mechanists list of the Submarine Mining Service and of the Electrical School, Chatham, but occasional appointments were made from other branches of the Corps. The first appointments included Captain Andrews, the Quartermaster employed in the office of the D.A.G., R.E., who was promoted to Major in the Coast Battalion.

Major Andrews retired in 1888 and was succeeded by Lieutenant W. G. C. Browne, well known to later generations of R.E. officers. In 1890 Lieutenant and Quartermaster J. H. Bailey, then serving in the office of Inspector of Submarine Defences at the War Office, was transferred to the Coast Battalion. Both Browne and Bailey were serving in the War Office on the outbreak of the Great War.

On the withdrawal of Submarine Mining, in 1905, the Coast

Battalion organization was retained for similar work in charge of the Electric Light Defences at home ports, and continued to function throughout the Great War. In 1914 the number of officers on this list was sixteen.

Coast Battalion officers were combatant officers. They received the rank of Lieutenant on appointment and were promoted to Captain and Major by time promotion after ten and fifteen years' service in the Coast Battalion.

Their pay on first appointment was seven shillings and tenpence a day Regimental and four shillings a day Engineer pay. Subsequent rates were as for R.E. officers.

They were retired at the age of 55, on the Regimental pay of their rank.

Reserve Lists

One of the objects expected from the regulations for compulsory retirement was the gradual growth of a Reserve list composed of officers who had resigned their commissions before the dates fixed for compulsory retirement. Owing to the fact that most officers of the R.E. served their full time and to the regulation under which officers left the Reserve list on reaching the age limits laid down for their respective ranks, the number of R.E. officers of this list never exceeded seventy, out of which only about fifteen were available for Regimental duty, the remainder being Colonels or General Officers. But though this official list was disappointing, the officers who had retired under the age limit, many of whom were between 50 and 60 years of age and still at the height of their powers, did constitute a very effective and useful reserve of officers. The number of such officers was about 290 in 1885 and by 1914 this number had reached 667.

On the outbreak of the Great War, every one of these who was physically fit volunteered for service, many did valuable work in training the new armies in garrison and other Engineer duties at home and abroad, and in several cases retired officers on this list served with the Army in the field.

On the abolition of the Submarine Mining Militia, in 1905, the officers were transferred to a special Supplementary Reserve and were detailed for service in Coast Fortresses on mobilization. Twenty of such officers were on the list in 1914.

In 1907, as explained in Chapters III and IV, a special group of officers was formed to provide junior officers for duty with R.E.

Field units. These were included in the Supplementary Reserve R.E. These officers were drawn from young civil engineers. To ensure the selection of suitable candidates, the Institution of Civil Engineers was approached by the War Office and it was decided that the Institution should nominate batches to be assembled at Chatham twice a year, in January and July, for a twelve months' course of training in military engineering. After the original course these officers were required to undergo a short annual training with the unit to which they were posted on mobilization. This organization proved most successful and 95 officers had been added to the Reserve by 1914.

Surveyors and Inspectors of Works

One additional group of officers must be referred to here, the group first called Quantity Surveyors and later Inspectors of Works. The origin of this group was the employment in the War Office of a Surveyor to assist in the supervision of the technical work of making contracts and checking contractors' bills under the R.E. At that time the work itself at home was supervised largely by civilian Clerks of Works, who were not satisfied with their position and, being civilians, could not always agree with the Military Staff.

In the years 1868 to 1870 a change was made in this organization by the gradual introduction of Military Foremen of Works to replace the Clerks of Works, and at the same time a number of Surveyors were added, who were distributed for duty under the C.R.Es. of Districts. The total had reached fifty-two by 1885. These officers were graded for pay at home as follows :—

Chief Surveyor at War Office	£800 to £1,000 a year
Surveyor 1st Class	£400 to £500 a year
Surveyor 2nd Class	£300 to £375 a year
Assistant Surveyor	£180 to £280 a year

Abroad the rates varied with the station.

In 1904, as described in Chapter III, the Surveyors were given military rank under the description of the " Staff for Royal Engineer Services," the title of Inspector of Works being substituted for that of Surveyor. They were given the honorary rank of Major, Captain or Lieutenant according to service.

This change served two purposes, it gave these officers a definite status when performing their duty in barracks occupied by troops, where the intrusion of a stranger in civilian clothes was apt to be

resented. It also enabled these officers to take charge of Engineer offices when required and to control the Military Staffs of Foremen and Clerks. This was part of a scheme proposed by Brigadier-General R. M. Ruck in connexion with the Franklyn Committee of 1903 and finally adopted when, in 1905, the civilian Director of Barrack Construction declined to take over any of the Engineer Staff. Had this latter scheme worked out as expected, the work falling on these officers as Surveyors would have been much reduced, so that they could have been employed on works in relief of R.E. officers and so have enabled a reduction to be made in the latter. Actually the relief to the Royal Engineer organization on the formation of the Director of Barrack Construction was much less than expected and the duties of the Inspectors of Works were much the same as the old Surveyors, but the fact that they could take charge of Engineer divisions proved very useful.

Regimental and Supernumerary Staff

Other important components of the organization of the Royal Engineers, which have not been mentioned in previous volumes of the *History*, are the groups of Warrant Officers and Non-Commissioned Officers which assisted the officers in many ways, one of these groups was called the Regimental Staff, the other came under the general name of Supernumerary Staff.

The Regimental Staff included Regimental Sergeant-Majors and Quartermaster-Sergeants employed on work connected with discipline and duties in barracks, similar to those of equal rank in the Infantry. The number of such appointments varied according to station requirements. The Regimental Staff also included the Drill Instructors at the depots, who were promoted Corporal on first appointment and then up to the rank of Quartermaster-Sergeant. There was also a special Instruction Staff for the various schools at the S.M.E. This Staff was at first composed of selected N.C.Os. who were promoted Quartermaster-Sergeants on selection, but, on the advice of Lord Sandhurst's Committee of 1886, this Staff was extended by the addition of five Sergeants and five Company Sergeant-Majors, up to a total of forty-six.

The Supernumerary Staff included several distinct classes; one of the first to be formed, which dates from about 1870, was that of Engineer Clerks and Draughtsmen and this group developed in several ways until there were Engineer Clerks for duty at the War

Office, for Regimental work at the depots, Engineer Clerks and Draughtsmen for Engineer services and for what was called Regular and Militia duties at the headquarters of the units of Engineer Militia.

Engineer Clerks and Draughtsmen were appointed from men of good education in the ranks of the Corps and, after a period of probation, they were appointed Sergeants on the Supernumerary Staff, R.E. They were promoted to the rank of Company Sergeant-Major after three years' service as Clerks and to Quartermaster-Sergeant after six years, and then by selection to fill vacancies on an establishment of Sergeant-Major Clerks.

There was a special list for the probationers, who were termed Temporary Engineer Clerks and Draughtsmen and, if not of higher rank, were appointed Lance-Corporals. They were excused all Regimental duties and were, for all practical purposes, part of the permanent staff. In 1907 this class of temporary clerks was abolished and the work was done by N.C.Os. or Sappers drawn as required from the R.E. units at the station; at the same time "Clerk" was included among the authorized trades.

In addition to the Clerks for duties connected with Engineer work, there was a special class called at first "Assistants to Garrison Instructors," and later, "Engineer Clerks and Draughtsmen for duty in General Staff offices." These were drawn from the R.E. but were employed under the Staffs of Commands, their duties including the preparation of plans and diagrams in connexion with defence schemes and training. They were kept on the Regimental list for promotion. They numbered eighteen in 1884 and thirty-seven in 1914.

Next after the Engineer Clerks came the Military Foremen of Works. These also date from about 1870 and were drawn from the rank and file of the Corps, from men of good education and with very superior qualifications at a recognized building trade. Their special function, under the officers, was the supervision of building work and the checking of work carried out by civilian contractors. They were given a course of instruction at the S.M.E., followed by a period of six months' probation, and were then given the rank of Company Sergeant-Major (Staff Sergeant) to give them the necessary seniority when in charge of working parties. They were promoted to the rank of Quartermaster-Sergeant after six years as Foremen of Works and then by selection to fill vacancies on an establishment of Sergeant-Major Foremen of Works.

A third group, which started in 1884, was the group of Military Mechanists (Steam and Hydraulic). Their duties, under the R.E. officers in charge of machinery, were the erection, maintenance and repair of all kinds of boilers and machinery, including machinery in Army Ordnance workshops, or in use by the Army Service Corps. The methods of selection and appointment were similar to those for Foremen of Works, except that to obtain the right class of men, special enlistments were made at first of suitable civilians, who were given the rank of Company Sergeant-Major on enlistment, and wore the uniform of this rank while learning their drill and military duties.

In 1885, at the beginning of the period covered by this volume, the numbers of the three classes referred to above were :—

For Regimental duties	44
In General Staff offices	18
Engineer Clerks and Draughtsmen	114 plus 53 temporary
Foremen of Works	216
Mechanists	10

The Sandhurst Committee of 1886 added considerably to the above numbers and introduced new classes mainly for duty with Submarine Mining Work.

Four new groups of Mechanists were formed under the titles of Mechanist Coxswain, Mechanist Electrician (S.M.), Mechanist Engine Driver (S.M.), Mechanist Instrument Repairer, and a new class was formed of Storekeepers (S.M.) for charge of the technical Submarine Mining Stores.

On the introduction of the Brennan torpedo a new class of Mechanist (Brennan Worker) was added.

All these classes were appointed under a similar procedure to that adopted for Foremen of Works. The individuals were selected from men of suitable trades and educational requirements, were put through a special course of instruction and after a period of probation were promoted to the rank of Company Sergeant-Major. Subsequent promotion varied a little in the different groups, but generally promotion to the rank of Quartermaster-Sergeant followed automatically after six years' service in the rank of Company Sergeant-Major, while promotion to Warrant Officer was by selection to fill a vacancy on an establishment, as voted by Parliament.

Ranks of Company Sergeant-Major and above had a married establishment of 100 per cent, and all could serve, if they wished

to do so, to a total of twenty-one years' service and so qualify for a pension. There was thus considerable competition for these appointments, and the standard of conduct and technical qualifications attained by the members of these special lists was very high.

One other group must be mentioned, this was called the Staff for Telegraph Services. It was composed of all ranks from Corporal upwards and comprised men with two classes of qualifications, office telegraphists and telegraph linesmen. The duties of this group were the charge and maintenance of military telegraph lines and telegraph offices in fortresses and garrisons. They were drawn from the R.E. Telegraph units, mainly from the company employed with the General Post Office, and were on the general list of the Telegraph Service for promotion.

In 1905, on the abolition of Submarine Mines, the class of Mechanist Coxswains was abolished, the Mechanist Electricians were amalgamated with the Staff of Telegraph Service to form a larger list of Mechanist Electricians, and the Mechanist Engine Drivers were amalgamated with the Mechanists (Steam and Hydraulic) to form one list of Mechanists, Machinery.

On the abolition of the Brennan torpedo, the list of Mechanists (Brennan Worker) was amalgamated with the Machinery Mechanists.

Rank and File

The rank and file of the Royal Engineers trace their origin to the Corps of Military Artificers, created at Gibraltar on the 6th March, 1772. The formation of this Corps and its extension to England in 1787 are described in Volume II, Part II, Chapter III. At first the Corps was limited to six companies at fixed stations in England, with two companies at Gibraltar, but in 1793 a company was sent on active service in Flanders and additional companies were formed until the total number of companies reached ten. The companies were officered from the Royal Engineers, but in 1806 one Sub-Lieutenant, promoted from the ranks, was allowed per company. The ranks held were Sergeant-Major, Sergeant, Corporal, 2nd Corporal and Private (labourer).

In 1807 the Headquarters of the Corps were established at Woolwich, where the depot was commanded by an officer of the R.E. with the title of Adjutant and Quartermaster.

During the Napoleonic Wars, the numbers increased to thirty-two companies and, as a result of the experience of the Peninsular

campaign, the School of Military Engineering was established at Chatham, in 1812, to give instruction in field engineering. This was emphasized by the change of the title in 1813 to Royal Sappers and Miners. In the same year the rank of Colour Sergeant was introduced.

In 1814 the duties of the Adjutant and Quartermaster were divided, a Quartermaster being commissioned from the ranks of the Corps, while the title of the officer commanding the R.E. Depot at Woolwich was changed from Adjutant to Brigade Major. The rank of Sub-Lieutenant was abolished in 1816.

Large reductions followed after the peace of 1815 until, in 1819, the peace establishment was fixed at twelve companies of sixty-one men each. Five of these companies were at home and seven abroad.

In 1824 and 1825 three new companies, the 13th, 14th and 16th, were raised for work on the Ordnance Survey in Ireland, and another company was added for work on fortifications at Corfu. In 1827 three additional companies were raised, of which two were later reduced again after their special work on the Rideau Canal in Canada had been completed. This left the total at seventeen, each of which had an establishment of sixty-two. In 1833 these seventeen were reorganized to form nine General Service and three Survey Companies each of ninety-one other ranks, with a total of 1,070. In 1838 and 1841 new companies were added and in 1846, when a general augmentation of the Army was carried out, further companies were added until, in 1849, there were eighteen Service and four Survey Companies, with a total establishment of 2,185.

On the outbreak of the Russian War of 1854–5 the establishment was increased to 2,658 and by May, 1855, nine of the Service Companies were on active service in the Crimea. Between this date and April, 1857, ten more companies were added and a new unit, later called "A" Troop, had been formed as a nucleus of an Engineer train.

On 17th October, 1856, the Corps of Royal Sappers and Miners was amalgamated with the Corps of Royal Engineers and from this date the two Corps, who had worked together for nearly eighty years, were joined into one body. The men, from this date, were called Sappers instead of Privates.

The depot for the men at Woolwich was moved to Chatham in 1856 and amalgamated with the detachments undergoing special courses at the S.M.E. Between 1856 and 1862 two new Service Companies, the 33rd and 34th, were formed and the depot at Chatham was organized into six companies, numbered 35th to 40th, of which the 38th was for the Band, Staff and Boys and the 39th

and 40th were for the supply of men to India, to provide the staffs of the companies of native Sappers and Miners.

In 1868 three new Company Headquarters were formed for India, the 41st, 42nd and 43rd, to be paid on the Indian Establishment.

In 1863, after a long struggle with the Quartermaster-General and the finance branches of the War Office, the "A" Troop was reorganized and enlarged as the "A," or Pontoon Troop, and a new unit was formed called the "B," or Field Equipment Troop, which was designed to carry tools and equipment to be used by R.E. companies in the field. In 1870 a third mounted unit, called "C," or Telegraph Troop, was formed to provide an electric field-telegraph system to supplement the system of visual signals.

In 1870 a new departure was made by the allotment of units to special branches of engineering, an arrangement which had hitherto been followed only in the case of the Ordnance Survey. The first service dealt with was the Telegraphs, for which, in addition to "C" Troop, the 22nd and 34th Companies were detailed for special work in the Telegraph Department of the Post Office.

The Submarine Mining Service was the next to break away, the 4th Company being allotted for this service in 1871, followed by the 33rd, 28th, 27th and 23rd, the latter becoming the depot on the Depot ship, *H.M.S. Hood*, at Gillingham. In 1884 the four Service Companies were reformed into six, including the numbers 22nd and 34th, surrendered by the Telegraph units. Each company had an establishment of sixty-two.

The 8th Company was converted into a Railway Company in 1882 and sent on active service in Egypt. The 10th Company was also converted to a Railway Company in January, 1885, for work on the Suakin-Berber line.

In 1877 the "B" Troop was broken up and sections attached to four companies. At first the companies to whom the sections of "B" Troop were attached were changed from time to time, but in 1885 this attachment was made permanent and these companies were called Field Companies. In May, 1885, the number of Field Companies was raised to six.

The remainder of the Service Companies not allotted to any special duty were then called Fortress Companies.

In April, 1885, the Depot Companies at Chatham were distinguished by letters, the numbers released being later given to new companies.

With these changes the organization of the Corps in 1886 was as follows :—

Mounted units	" A " Bridging Troop
	1st Division, Telegraph Battalion
	9 Field Companies
	Field Park and Depot
Dismounted	2nd Division, Telegraph Battalion
	13 Fortress Companies
	9 Submarine Mining Companies
	4 Survey Companies
	2 Railway Companies
	9 Depot Companies, Chatham
	1 Depot S.M. Company, Chatham
	3 Companies, India

This was the organization of the Corps at the start of the period dealt with in this volume.

This organization was largely increased as a result of Lord Sandhurst's Committee of 1886. New units were formed for Ballooning and for a Field troop until in 1900, just after the outbreak of the South African War, the number of units was :—

Mounted	3 Bridging Companies
	4 Field Parks and a Mounted Depot
	3 Divisions Telegraph Battalion
	1 Field troop
	9 Field Companies (higher establishment)
	8 Field Companies (lower establishment)
	1 Balloon Depot and sections
Dismounted	1 Division Telegraph Battalion
	19 Fortress Companies (11 home, 8 abroad)
	2 Local Fortress Companies (abroad)
	13 Submarine Mining Companies (9 home, 4 abroad)
	5 Local S.M. Companies (abroad)
	1 Coast Battalion of eleven sections
	3 Railway Companies
	4 Survey Companies
	9 Depot Companies

Considerable additions were made to these numbers during the South African War, followed by reductions which are described in

Chapters II, III and IV of this volume, until in 1914 on the outbreak of the Great War the organization was as follows :—

Mounted	5 Field Troops—four formed into a Field Squadron
	1 Mounted Depot
	2 Bridging Trains (material only)
	2 Groups Telegraph units
	6 Divisional Telegraph Companies
	15 Field Companies
Dismounted	" K " Telegraph Company
	31 Fortress Companies—Works and Electric Light
	1 Works Company for Line of Communications
	2 Railway Companies
	3 Survey Companies
	10 Depot Companies

The rank and file of the Royal Engineers have always been drawn from the class of artificers or tradesmen, in contra-distinction to the class of labourers which provided most of the recruits for the remainder of the Army. Of recent years, owing to the growth of mechanical transport and of mechanization generally, the whole nation has become much more mechanically minded and the classes of tradesmen have increased and those of labourers decreased. But up to about 1912 the Royal Engineers were still responsible for all work requiring special technical and mechanical knowledge, excepting, of course, the very specialized and important form of Engineering connected with the manufacture and improvement of artillery and small arms.

Two factors arise from this distinction, which must be kept in mind in considering the history of the growth of the Corps. The first of these is that the individual N.C.Os. and men are not interchangeable with one another. While all are fully trained as soldiers, each has his own individual value so that a unit of Engineers is not composed of so many men picked out haphazard, but must be composed of selected proportions of men of various trades, such as carpenters, smiths, telegraphists or electricians, the proportion being based on experience and being modified for operations according to the nature of the country. And the second factor is that the units themselves are not interchangeable with one another, thus a Field Company is not organized to run telegraph lines or manage a railway.

It follows that the recruiting and drafting of the personnel are much more complicated than the similar duties in an Infantry battalion, while the supervision and distribution for work of an Engineer company demands much greater knowledge and experience than that required from an officer of other arms. Another point follows and has been often overlooked, that to enable an Engineer unit such as a Field Company to make the best use of its technical training, it must be associated with a body of labourers to supplement the work of the experts. Such labour may be found by civilian labour engaged on the spot, by specially enlisted labour corps, or by working parties supplied by the troops themselves.

The fact that the Royal Engineers are composed of skilled tradesmen carries a further obligation. It is an essential feature of our Army that it is composed of young men, the majority unmarried. The learning of a technical trade in civil life requires a considerable number of years, not only to learn the technical details but to acquire the mechanical experience of a handicraft and of the use of tools and materials.

The recruits for the R.E., being enlisted young, have seldom acquired the qualifications of mature tradesmen, so that to attract a suitable class of men, provision must be made, while they are in the service, to give them opportunities of practising and improving their trades, and this form of technical training must be supervised by their officers, who must themselves have the necessary technical knowledge. Opportunities for such training are provided in peace by making the Royal Engineers responsible for much of the work in connexion with barrack construction and repairs, the construction and maintenance of telegraph and telephone systems* and the care of electrical apparatus and many forms of machinery.

Engineer Pay

In order to attract suitable recruits, the rank and file have always received some form of Working pay in addition to the Regimental pay which they receive in common with the rest of the Army. This Working pay used to be issued only for actual work, so that men lost pay if taken for military duty such as guards or parades or for fatigues in barracks. These difficulties were first overcome in the Submarine Mining Service, where a system of continuous Engineer pay was introduced, under which men received a fixed daily rate

* Up to the separation of the Royal Corps of Signals in 1921.

irrespective of employment, but varying according to qualifications. In 1889 this system was extended to the whole Corps on the recommendation of Lord Sandhurst's Committee of 1886. The details of this proposal were carefully investigated by a Committee composed of Colonel R. N. Dawson Scott, D.G.I.F., Lieut.-Colonel A. C. Hamilton,* O.C. Troops and Companies Aldershot, and Mr. F. T. Marzials of the Finance branch of the War Office.

The Committee recommended an issue of continuous Engineer pay for six days a week, omitting Sundays, but including authorized holidays. Engineer pay was to be forfeited while undergoing imprisonment or confinement to barracks and was withheld in certain special employments. The rates recommended were for men classed as :—

Very superior	1s. 8d. a day
Superior	1s. 4d. a day
Skilled	1s. 0d. a day
Fair	8d. a day
Labourer	6d. and 4d. a day

There was a higher rate of two shillings which was for special cases only.

Detailed regulations were laid down for assessing the qualifications of each man and for raising his rate as he improved at his trade. On first enlistment a man was tested at the workshops at Chatham and given a qualification as Skilled, Fair or Indifferent. Men with the last of these were classed as labourers and special approval was required for their retention in the service.

After completing their military courses and some service with a company, during which they had had an opportunity of working at their trades, any men who were recommended by their officers for advancements of their rate were examined by a Board of Officers, assembled quarterly by the Commanding Royal Engineer of the station, and if found qualified were recommended for an advance of rate.

For the guidance of local boards a long list of jobs, suitable for the different rates and trades, was laid down in a Corps Memorandum† as a guide, but instructions were given that whenever possible

* Afterwards Lord Belhaven and Stenton.

† Corps Memoranda were a series of instructions issued by the D.A.G. or A.A.G., R.E., and formed what was really a series of standing orders, affecting all ranks and all details of military work and training. They were periodically reprinted in book form.

the work to be done should be something useful connected with some job in progress at the station. It was also laid down that whenever men came home to the School of Military Engineering or one of the special schools, their qualifications would be tested. The number of different trades in 1889 was forty-two, but some of these, such as Smiths or Masons, had several subdivisions. These regulations worked very well and the local boards proved very careful, so that a good standard was maintained. Most men with really good qualifications could attain the 1s. 4d. rate after about three to four years' service, but the 1s. 8d. rate was only reached by a minority of the whole.

In addition to their trade qualifications on enlistment, men selected for special courses, such as Submarine Mining and the special groups of Electricians, Engine Drivers, Brennan Workers, Instrument Repairers or Divers, were given a qualification on this special work, thus attaining a double rating. If these were different the men usually drew the rate which was the better of the two and were mustered in the corresponding trade and shown as such in all returns. For special courses forms of qualification report were issued, on which any advance of rating was recorded. Such advances were usually referred to the school issuing the qualification report before being granted.

In 1912, following the investigation by the Kitchener Committee referred to in Chapter IV, Engineer pay was issued for seven days a week instead of six as a partial set-off to the grant of proficiency pay to other arms, but withheld from the R.E.

The drivers for the mounted units of the R.E. were specially enlisted and trained. They included a number of men for training as Farriers and Shoeing Smiths. Drivers, in addition to training in riding and driving, received elementary instruction in Field Engineering, Bridging or Telegraph work, so that they could assist in the work of their units. They were rated for Engineer pay at the two lower rates of sixpence or fourpence a day.

In addition to Regimental and Engineer pay, all men could qualify for good conduct pay in accordance with the regulations applicable to the rest of the Army.

Promotion

The promotion of Sappers to non-commissioned rank as Lance-Corporals was arranged locally, each company or other unit having an establishment of Lance-Corporals fixed by the War Office.

Vacancies in this establishment were filled by selection from a list of suitable Sappers, which was kept by each unit. With the good-conduct and high educational qualifications which distinguished the Royal Engineers such lists were rather long and men of average qualifications had often to wait four or five years before making a start on the ladder of promotion. Confidential reports on all N.C.Os. were made to the War Office quarterly, after careful consideration by the Officer Commanding their company and the Commanding Royal Engineer at each station, and from these, N.C.Os. were selected for promotion in succession to Second Corporal, and higher ranks. As individual units were not interchangeable it was necessary to keep N.C.Os. of special units on separate lists for promotion.

Foreign Service

A very important detail in the training and service of both officers and men was the arrangement for foreign service. This was important for training, as it was part of general Army policy to keep up to their war establishment all garrisons abroad ; all ranks were thus working together at this establishment and it was possible to carry out a much more complete and systematic training than was possible at home stations, where the strength of units was much depleted during the winter months. Abroad also, less reliance could be placed on contractors, so that the R.E. had a more definite place in the works programme.

To regulate the tours of foreign service, stations were divided into two lists, temperate and tropical. The temperate stations included Canada, South Africa, Gibraltar, Malta and Egypt, also Bermuda and St. Helena. The tropical stations included the West Indies, Ceylon, Straits Settlements, Hong Kong and China and Mauritius. The usual tour of service for a temperate station was five years and for a tropical station three years. Sierra Leone and West Africa had a special short term of two periods of one year separated by six months' leave. For officers there were modifications, thus service at Bermuda was varied by a transfer to Halifax, Nova Scotia and vice versa. Generally the majority of officers had to take at least three tours of foreign service before completing their period of service as Lieut.-Colonels. For the junior officers, their first tour constituted a most important part of their training.

The N.C.Os. and men had approximately the same length of foreign service, but a man enlisting for seven years' service could, of

course, not do more than one tour. To fit in with the moves of troopships the conditions of enlistment contained a clause under which a man serving abroad could be kept with the colours up to eight years before passing to the reserve. N.C.Os. and men extending for further service usually had a second or even a third tour.

The rosters for foreign service were kept by the A.A.G., R.E., at the War Office.

In 1906, on the appointment of a Colonel-in-Charge of Records, the details of the foreign service rosters for the rank and file were arranged by this officer.

Service in India followed special rules, officers and men being struck off the strength of the Home Army on embarkation for India.

CHAPTER IX

TRAINING OF OFFICERS AND MEN—SCHOOLS OF INSTRUCTION

Qualifications of Royal Engineers—Military training—Men—Officers—Technical training of officers—Increased specialization—Jack of all trades and Master of one—School of Military Engineering—Growth from 1812—Division into Schools—Submarine Mining School formed 1886—Expanded into three schools in 1892 at Chatham, Portsmouth and Plymouth—Assistant Commandant—Brigade Major—Details of courses—Used for instruction of officers of other arms—Courses for men—Battalion organization—Commandant appointed to Command of Thames District—Organization changed by Esher Committee—Officer in charge of Records—Appointed to Command of Depot—Names of Commandants—Brennan School—On transfer of Mines to Navy, Schools of Submarine Mining become Schools of Electric Light—Instruction of Drivers at Aldershot—Pontoon troop trained its own recruits—Training in Survey at Southampton—In Telegraphy by Telegraph Divisions—Training in Telegraphy transferred to Signal School, Aldershot—Practical training in all branches continued throughout service—Foreign service part of training—Annual courses.

This chapter links up with Vol. II, Part II, Chap. IV and with *History of Submarine Mining*, Chap. VI.

ALL officers and men of the Royal Engineers must possess two special qualifications, they must be fully trained as soldiers and they must be trained as engineers in those branches of engineering which concern the work allotted to the Corps in peace or war.

These two sides of their training, though for the purpose of this chapter they may be considered separately, really proceed simultaneously and are both continuous during their whole military service.

The military training of the dismounted N.C.Os. and men may be briefly described as having been, with some exceptions, the same as that applied to the Infantry. The men began their training at the depot following the form of Infantry drill in force at any period. They were trained in musketry as recruits, through a course rather

shorter than that of the Infantry. Their training in what used to be called extended order was rather less complete than that of the Infantry. In 1885 the rank and file were armed with the short rifle and sword bayonet, which involved some variations from the Infantry drill for handling arms. With the introduction of the .303 rifle and short bayonet, the equipment of the R.E. was assimilated to that of the Infantry.

Training of Officers

The officers began their military training as cadets at the Royal Military Academy, continuing this at the School of Military Engineering where they completed their instruction in Infantry drill and musketry and learned interior economy and the practical work of soldiering by attachment to one of the Depot Companies. They passed all the examinations for promotion laid down for Officers of Infantry.

When employed in garrisons they took their full turn of all Military duties such as Courts Martial, or Courts of Inquiry, and took part in the annual manœuvres.

The technical training of the officers as Military Engineers requires and deserves a rather longer reference. During the early part of the nineteenth century the training of all engineers, civil as well as military, may be described by the general expression of " Jack of all trades," but during the latter half of this century the increase in scientific knowledge and the additional use of machinery caused more specialization among engineers, so that groups of men with special qualifications joined together to form societies and institutions. This increased specialization necessarily affected the training of the Military Engineer and in some ways made it more difficult. It is an essential condition of military service that a Military Enginner must have a good working knowledge of many different branches of engineering, while it is obviously desirable, in order to ensure that the Corps is keeping in touch with the developments of Science, that individual officers should make a special study of particular branches. Thus, a popular description of the Military Engineer is that he should be a " Jack of all trades and Master of one." Actually he is rather more than this ; all officers obtain an excellent working knowledge of the ordinary branches of engineering, while among those who specialize many have proved to be pioneers in the development of their special branch.

Engineer Schools

For the technical training of the officers and men a group of Engineer Schools had gradually developed. The first of these was the Royal Engineers Establishment at Chatham.* The formation of this establishment is described in Volume II, Part II, Chapter IV of our *History*. Started by Major Charles Pasley in 1812, it remained under his fostering care for thirty years. It was originally formed for training in Sapping, Mining and Pontooning and other military operations based on the experience of the Peninsular War. In addition to the officers and men for the British service, all officers who entered the three Corps of Indian Engineers from Addiscombe went through the full course at this school. Training in Practical Architecture was added in 1826, following the decision that the construction of military buildings should be placed in the hands of the Royal Engineers. Surveying and Map-making was added to the course in 1833, to which Colonel Pasley added Practical Astronomy and the higher branches of Surveying. In 1838 Pasley began his experiments in the destruction of wrecks, which resulted in the evolution of the firing of charges electrically and the use of diving and the diving dress. Telegraphy followed, first used in the Crimean War, Signalling came from the Abyssinian campaign of 1867, Chemistry and Photography were added in 1871, associated with the name of Captain W. de W. Abney. In 1865, on the recommendation of a Committee presided over by the Quartermaster-General, Sir Richard Airey, various improvements were introduced, a concentration of the workshops was effected and Sand Modelling started; the Pontooning Field at Wouldham dates from this Committee.

On the conclusion of this reorganization the school was given its present name of the School of Military Engineering. The head of the school was then called Commandant instead of Director.

Under the Commandant the technical instruction was divided between four Instructors usually of the rank of Major. These subdivisions were :—

1. Fortification School which included Field works and Pontooning and also the general charge of Workshops.

* Further information, with many interesting details, is given in Colonel B. R. Ward's book *School of Military Engineering 1812–1909*. A summary only is given in this chapter as this is necessary to explain the systems of instruction of officers and men which developed during the period covered by this volume.

2. Survey School.
3. Construction School.
4. Special Schools which included Telegraphy, Electricity and Demolitions, Chemistry, Photography and Lithography and Submarine Mining (then just starting).

At first the head of each school was called Superintendent, but in 1872 this title was altered to Instructor and at the same time the Superintendent of Special Schools was renamed Instructor in Telegraphy, which was again altered to Instructor in Electricity in 1885. Under the general supervision of the Instructor in Telegraphy there were two Assistant Instructors, in charge of schools for Chemistry and Submarine Mining. The Chemistry School, which included Photography, Printing and Lithography, became in practice independent of the Instructor in Telegraphy from about 1885. In 1904, owing to the increased use of map-making, the Chemistry School was put under the Instructor in Survey.

The R.E. Workshops gradually grew up under the general charge of the Instructor in Fortification and were given a separate organization in 1884, from which time the Assistant Instructor in charge reported direct to the Commandant. This school was also responsible for the steam road-transport engines and instruction in their use.

Instruction in railway work was at first limited to narrow gauge railways and was taught as part of the course of Field works, but in 1906, on account of the experience of the South African War, a special centre for railway work and training was established at Longmoor.

Experiments in ballooning and instruction in its use were started at Chatham, but in 1891 the school and manufacturing establishment were moved to Aldershot.

In 1886, consequent on the large expansion of the Submarine Mining Service, the instruction in this branch was separated from that in Electricity, and a new school was formed at Gillingham under an instructor with a largely increased staff. This was a specialist school and only selected officers and men were trained in this branch.

In 1909 the status of the heads of the four principal schools at the S.M.E. was raised to that of Chief Instructor and their subordinates were graded as Instructor or 1st or 2nd Assistant Instructor. The head of the Workshops was called Superintendent in 1904 and in 1909 was graded as an Instructor.

In addition to the Instructional Staff the Commandant was, from 1870, assisted by a Lieut.-Colonel who, with the title of Superintendent of Military Discipline, was responsible for the command and discipline and also for the military training of the Depot Companies. The title was changed to Assistant Commandant in 1878 and the rank of the holder was later raised to Colonel. The Staff was completed by a Brigade Major, who was the personal Staff officer of the Commandant, and by an Adjutant who assisted the Assistant Commandant ; there were also two Quartermasters for Barracks and Clothing and other officers for the command of the different companies.

Instruction of Officers

In 1885 the length of the Officers' Course was about two years and three months, beginning with military drill and musketry. The order in which the batches of officers went through the various schools varied according to the time of year at which they joined.

In the Construction School they learnt the elements of constructional engineering, the strength of materials, design of buildings, principles of construction, steel bridges, water supply, sanitation, heating, lighting, the manufacture and use of concrete, and in later years the use of reinforced concrete.

The principles of Fortification were first taught at the Royal Military Academy, but the course at Chatham included a tour lasting about a fortnight to the fortifications at the Isle of Wight and Portsmouth and visits to the forts then building for the defence of Chatham Dockyard. The greater part of the six months spent in this School was devoted to Field and Siege Engineering, the construction of field defences, obstacles, water supply and sanitation in the field, camps, also sapping and the construction of siege trenches, mining, and the construction of military bridges ; the last included timber bridges over the ditches of the old fortifications and the use of pontoons and other forms of floating bridges. The pontooning was practised from a hard at Upnor and each summer a camp was formed at Wouldham, which gave useful experience in camp life and where the tidal waters of the Medway gave excellent practice in the construction of piers and bridges.

The course in the Survey School was in two distinct parts, Military Topography and Surveying. The former included the military reconnaissance of ground and the preparation of the sketch maps

and reports required for the proper appreciation of military features. The accurate surveying included all the stages necessary for the preparation of maps and followed the procedure adopted by the Ordnance Survey, beginning with a trigonometrical survey connecting selected fixed points in the area to be mapped, the detail to be filled in by a chain survey or by plane table. It also included the running of a line of traverse by theodolite and level, suitable for the lay-out of a road or railway. There was a short course of Astronomy, sufficient to enable an officer to fix his position in any part of the world or to carry out simple navigation. Meteorology and the recording of weather statistics were also taught.

In the Electrical School, all officers were taught signalling with flag and lamp, the principles of electricity and its application to firing charges, the use of the telegraph and telephone and the use of lightning conductors, electric bells and the lighting of buildings. Instruction was also given in the theory and use of searchlights.

In the Workshops, the only course for officers in 1885 was a short course on the steam engine, accompanied by practical experience in driving the steam road-engines or steam sappers. This course was much extended in later years. Officers also saw the practical operation of the ordinary trades, such as carpenters, plumbers and bricklayers.

In the Chemistry School, the officers were given instruction on the chemistry of building materials.

For the instruction of officers in Tactics, Military Law and Organization, a special appointment was made in 1874, the first holder being Captain Lonsdale A. Hale, later well known as an Instructor and Lecturer at the Staff College and as a writer on military subjects. In 1906 the Instructor in Tactics was made a Major of the Training Battalion.

In addition to the instruction of the junior R.E. officers, the School of Military Engineering was used for the instruction of officers of other arms in Field Fortification and Military Topography. Classes in these subjects were formed each year of officers drawn from the Cavalry and Infantry. There were also special courses for R.E. officers from India. At that time many officers had accepted continuous service in India, so that these home courses were designed to enable such officers to keep abreast of the latest military methods and ideas and also to learn any new developments in practical engineering.

Instruction of Recruits

For the recruits intended for the ordinary service companies, the course of Military Engineering included about six months of Field Engineering, Bridging and similar subjects as detailed for the officers. Men selected for the Submarine Mining Service did not go through this course, but were sent direct to the Submarine Mining School on completion of drill and musketry. Office telegraphists were also exempted from the Fieldwork Course. There were special courses at the various schools for office and line telegraphists, also for draughtsmen, surveyors, printers, lithographers and photographers and, in the workshops, a number of boys were taught trades. Such trades were selected to supplement the recruits enlisted through the ordinary channels, thus there was usually a shortage of blacksmiths and bricklayers while other trades were occasionally added. There were also spacial courses in the different schools for Mechanists and Foremen of Works.

The above summary of a very complete and intricate organization is an outline of the procedure as it existed in 1885, but such procedure was in no way permanent. It was constantly being altered, partly to meet changes in engineering practice and also partly to meet the insistent demands for officers and men consequent on the very small peace establishment of the home units. Thus, in 1886, when there was a great demand for officers and men, for reasons discussed in Chapter I of this volume, the course for officers was divided into two parts. All officers were put through Part 1, but at the conclusion of this part they were distributed to stations and often sent direct on foreign service. They were required to rejoin at Chatham later, to complete Part 2, before they could obtain promotion.

Military Organization

A separate battalion organization was formed for the Submarine Mining Service in 1884 at St. Mary's Barracks and, in 1889, the remaining companies were divided into two parts, a Training Battalion, which included the companies for the recruits under instruction, and a Service Battalion which included the Band, Boys and Instructional Staff, also men under instruction in special schools and a large group of men sent to Chatham on return from foreign service, pending transfer to the reserve. With three battalions under him, the position of the Assistant Commandant became similar to that

of a Brigadier. When the Training Battalion was formed the officer commanding took over the responsibility for the training of the recruits in Fieldworks and the Instructor in Fortification was given the position of Major of the Battalion, continuing to superintend the instruction of the officers and special classes.

In 1898 the Commandant S.M.E., Major-General Sir Thomas Fraser, was appointed to the Command of the Thames District in addition to his other duties and this arrangement was continued with his successor, Major-General Sir Reginald C. Hart.

In 1905 the School of Military Engineering received somewhat drastic treatment on the advice of the Esher Committee, who, without any apparent reason other than a desire to assimilate the organization of the Engineers to that of the Infantry, attempted to divide the command and training of the men from the technical training as Engineers. A new appointment was made of a Colonel to command the Engineer depot, while the status of the Commandant S.M.E. was reduced to that of Colonel. The former Commandant, Major-General Sir R. C. Hart, remained in command of the Thames District. This arrangement worked badly, as described in Chapter III of this volume, and in 1907 the Colonel in charge of Records was moved to Gravesend and the Commandant resumed command of the Training and Service Battalions. The appointment of Assistant Commandant which had lapsed in 1905 was not renewed.

In addition to their work as Instructors, the officers at the head of the principal branches were also members of the R.E. Committee, which dealt with patterns of Engineer stores and equipment and all schools carried out experiments with new patterns. The Commandant S.M.E. was the President of this Committee up to 1906. The various Instructors also kept abreast of the newest civil practice in their respective branches, while a series of technical handbooks was prepared by the Instructors, which were eagerly welcomed by civil engineers. The school was thus not only a great training establishment but a centre of engineering science, which rendered valuable assistance to all branches of the Army. Signalling, the electrical firing of charges, mechanical transport and flying may be mentioned as services which had their beginnings at the School of Military Engineering.

The names of the Commandants of the S.M.E. are given in Volume II, Part II, Chapter IV, up to Colonel R. N. Dawson-Scott, 1888–93, who was promoted Major-General in 1890. The following officers* held this appointment between 1893 and 1914 :—

* Ranks and decorations shown at time of appointment.

Major-General E. O. Hewett, C.M.G....	1893–1895
Colonel Sir John C. Ardagh, K.C.I.E., C.B	1895–1896
Colonel T. Fraser, C.B., C.M.G.	1896–1902
Major-General Sir Reginald C. Hart, V.C., K.C.B.	1902–1905
Colonel H. W. Smith-Rewse, C.V.O.	1905–1906
Colonel F. Rainsford-Hannay	1907–1908
Colonel J. S. Ferrier, C.B., D.S.O.	1908–1910
Colonel J. L. Irvine	1910–1911
Colonel J. E. Capper, C.B.	1911–1914

Schools of Submarine Mining

In 1886, Captain A. T. Preston was appointed the first Instructor in Submarine Mining. The course for officers included a full course of Submarine Mining and of the electrical work of preparing the electrical apparatus, the daily testing of the condition of a mine-field and the arrangements for firing mines if attacked. Included in the course in 1886 was a fortnight's instruction in searchlights, but this was given at the Electrical School in St. Mary's Barracks. The recruits detailed for the Submarine Mining Service were first put through a course of about four and a half months in the details of submarine mining, including boatwork, and flag signalling. On completion of this first course about two-thirds of the men were selected for special training as Electricians, Engine Drivers, Instrument Repairers or Divers.

On the purchase of the Brennan Torpedo in 1887, a new course was added for instruction in the use of this weapon, and Lieutenant E. C. Seaman was appointed as an additional Assistant Instructor for Brennan work. Selected officers and men were trained for this work on completion of their Submarine Mining course. The course of engine driving included instruction in driving the Brennan engine.

In 1892, owing to the increased demand for Officers and men, it was decided to form two additional schools of Submarine Mining at Portsmouth and Plymouth. In each case the staff of the school was also responsible for the charge of the Submarine Mining defence at these important ports. The schools were therefore formed very economically, while the additional staffs, provided for instruction, were a useful addition to the Defence staff.

In 1901, the instruction in Brennan work was separated from the Chatham School and transferred to Sheerness, where there was a

Brennan installation. The officer commanding the Submarine Mining Company at Sheerness was appointed Instructor.

In 1902, owing to the increased use of defence electric lights, arrangements were made to give every man of the Submarine Mining Service a general training either as attendant on the lights or as assistant to the engine drivers on the engines, which by this time were all driven by oil.

In 1905, on the transfer of the Submarine Mining Defence to the Navy, the Submarine Mining Schools had to be reorganized. The use of electric lights had, by that time, extended to various ports, such as Gibraltar, where there was no mine defence. The charge of the lights at these ports thus devolved on the ordinary Fortress Companies and men for this work were being trained in the Electrical School at the S.M.E. Such training was necessarily largely theoretical and the same was the case at the Gillingham School, while both Portsmouth and Plymouth had by now a large electric-light defence which could be used for instruction. It was, therefore, decided to close the school at Gillingham and to concentrate all the instruction in electric lighting at the schools at Portsmouth and Plymouth, which were renamed Schools of Electric Lighting.

In 1906 the decision to abolish all Brennan torpedo defences involved the abolition of the special school at Sheerness.

Details of the schools are given in Chapter VI of the *History of Submarine Mining.*

Instruction at Other Stations

In addition to the organized schools, described above, there were arrangements for instruction at other stations, usually combined with other work.

The instruction of Drivers for R.E. units was, from 1871, concentrated at Aldershot under the Lieut.-Colonel Commanding Troops and Companies. In addition to the training of Drivers, both in the riding school and in the open, selected men were trained as Shoeing and Carriage Smiths, including a course at Woolwich Arsenal.

On the formation of the Pontoon Troop, it was decided that, while it would be officered from the general list of the R.E., the men should be specially enlisted so as to obtain men of physical qualifications to handle the heavy pontooning equipment. This proved very successful, and it was found possible to provide this unit with men of a standard of height and weight considerably higher than that of the

R.E., or of any Corps in the Army except the Guards. Most of these men were enlisted as labourers and received Engineer pay as such. A few men were qualified as tradesmen. Men enlisted for the Pontoon Troop were sent direct to Aldershot, where they were put through their recruits drill and technical training with their units.

Men for the Survey Companies carried out their recruits training in drill, musketry and fieldworks at Chatham and were then transferred to the Survey Headquarters at Southampton, where they received training in the technical side of their work.

Men for the Telegraph Service, after their training at Chatham, were transferred to the Telegraph Battalion, where they completed their training as Telegraphists. The distribution of these men between the 1st Division (Mounted) and the 2nd Division(Unmounted) was controlled by the officer commanding the 2nd Division. On the Amalgamation of the Telegraph and Signal Services in 1912, all work connected with the training and distribution of the personnel was transferred to the Army Signal School at Aldershot.

Men for railway work, after their training in drill, musketry and field works at Chatham, were transferred for technical training to one of the two Railway Companies, at first stationed at Chattenden and Woolwich Arsenal. From 1905, when the railways were concentrated at Longmoor, all technical training was carried out at that station (see Chapter XII).

Men for the Balloon Service, after training in drill, musketry and fieldworks, were posted to the Balloon Company, first at Chatham and from 1891 at Aldershot, and received their technical instruction with the unit. Lieut.-Colonel J. L. Templer (7th K.R. Rifles) was appointed Instructor in Ballooning in 1889 and held this appointment till 1905 (see Chapter XIII).

In addition to the training described above, arrangements were made with civil firms to attach selected officers for courses, of some months' duration, in Machinery, Railway Traffic and Electrical work.

It has been urged by critics of this system of instruction that it was quite impossible for officers of the Royal Engineers, in the short time of two years, to properly master the details of so many different branches. Such critics point out that in civil life a learner is usually kept four or five years at work on practical details before he is considered fit to be classed as an Associate member of one of the recognized societies; they instance also the case of a medical student with his long hospital course before he can begin to practise. But such a comparison overlooks a feature of the training of the R.E.

officers, in that the first two years' course is largely theoretical and is intended to prepare them for the practical engineer work which they carry out when distributed to stations, under the control and supervision of more experienced officers. As pointed out in the previous chapter, such experience includes work at stations overseas and the officers administering the personnel at Headquarters have always watched the distribution of the young officers to stations, so that they may obtain the necessary experience in different branches. The interchange of officers between the home and Indian establishments also facilitated this side of their training, the conditions of India giving special facilities for practice in road-making and railway work, or military operations in a mountainous country, while India benefited by the development of the Electrical and Machinery branches in the home Army. The full training of the young R.E. officer should, therefore, be considered as continuous until he was promoted to Captain.

The further training of the N.C.Os. and men was carried out at stations, the military side of the work being taught by special annual courses, sometimes lasting several months, while trade training was given by employment on actual work on barracks and fortifications and in Engineer workshops.

The annual training included a course of musketry for all ranks. The annual courses of training usually ended, in the case of Field units, with Army manœuvres, or in fortresses, in a special manning of the garrison during which local units of Militia, Volunteers or Territorials were included in the practice. The details of such courses are given in Corps Memoranda, but are too long to include in this volume.

CHAPTER X

ORGANIZATION

Engineer-in-Chief — Becomes Inspector-General of Fortification — Deputy Adjutant-General R.E.—Inspector-General's office divided into Fortification and Barracks—Duties of branches—Subordinate Staff—Inspector of Submarine Defences—Inspector of Iron Structures—Deputy Inspector for charge of Barrack Loan work—Corps of Royal Sappers and Miners—Amalgamated with R.E. 1855—Depot moved to Chatham—Duties of D.A.G.—Names of officers who held senior appointments up to 1904—Representation of R.E. on Army Committees—Alterations caused by Esher Committee—Director of Fortifications and Works—New organization of office—Military Lands transferred to Civil branch 1909—Changes in organization 1913—Names of officers who held senior appointments after 1904—Changes in Committees—C.R.Es. of Districts—Engineer Divisions—Executive officers—Sub-districts—Commands at home—Chief Engineers—Financial control—W.O. Votes—Details of Engineer Vote 1884—Parts I, II and III—Preparation of Estimates—Contracts—Loans.

This chapter links up with Vol. II, Part II, Chap. I, with Vol. III, Chap. I, and with *History of Submarine Mining*, Chaps. III and IV.

FROM the earliest days there are traces of the appointment of a senior officer as the head of the engineer work of the Government. Some details are given in Volume I, Chapters II and III, from which it will be seen that this officer had a variety of titles at different times, such as "Magister Ingeniatorum," "Principal Engineer," or "Chief Engineer of England and Wales." His duties seem to have included engineer work in peace as well as in war, though these duties were very undefined and there were probably many lapses in the appointment. A definite appointment as "Chief Engineer" first appears in the Royal Warrant of 26th May, 1716, in the reign of George I, when the Artillery branch was formed into separate companies and an establishment of numbers and grades was laid down for the officers. This title was changed to that of Engineer-in-Chief when the Engineers were given military ranks in 1782. On 21st April, 1802, in connexion with an augmentation of the establishment, the title of the head of the Corps was changed to that of Inspector General of Fortifications. By that time the Artillery and

Engineers had been formed into separate Corps but were both under the control of the Master-General of the Ordnance, a senior military officer, independent of the Commander-in-Chief. (See Volume II, Part II, Chapter I.) The Master-General was the head of the Board of Ordnance, which had been in existence since 1483 and which had numerous duties in peace, including the custody and supply of military stores and the provision and repair of barracks. The Board of Ordnance was abolished in 1855 and the Inspector-General of Fortifications was then placed for a time directly under the Commander-in-Chief. But in 1859, consequent on the increased importance of the civilian Secretary of State, there was a further change of status and the Inspector-General became directly responsible to the Secretary of State for the execution of engineer works; all questions affecting the personnel, such as recruiting, pay or promotion of officers and men being dealt with by a senior officer of Engineers called the Deputy Adjutant-General R.E. This division of responsibility gave rise to a good deal of friction and correspondence until, in 1868, the Inspector-General of Fortifications was appointed the Inspector-General of Engineers and Director of Works and his position was defined as that of a General Officer on the Staff of the Army, holding the position of a Divisional General as regards his own special Corps. As Inspector-General of Engineers he was in direct communication with the Commander-in-Chief, but in his capacity as Director of Works he was under the immediate control and authority of the Secretary of State for War. The D.A.G., R.E., was to consult the Inspector-General regarding appointments and transfers of senior officers, and the orders for these were issued by the Adjutant-General. The position of the Inspector-General was strengthened in subsequent years until, in 1886, as explained in Chapter I of this volume, Lieut.-General Lothian Nicholson was appointed Inspector-General of Fortifications and Director of Works and also Inspector-General of Royal Engineers.

Although the Board of Ordnance had been abolished, the distinction between Ordnance Services and the rest of the Army had been retained, and there was at Army Headquarters an official called the Surveyor-General of the Ordnance. By 1886 this had become a political appointment, the occupant being changed with each change of Government. The Surveyor-General was responsible for Supply and Transport, Artillery and Ordnance, and for Engineer Works. As Director of Works the Inspector-General was responsible to this officer, though as Inspector-General of Fortifications and

Royal Engineers he was responsible to the Commander-in-Chief. On the 29th December, 1887, there was an important rearrangement of the War Office, the post of Surveyor-General was abolished, his duties connected with supply and transport were taken over by the newly formed Army Service Corps and put under the Quartermaster-General, the duties connected with Artillery and Ordnance Stores were put under a senior officer of Artillery, with the title of Director-General of the Ordnance, and this latter officer and the Inspector-General of Fortifications became the heads of branches directly under the Commander-in-Chief. The details of this organization were modified by a subsequent order in 1888, but the changes were mainly verbal and the Royal Engineer organization at the War Office, introduced in December, 1887, remained in force until it was broken up on the advice of the Esher Committee in 1904.

Under the Inspector-General of Fortifications the work of his office was divided into two main branches called " Fortifications " and " Barracks," each under a senior officer of Engineers ; there was also a smaller technical branch, under the Chief Surveyor, to deal with the technical side of contracts and bills.

The variations in the titles of the two senior appointments are given in Volume II, Part II, Chapter I. In 1885 they were called Deputy Directors of Works, but when the Inspector-General of Fortifications dropped the title of Director of Works in December, 1889, his two subordinates were renamed Deputy Inspector-Generals of Fortifications and retained this title until 1904.

The two D.I.G.F. were assisted by a considerable staff and were actually the executive heads of their technical branches, each controlling the expenditure of large amounts of public money, and corresponding, in the name of the Secretary of State, with the General Officers commanding Districts or Commands at home and abroad. They also frequently visited stations at home to discuss details with the Commanding Royal Engineers of Districts. The Inspector-General of Fortifications was, of course, in touch with all work in hand, but he was often absent from the office on inspection duty, so that the actual executive work devolved on his two deputies.

The duties of the D.I.G.F. (Fortifications) were defined as under in 1888 :—

Correspondence, estimates and expenditure relating to :

Fortifications ; Lands ; Ordnance Store buildings ; Army Clothing Factory ; Brennan Torpedo Factory ; Submarine

Mining; Military Railways; Military Telegraphs and Permanent Signal Stations; Survey of Defensive Positions; Ballooning; Examination of Parliamentary Bills affecting the War Department Lands or Works.

To this list were added later:

Artillery Ranges; Water Supply in Fortresses; Engineer Experiments; Military Roads and Bridges; Permanent Telephones; Special R.E. Stores; R.E. Committee; R.A. and R.E. Works Committee.

The duties of the D.I.G.F. (Barracks) were defined as under in 1888:—

Correspondence, estimates and financial business relating to:

Barracks; Hospitals; Examination of Contractors' claims; Military and Civil Staff of R.E. Department; Financial Contract schedules; Purchase and shipment of building material and stores for foreign stations; Photographic and miscellaneous services. From 1888 the responsibility for barrack design was placed on this officer.

The duties of the Surveyor branch included:

Professional duties of Surveyor; Framing estimates and specification for every description of builders' work; Preparing bills of quantities; Measurement of works and buildings; War Department pattern book.

The D.I.G.F. (Fortifications) was assisted by two senior officers of the R.E. with the title of Assistant I.G.F.; these usually held the regimental rank of Lieut.-Colonel. The second of these was added in 1886 to deal with the large increase of work consequent on the development of the defences of commercial ports and coaling stations. There were also six or more R.E. officers employed in preparing plans of fortifications and a staff of clerks and draughtsmen. The records connected with the W.D. Lands were in a special Lands office under a Chief Draughtsman.

The D.I.G.F. for Barracks was assisted by two A.I.G.F., usually of the rank of Lieut.-Colonel, who divided the work between them. A third A.I.G.F. for Barracks was appointed in 1894. When the responsibility for barrack design was placed on this branch an officer of the rank of Major was appointed in charge. Among the duties of this officer was the maintenance of a complete set of record

plans of all barracks and hospitals, at home and abroad. There was also a staff of clerks and draughtsmen.

In addition to the three main branches, described above, there were two smaller branches under officers who were called the Inspector of Submarine Defences and the Inspector of Iron Structures. Both these branches were originally under the D.I.G.F. (Fortifications).

The appointment of Inspector of Submarine Defences originated in 1870 with the formation of a special Committee to control the purchase of the first Submarine Mining Stores. The President of this Committee was appointed to the War Office and gradually took control of all correspondence connected with mine defence. In 1876 the title of the officer in charge was changed to Inspector of Submarine Defences and an Assistant Inspector was appointed. These officers usually had the rank of Major. This branch had a separate staff of clerks and, in 1885, the chief clerk was granted a commission, at first as Quartermaster. In addition to the work in the War Office, the Inspector or the Assistant Inspector carried out an annual inspection of all Submarine Mining stations at home. This was usually during the period of the annual practice, when the local Submarine Mining units—Militia or Volunteer—were training with the regular units.

As the use of electricity extended, the officers of the Submarine Mining branch were naturally consulted, until all questions connected with the use of electricity were dealt with by this branch. Such questions included defence electric lights, telegraphs, both field and permanent, also lightning conductors. Later, as the use of electric lighting in barracks became more general, special power stations were constructed at the principal military stations, and there was a considerable increase of work under this head. The Inspector of Submarine Defences became in practice an independent branch advising both the Fortification and Barrack sides of the office.

The Inspector of Iron Structures traced his origin and title to the days of the iron-fronted fortifications described in Volume II, Part III, Chapter I. By 1886 the use of iron in fortifications had been dropped, but there remained a large amount of steam and hydraulic machinery in charge of the R.E., which naturally fell to the care of this officer. When steam road transport was introduced it also came under this branch and on the formation of the R.E. Railway Companies, railway work was added. Thus the branch gradually assumed responsibility for the work now included in the

description of Mechanical Engineers, and had duties which affected both the Fortification and Barrack branches. Although the I.I.S. was thus partly independent, he never quite reached the position given to the Inspector of Submarine Defences. Also the latter officer remained responsible for all engines and machinery used in connexion with Defence Electric Lights or Submarine Mining vessels, or in the power stations in barracks.

The I.I.S. made technical inspections of boilers and machinery, but did not inspect personnel.

In addition to the staffs described above, there was a central office under a chief clerk which co-ordinated the work of the different groups of clerks and kept the registry of correspondence. In 1904 the Chief Clerk was commissioned as a Quartermaster R.E. The total staff of military and civil clerks in the I.G.F's. office in 1888 was fifty-three.

In 1890, consequent on the passing of the Barracks Act, under which a loan of £4,100,000 was provided by Parliament, the appointment was approved of an additional Deputy Inspector-General of Fortifications to take charge of a new branch to deal with the Barrack services carried out under these loans. The details of the work are given in Volume III, Chapter V.

An additional Assistant Inspector was appointed for the new branch.

Military Organization

Prior to the amalgamation of the Royal Engineer Officers with the Corps of Royal Sappers and Miners, in 1855, the control of the latter was vested in an officer stationed at Woolwich. At first this officer was called the Adjutant and Quartermaster, but in 1802 the title was altered to Brigade Major which was again advanced to that of Assistant Adjutant-General in 1846.

In 1855, on the amalgamation of the Corps of Officers and men, the depot was moved from Woolwich to Chatham and placed under the command of the Superintendent of the School (see Chapter IX), and the Assistant Adjutant-General joined the staff of the Commander-in-Chief at the War Office and was advanced to the grade of Deputy Adjutant-General. A second officer with the title of Assistant Adjutant-General was appointed to assist the D.A.G.

In 1872 the Chief Clerk in this office was commissioned as a Quartermaster in the R.E., the holder being transferred to the Coast Battalion when it was formed in 1886.

The D.A.G., R.E., was responsible for all military questions affecting the Corps, including the record of service of officers and men and the rosters of foreign service. The records of the officers were kept at the War Office, but the records of the men were kept at Chatham under a Quartermaster R.E. who took his orders direct from the War Office.

The D.A.G. was usually selected from the senior Colonels, but if promoted to Major-General during his tenure of the appointment, retained his position as D.A.G.

The names of the officers who have held the various appointments at the War Office are given in Volume II, Part II, Chapter I and Volume III, Chapter I, up to 1911, but for convenience of reference by readers of this volume, the names of the principal officers responsible for the organization and growth of the Royal Engineers are given below, the rank shown being that held when first taking up the appointment :—

Inspector-General of Fortifications :

Colonel (tempy. Major-General) Sir Andrew Clarke	1882–1886
Lieut.-General Lothian Nicholson	1886–1891
Major-General (tempy. Lieut.-General) Robert Grant	1891–1898
General Sir Richard Harrison	1898–1903
Major-General W. T. Shone	1903–1904

Deputy Inspector-General of Fortifications (Fortifications) :

Colonel H. Schaw	1883–1887
Colonel A. G. Durnford	1887–1889
Colonel R. H. Vetch	1889–1894
Colonel H. F. Turner	1894–1897
Colonel G. Hildebrand	1897–1902
Colonel R. M. Ruck	1902–1904

Deputy Inspector-General of Fortifications (Barracks) :

Colonel R. N. Dawson-Scott	1882–1887
Colonel H. Locock	1887–1891
Colonel W. Salmond	1891–1896
Colonel A. Hill	1896–1899
Colonel C. H. Bagot	1899–1904

Deputy Inspector-General of Fortifications (Barrack Loan) :

Colonel H. Locock	1891–1896
Colonel C. M. Watson	1896–1902
Colonel H. M. Lake	1902–1904

Inspector of Submarine Defences

Major R. Y. Armstrong	1884–1891
Major R. M. Ruck	1891–1896
Major C. Penrose	1896–1898
Major F. Rainsford-Hannay	1898–1901
Major H. N. Dumbleton	1901–1905

Inspector of Iron Structures :

Major T. English	1884–1887
Captain H. P. Willock	1888–1889
Captain C. McG. Bate	1889–1895
Captain J. H. L'E. Johnstone	1895–1899
Captain C. H. H. Nugent	1899–1905

Deputy Adjutant-General R.E. :

Colonel J. Stokes	1881–1886
Colonel R. Grant	1886–1891
Colonel J. M. H. Maitland	1891–1896
Major-General W. Salmond	1896–1902

Assistant Adjutant-General in charge :

Colonel R. C. Maxwell...	1902–1906

The work of the R.E. was linked up with that of the rest of the Army by a series of Committees on which the R.E. were represented.

The Army Board formed in April, 1899, included the Commander-in-Chief and the four senior military officers at Headquarters : Adjutant-General, Quartermaster-General, Inspector-General of Fortifications, Director-General of Ordnance. Among its duties were the recommendation of all officers for promotion to ranks above Major and of all Staff appointments above Lieut.-Colonel, also the general consideration of the Annual Estimates.

There were also, from time to time, other Committees at Headquarters, of which the I.G.F. was an *ex-officio* member.

The Defence Naval and Military Committee was presided over by the Under-Secretary of State for War, with three Naval and three Military members : Adjutant-General, Inspector-General of Fortifications and the Director-General of Ordnance. The Joint Secretaries were the D.I.G.F. (Fortifications) and a Captain R.N., who was permanently attached to the office of the I.G.F.

The Colonial Defence Committee worked in conjunction with the above. The I.G.F. was President, the permanent Under-Secretary

for the Colonies was Vice-President and the members represented the Treasury, the Intelligence branch of the Admiralty and the Intelligence, Mobilization and Artillery branches of the War Office. The Secretary was a Major R.E., who worked in the Fortification branch of the I.G.F's. office.

In 1903 both these Defence Committees were enlarged and put under the Presidency of the Duke of Devonshire, representing the Cabinet.

The Ordnance Committee under the Director of Artillery had a senior officer of the R.E. as a member.

The Army Sanitary Committee, which had been in existence for many years, was reconstructed in June, 1890, under the Presidency of the Q.M.G. The D.I.G.F. (Barracks) was a member and one of the civil staff of the Works Division of the War Office was Secretary. This Committee dealt with barrack design and arrangements.

The Army Hospitals Committee which was similarly composed dealt with hospital questions.

The R.A. and R.E. Works Committee was formed in 1885, under the I.G.F., when the Secretary was an R.E. Officer. In 1892 it was transferred to the Director-General of Ordnance. The D.I.G.F. and the two A.I.G.F. (Fortifications) were *ex-officio* members and the I.S.D. and I.I.S. were Associate members.

The R.E. Committee, first formed in 1782, was reconstituted in 1869. Its work is described in Vol. II, Part II, Chapter V and in Chapter XIII of this volume. Its President in 1886 was the Commandant S.M.E. and there was an R.E. officer as Secretary, who had his office at Chatham.

To complete the organization of R.E. work there was an Inspection Staff at Woolwich, under the Inspector of R.E. stores. Some details of the work of this officer are given in Chapter XIII of this volume.

Alterations in 1904

In 1904, consequent on the recommendations of the Esher Committee, very drastic alterations were made in the above organization (see Chapters II and III of this volume). The appointment of Inspector-General of Fortifications, which had been in existence for just one hundred years, was abolished and the work done by this officer was divided among several branches of the War Office. The work connected with the inspection of Engineers was transferred to a new officer with the title of Inspector of Royal Engineers. The

work connected with the policy of fortification and the preparation of schemes of defence was transferred to the General Staff and divided into two parts, the defence of home stations coming under the Director of Military Training and that of foreign stations under the Director of Military Operations and Intelligence. The Barrack Loans were closed and the work connected with new barracks at home was transferred to a new branch under a civilian Director of Barrack Construction. The responsibility for the organization of the Corps and the use of the Engineers in war was transferred to the Chief of the General Staff.

The status of the head of the personnel branch, who, whether called D.A.G., or A.A.G., had previously worked as a Director immediately under the Adjutant-General, was reduced to the status of an Assistant Director and the A.A.G., R.E., was made the adviser of the General Staff on the organization of R.E. units.

The abolition of the Submarine Mining Defences in 1904 involved some changes in the office of the Inspector of Submarine Defences and this officer was renamed the Inspector of Electric Lights.

The work connected with railway traffic was transferred to a new Directorate of Movements and Quartering under the Q.M.G., which also advised on the organization of the Railway Service. All work connected with the development of mechanical road transport was transferred to the Q.M.G.

The work of the I.G.F. in connexion with the construction and maintenance of Fortifications and the smaller services and maintenance of Barracks was put under a Director of Fortifications and Works, who was himself under a member of the Army Council, called the Master-General of the Ordnance.

Under the D.F.W. the Staff in the War Office was much reduced and was organized in six branches. Three of the branches were under Colonels, with the title of Assistant Directors, and two were under the Inspector of Electric Lights and the Inspector of Iron Structures, who were usually of the rank of Major. The sixth was the Surveyors' branch. The first of the Colonels' branches, known as F.W.1, dealt with Lands; Staff for Engineer services; rifle ranges and minor questions. This officer was President of the R.E. Committee. The second and third branches, F.W.2 and F.W.3, took over the work connected with Fortifications, Ordnance Store buildings and Barrack services, dividing the work between them.

The Inspector of Electric Lights (F.W.4), though relieved of the

work connected with Submarine Mining, remained responsible for Defence Electric Lights; electric lighting of barracks and other buildings; telegraph and telephone services; and patterns, purchase and supply of stores for the above. He was also given charge of the equipment for all R.E. units and was thus responsible for the patterns, purchase and supply of all technical stores, including special R.E. vehicles. When the Headquarters of the R.E. Committee was moved to London, in 1905, the Secretary was moved into the War Office and attached to the branch under the I.E.L.

The I.I.S. (F.W.5) remained responsible for all Engineer machinery, also for the technical side of railway work. The work connected with railway traffic and general railway questions, including the mobilization of the R.E. Railway Companies, was handed over to the Director of Movements and Quartering, while the work connected with the development of mechanical transport was handed over to the Mechanical Transport Committee under the Director of Transport; but the I.I.S. remained an active member of this Committee. The I.I.S. took over from the Barrack branch the responsibility for the supply of Works stores for all stations abroad.

The number of junior R.E. officers under the Assistant Directors was limited to five Staff Captains. There were in addition five officers commissioned as Quartermasters R.E. There was also a senior officer of the Coast Battalion who assisted the I.E.L. and a retired Quartermaster R.E. who was in charge of Land Records. A few additional R.E. officers were employed as required. The staff of Clerks and Draughtsmen numbered seventy-six in all.

In 1908 the new Director of Barrack Construction was placed under the Master-General of the Ordnance, who arranged each year what new services at home were to be allotted to this officer and what were to be carried out by the D.F.W.

At the end of 1908 a new distribution of duties took place. One A.D.F.W. (F.W.2) was made responsible for all Barrack services including designs. One A.D.F.W. (F.W.3) was made responsible for Fortifications and Ordnance Store buildings. The remaining A.D.F.W. (F.W.1) relinquished the detailed control of the R.E. Committee, while remaining President, and took over some general questions from the Barrack branch. A new sub-branch was formed under the I.E.L. (F.W.4(b)) in charge of the Secretary, R.E. Committee, who was made responsible for equipment tables and manuals for Field units as well as the work of the R.E. Committee. The Electrical work and the equipment of Fortresses and Stations

remained under the I.E.L. The remaining branches F.W.5 (I.I.S.) and F.W.6 (Surveyors) were not affected by these changes.

In 1909 the responsiblity for the control of military lands at home was transferred to a Civilian Lands branch working under the Under-Secretary of State. Representatives of this branch were allotted to Commands at Home, but abroad all land questions were still dealt with by the R.E.

In 1913 a change was made in the organization of the D.F.W's. office in order to form a new branch to deal with the provision of rifle ranges for the Territorials. The branch known as F.W.1 was limited to rifle range questions and put under a retired Colonel of Royal Engineers, and the I.E.L. and I.I.S. were combined to form a new branch called F.W.4 under an A.D.F.W. This branch was organized in four subheads, one for Electrical questions, one for Mechanical questions and Works Stores, one for Equipment and Technical stores, and the fourth, under the direct control of the A.D.F.W., dealt with Staff for Engineer Services and the military side of Lands questions. The Chief Engineer, Aldershot, was made *ex-officio* President of the R.E. Committee.

The following officers held senior positions in this organization from its inception in 1904 up to 1914:

Director of Fortifications and Works:

Colonel R. M. Ruck	1904–1908
Brigadier-General F. Rainsford-Hannay	1908–1911
Brigadier-General G. K. Scott-Moncrieff	1911

Assistant Director (F.W.1):

Colonel W. J. Mackenzie	1904–1905
Colonel L. B. Friend	1906–1908
Colonel J. H. Cowan (remained at War Office on retirement in charge of Rifle Ranges)	1908–1912

Assistant Director (F.W.2) for Barracks:

Colonel S. D. Cleeve	1904–1906
Colonel G. K. Scott-Moncrieff	1906–1909
Colonel F. J. Anderson	1909–1912
Colonel E. H. Hemming	1912

Assistant Director (F.W.3) for Fortifications:

Colonel F. Rainsford-Hannay	1904–1905
Colonel C. B. Mayne	1905–1907
Colonel L. C. Jackson	1907–1910
Colonel A. M. Stuart	1910

Inspector of Electric Lights (F.W.4) :

Major H. N. Dumbleton	1904–1905
Major W. Baker Brown	1905–1908
Major E. C. Seaman	1908–1912
Major A. H. Dumaresq	1912

Inspector of Iron Structures (F.W.5) :

Captain C. H. H. Nugent	1904–1905
Major T. H. Cochrane	1905–1909
Major A. G. Stevenson	1909–1913
Captain R. Oakes	1913

In charge of F.W.4 and F.W.5 and part of F.W.1 :

Colonel W. R. Stewart	1913

The names of the Secretaries R.E. Committee are given in Chapter XIII.

While these changes were in progress on the Works side, there were also changes in the duties and status of the personnel side. The appointment of A.A.G., R.E., was continued, but his assistant, graded as D.A.A.G., was abolished, and part of his duties was added to those of the Major of the Coast Battalion employed in this office.

The A.G. was relieved of the detailed work connected with Field equipment which was transferred to the Director of Fortifications and Works (F.W.4 branch).

The names of the officers who held the appointment of A.A.G., R.E., from 1904 to 1914 are as follows :—

Colonel R. C. Maxwell...	1904–1906
Colonel F. C. Heath	1906–1908
Colonel J. L. Irvine	1908–1910
Colonel G. H. Fowke	1910–1913
Colonel R. S. Curtis	1913

In addition to the changes described above, a new appointment was made of an Inspector of Royal Engineers :

Colonel G. Barker	1904–1908
Brigadier-General F. C. Heath (Heath-Caldwell 1913)	1908–1913
Brigadier-General G. H. Fowke	1913

In 1913 a new branch was formed under a Colonel for the technical examination of Engineer bills. The object was to obtain an

independent check on Engineer expenditure. The first officer in charge was Colonel S. Davidson.

The reorganization of the War Office in 1905 was accompanied by changes in the Committees detailed on page 208. The Army Board was abolished and from this date the Royal Engineers ceased to be directly represented on any of the senior Committees in the War Office, except on the Barrack Policy Committee, of which the D.F.W. was a member. The Naval and Military Committee of Defence was enlarged as explained in Chapter II and a permanent Secretary was appointed. The first Secretary was Colonel Sir George Sydenham Clarke and one of the Assistant Secretaries was usually drawn from the R.E., but except in this way the R.E. were no longer directly represented on this Committee. The Colonial Defence Committee was retained, with an R.E. officer as Secretary, but the latter left the War Office and no longer worked under the head of the Engineer branch.

The Army Sanitary Committee and the Army Hospitals Committee were combined to form the Army Medical Advisory Board, under the D.G. Army Medical Service. The A.D.F.W. (Barracks) remained an *ex-officio* member of this Committee.

The R.A. and R.E. Works Committee was abolished.

The R.E. Committee was retained.

The R.E. were represented on the Ordnance Council and the Technical Education Committee by the D.F.W., on the Mechanical Transport Committee by the I.I.S., and on the War Establishment Committee by the I.E.L. as head of F.W.4.

Organization of R.E. in Commands

In 1885 the control of the Engineer work outside the War Office was organized in Districts, each District being in charge of a "Commanding Royal Engineer" of the rank of Colonel or Lieut.-Colonel. Up to 1888 each District C.R.E. was responsible for "Works" direct to the Inspector-General of Fortifications, in the latter's capacity as Director of Works, and the names of all C.R.Es. were shown in the War Office lists as officials of the Director of Works. The total number of Districts in 1885 was thirty-four, of which :

16 were in England and Wales	11 Colonels and 5 Lieut.-Colonels
1 was in Scotland	1 Colonel
5 were in Ireland	3 Colonels and 2 Lieut.-Colonels
12 were abroad	8 Colonels and 4 Lieut.-Colonels

In the larger Districts controlled by Colonels an officer of Major's rank was appointed, with the title of Executive Officer. This officer commanded the R.E. companies in the District and acted as Staff Officer to the C.R.E. Under the C.R.E. each District was divided into Engineer "Divisions," under a R.E. Officer of the rank of Major or Captain. In 1888, consequent on the I.G.F. being put at the head of a branch of the War Office under the C.-in-C., the title of Director of Works was dropped and the C.R.Es. of Districts were made responsible to the local General Officers Commanding, and acted as Staff Officers to the G.O.C. and corresponded in his name with the War Office. At the same time the appointment of Executive Officers was dropped at home stations and the number of Districts was reduced to thirteen at home and twelve abroad, corresponding to the distribution of Military Commands.

Some of the larger Districts controlled by Colonels were sub-divided into Sub-Districts, each of which constituted a Lieut.-Colonel's charge, under the title of "Sub-District C.R.E." These C.R.Es. commanded the R.E. units in their Sub-Districts. Each Colonel had a junior officer, Major or Captain, as Staff Officer, who was in general charge of the office and usually took charge of Lands questions.

In 1893 this organization was extended to the fortresses of Gibraltar and Malta, the appointment of Executive Officer was abolished and two Sub-District C.R.Es. were appointed to each station. One Sub-District C.R.E. was appointed to Hong Kong in 1906.

The officers of the R.E. units were employed primarily in the command and training of their men, but when not training, officers and men were employed on Works, either directly under Division Officers or in the R.E. workshops which were provided at each station. One of the officers was usually detailed for charge of all R.E. machinery at a station and another for the charge of military telegraphs.

The details of this organization, as it existed in 1888, are given in Volume III, Chapter I. This arrangement lasted with changes of detail up to 1902, when, as explained in Chapter I, a grouping of the Commands at home into Army Corps Districts was carried out. One of the objects of this change was to decentralize some of the work done in the War Office on to the Officers Commanding the new Commands. This increased the work falling on the C.R.Es. of these Commands and the C.R.Es. at Aldershot and Salisbury were raised to the rank of Major-General.

In 1905 this organization was again altered and the home Army was divided into eight Commands, each of which formed an Engineer area under an officer called a Chief Engineer, who had the rank of Colonel or Brigadier-General. There were also Chief Engineers for the three large fortress areas at Portsmouth, Plymouth and Chatham (Thames and Medway Defences). Each of such areas was divided into Districts under Lieut.-Colonels. Under the Chief Engineers of Commands the country outside the three large fortresses was divided into Lieut.-Colonels' charges, which were now called Districts. The details of this organization, which lasted till the Great War, are given in Volume III, Chapter I. The total number of senior appointments at home in 1912, including Channel Islands, were :—

Chief Engineers of Commands	8
Chief Engineers of Fortresses	3
Commanding Royal Engineers (Lieut.-Colonel)	29

Abroad there were :—

Chief Engineers (Colonel)	5
Commanding Royal Engineers (Lieut.-Colonels or Majors)	15

Compared with 1888 it will be seen that there had been a considerable reduction of the number of appointments carrying the rank of Colonel (or Brigadier-General) although the size of the Army and the amount of Engineer work had increased, and there had been a very considerable expansion in the technical services controlled by the Royal Engineers, both in connexion with the Field Army and in Fortresses.

Finance

To correctly appreciate the daily work of the Engineers a short description is necessary of the system of financial control of the large sums of public money entrusted to them for the execution of works.

It is well known that the primary control of all public funds rests with the House of Commons, which each year discusses and approves a Budget presented by the Chancellor of the Exchequer, showing the Government's proposals for the expenditure during the financial year (twelve months from 6th April in each year) and the proposed method of providing the money required. Separate estimates are

presented for each branch of the Government Service. The Army Estimates are divided into sub-heads called Votes, each Vote being passed separately. There is a separate Vote for the expenditure on Engineer Works, which is administered by the head of the Engineer branch at the War Office.

In 1884–5 the total of this Vote was £790,886, divided into twenty sub-heads.

The first sub-head was for salaries, included the pay of the Surveyor branch, all military or civilian Foremen of Works, clerks and draughtsmen, messengers, storekeepers, caretakers, engine drivers, etc., the total of all these classes reaching 892. The pay of all these subordinates was regulated by well-defined scales approved by the Finance branches.

The greater part of the Vote was in sub-heads for " Fortification and Ordnance Store Buildings," " Barracks and Rifle Ranges," and " Manufacturing Establishments " ; under each of these heads the total was divided into three parts which had to be kept separate. Part I in each case was for large new services, each of £1,000 and over, Part II was for smaller new services, and Part III for repairs and maintenance.

Services in Part I were all detailed separately in the Estimates, and even if voted could not be started without the approval of the Treasury. Except in the case of normal Part III repair services, there was a regulation that no expenditure could be incurred until the vote had actually been passed in Parliament. As discussion on these Votes often continued into the summer months, new services could seldom be started till the end of the summer and they then had to be completed, billed and paid for before the end of the current financial year. In order to avoid delay, every possible step which did not involve actual expenditure was taken in anticipation of the order. The design was prepared with working drawings, contract documents got ready and a selection made of the contractors who should be invited to tender.

Abroad this procedure involved further difficulty owing to the time required to ship out any stores required in connexion with services.

The preparation of the Estimates in the War Office began about the Christmas preceding the financial year to which they referred, and this had to be preceded by the preparation of draft estimates in each Command, which commenced about May of the year preceding the financial year in which the money was to be voted and spent.

To facilitate all this procedure, the War Office prepared and issued to stations type drawings of each class of building likely to be required, with a schedule showing every detail of fittings. The War Office also arranged a system of standing contracts for the supply of such fittings and the contractors had to maintain a suitable stock, so that supply of any article could be made promptly. There was also a system of inspection of such articles always at work.

This procedure proved invaluable during the Great War when the supply of stores required increased many thousand-fold.

Contracts

To complete this summary of the financial procedure a reference is necessary to the system of contracts.

It is a primary condition, to which the House of Commons and the financial branches of the Government attach great importance, that all services shall be executed as far as possible by the system of competitive contract. This gives all contractors a fair chance and avoids any suspicion of jobbery. On the other hand, if anybody were allowed to tender there is the probability that contractors, to get business, may tender at a cut price or may attempt to secure orders which they cannot finance. The system of open contract is therefore limited by the preparation of a list of selected contractors. Before getting on this list, each contractor must satisfy the Government, by producing references, both as to their financial stability and the technical efficiency. All this procedure is controlled by a civilian official called the Director of Contracts. A similar procedure is adopted at foreign stations ; for each station a list is prepared of contractors submitted by the local C.R.E. and approved by the Director of Contracts.

Another detail of importance is the system of Triennial Contracts, under which much of the repair work and small new services of £400 and under were paid for by a Schedule of Prices prepared at the War Office. Triennial contracts were usually placed for each Engineer Division, though the same contractor could be employed in more than one division. The successful tenderer then became a servant of the Government. He was allotted some area in the barracks where he could establish a works yard, or where he could arrange workshops and place a store of tools and materials.

The above summary covers the ordinary procedure from 1885 to 1914, except that in 1902 the limit for Part II services was raised

to £2,000, and it will be seen how the necessity of complying with the instructions of Parliament restricted the work of the Engineers. To avoid such restrictions in the case of new services which must be carried on over several years a system of Loans was introduced by the Financial authorities. Under this system a programme of Works was prepared, covering a period of some years, and the total amount required was included in a Loans Act which authorized the total expenditure and the raising of the necessary funds from time to time by means of a loan to be paid off over a period of years. The first of these Acts was passed in 1872; a description of subsequent loans and the procedure for spending them is given in Volume III, Chapter V. From the figures there given it will be seen that between 1888 and 1903, a sum of £27½ million had been voted for Barrack services, of which £23 million had been spent when the system of Loans was abandoned in 1906, giving an average of £1½ million a year.

In addition to this expenditure the ordinary annual estimates showed a steady rise, consequent on the gradual increase of the Army. In 1898 the total of the Vote for Works exceeded £1 million and in 1901, during the South African War, the total exceeded £3 million. In 1914, before the Great War, the total was £2,064,308.

In addition to the expenditure on Works, there was a sub-head in the Vote for Stores to cover the cost of special Engineer equipment for Submarine Mining, Ballooning, Railways and similar special stores. Expenditure under this sub-head was controlled by the I.G.F's. office. In 1887 the total under this head was £50,000. In 1914 it had risen to £123,000, after the expenditure on Ballooning and Railways had been transferred to special headings.

The cost of the pay of officers and men of the Royal Engineers was included in the general Vote for Army pay and is not included in the above figures.

CHAPTER XI

FORTIFICATION

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This chapter links up with Vol. II, Part III, Chap. I, also *History of Submarine Mining*, Chaps. I to V.

OF the many duties of the Corps of Royal Engineers, the most distinctive and typical are those which come under the general heading of Fortification. From the earliest ages, combatant man has made use of materials, such as rocks, earth or timber to provide cover from the missiles of an enemy, or to give him an advantage in hand to hand fighting. Until the discovery of explosives the defence seems to have had the advantage over the attack, but as the use of artillery developed, the defence has had to be strengthened until the construction of fortifications became a science. With the growth of navies a new form of this science developed, for ships as they increased in tonnage could carry an armament, which in size

and weight of metal, was far heavier than any artillery which could accompany an army in the field.

There followed from this a definite division in the science of fortification, which fell into two groups, one called Coast Defence which dealt with fortification to oppose ships, and so to prohibit entry into a harbour or port, and one called Land Fortification for the defence of towns, the crossing of a river, or in some cases to limit the movements of an invading enemy. Both groups have certain principles in common, in that the strength of any fortifications must be considered in relation to the strength of the probable enemy and the strength of the armament with which he can attack.

Of these two forms the science of Land Fortification developed first, on account of the constant wars on the Continent, and the fortifications which resulted reached a complication of trace and an elaboration of detail of which we have no examples in our own country. On the other hand, when the development of our Navy and the growth of our Colonies impressed on us the necessity of obtaining the command of the sea, the adequate protection of the harbours and ports on which our Navy and our shipping depended for their continued existence became of increasing importance. This has been especially the case during the period covered by this volume.

Coast Defence

The British system of Coast Defence began in 1785, when defences were constructed for the principal dockyards. These proved effective during the Napoleonic Wars.

A new phase in Coast Defence began about 1859 with the introduction of rifled ordnance. As this increased in size and efficiency the ships of all navies had to be protected with thicker and stronger plating; while the introduction of steam materially affected the conditions of all fighting at sea.

The condition of our Coast Defences was considered by a Royal Commission in 1859. Their recommendations are fully discussed in Volume II, Part III, Chapter I, and resulted in an expenditure of about £7 million on a programme which included defences at Portsmouth, Plymouth, Pembroke, Portland, Dover, the Thames and Medway and Cork. Up to this time the coast forts had been constructed of stone, earth and brick, on the same system as that used for Land Defences, but the threat of the improved ordnance imposed an alteration of design for the new forts. These were constructed

each with a battery of guns placed side by side like the broadside of a ship and protected first by heavy granite structures with armour plated embrasures and later with a continuous iron front. Up to this time the manufacture of steel had not developed and the armour plating of ships and forts consisted of soft iron plates with a hardened face.

While this work was in progress there was continual development in the size and construction of ordnance, up to the 10-in. gun of 18 tons weight and the 12½-in. gun of 38 tons, and the designs of the forts had to be strengthened accordingly. All the guns were muzzle-loaders, though the breech-loader had been tried in an experimental form.

At this period the method of fighting at sea was for ships to get as close as possible to their adversary and it was expected that this would be the case in ships versus forts. The maximum effective range of the guns was put at about 2,000 yds.

Torpedoes and Submarine Mines

While the competition between ships and guns was approaching this point another factor was introduced into the problem by the development of torpedoes. It had long been recognized that one way of attacking fixed defences was for the attackers to endeavour to pass between the forts and either to attack these from the rear or to proceed to the attack of the dockyard or town inside the line of defence. To prevent this some form of obstacle was used to bar the passage and hold the attackers under fire, and this was most usefully employed when the defences were situated at the mouth of an estuary or river, where attacking ships, evading the forts, might reach "inner waters" and manœuvre at leisure. This form of attack became much more serious when the use of steam increased the mobility of fleets.

The obstacles were composed of ropes or hawsers supported by floats, or by small ships lashed together.

With the discovery of the method of firing explosives under water the engineers of all countries began to develop explosive machines, called torpedoes, which, whether mobile or fixed in position, could be used to damage vessels under the water-line, where they were not protected by armour. In 1863 the Inspector-General of Fortifications, Sir John Burgoyne, prepared a memorandum on Floating Obstructions and Submarine Explosive Machines, with the result

that a joint Naval and Military Committee was formed under the Presidency of Lord de Grey to investigate the whole question. This Committee reported in 1868. The introduction of this new weapon necessarily affected the arrangements of the fortifications of our ports and also had the effect of producing a greatly increased interest in questions of defence in both Naval and Military circles; while the interest was further stimulated by the experience of the American Civil War of 1866–9, when many instances occurred of the use of torpedoes and of attacks on Coast Defences.

The explosive machines soon took two distinct forms, one that of a charge contained in a mobile envelope which could be propelled or might be allowed to drift, and the other that of a charge in a container moored in position or attached to the defensive booms. The term Torpedo was eventually adopted for the mobile weapon, while the fixed defensive charge was called a Submarine Mine. Another discovery, which had an important bearing on this question, was the invention of compressed gun-cotton and the method of detonating it. From 1868 the possibilities of this new weapon were actively investigated by mixed Committees of the Royal Navy and of officers of the Royal Artillery and Royal Engineers representing the Army; the practical work connected with torpedoes being carried out by the Royal Navy from the Gunnery School in H.M.S. *Excellent* at Portsmouth, while the experiments with mines were carried out by the Royal Engineers at Chatham and Portsmouth. Details of some of these experiments and the gradual growth of the Service are given in the *History of Submarine Mining*, Chapters I and V.

In 1870 the details had so far crystallized that a joint Naval and Military Committee was assembled, under the Presidency of the I.G.F., Sir Frederick Chapman, to advise on the detailed organization of minefields and the ports at which they were to be used. This Committee laid down two important principles, that all mines should be controllable, that is, should be fired electrically, and that their proper application was in conjunction with, and as auxiliary to, the fire of artillery.

The committee recommended the immediate provision of mine defences at the principal ports at home, and submitted a list of stations abroad and of commercial and other ports at home where mines might be usefully employed. This was the beginning of the Submarine Mining Service of the Royal Engineers, which took a prominent part in our systems of Coast Defence for the next thirty-

five years. The recommendations of this Committee were subsequently modified as the result of experience, but mines were eventually provided, in addition to the home fortresses, at nine ports abroad and twelve commercial ports at home.

Between 1871 and 1887 there was a series of operations dealing with the attack and defence of ports in which the Royal Navy and Royal Artillery co-operated. One result was a demand for smokeless powder, another was for the use of electric lights to cover the minefields at night.

During this period there was a gradual increase in size of the muzzle-loading guns in use both on ships and forts and this naturally led to attempts to develop stronger propellants, which required longer guns for their effective use and made muzzle-loading difficult. As has always been the case, such demands stimulated inventors and in 1880 a breech-loading gun was introduced into the Navy, and, from about 1884 onwards, this type of gun was definitely adopted by both services, though some of the older muzzle-loaders remained in our defences for many years.

Land Fronts

Before proceeding with the story of the development of Coast Defence, a few words may be added on the defence of Land Fronts. Although the conditions of the British Empire did not necessitate the construction of fortified towns or positions on the scale required on the continent, the schemes of defence for our larger ports always included fixed defences on the landward side. It was assumed that an enemy wishing to attack one of these fortresses would be accompanied by a landing force of considerable size which, effecting a landing near the port to be attacked, would endeavour to take the sea defences in flank or rear in co-operation with an attacking fleet. These land defences at first took the form of a continuous enceinte, such as the defences of Chatham and Old Brompton ; then, as the range of guns increased, this enceinte was strengthened by an outer ring of detached forts placed farther out to keep the attack at a distance. In connexion with the scheme of iron-fronted fortification, which commenced in 1859, our larger ports were provided with a land defence of detached forts, which were still under construction in 1885, when this volume opens.

The Fortification branch of the R.E. therefore kept in close touch with all developments of land defence on the continent, especially

with the experience of the siege of Paris in 1870–1. Towards the end of the siege, Colonel Lennox, the Instructor in Fortification at the S.M.E., obtained permission to visit Paris, and on his return sent an official party of R.E. officers composed of Lieutenants Thomas Fraser, H. C. Chermside and W. F. N. Noel, who were in Paris during the fighting with the Communists and were allowed to inspect the fortifications which had been captured by the Germans and to visit Strasbourg and some of the battlefields. Other officers managed to get to Paris on leave, including Lieutenants J. F. Lewis and R. C. Hart. The study of land defence was further stimulated by the Russo-Turkish War of 1877–8, when Captain Thomas Fraser and other R.E. officers were employed on a special mission to advise on the defences of Constantinople. The siege of Plevna, where the Turks held out against heavy Russian attacks, though protected only by earthworks, attracted the attention of all military Engineers, and after the war Plevna was visited by Lieutenant G. Sydenham Clarke, R.E., and other R.E. officers, and Clarke's account of the defences emphasized the efficiency of earth protection.

In 1880 Captain J. F. Lewis, R.E., who was employed in the Fortification branch of the War Office, delivered a series of lectures at the S.M.E. Chatham, which were revised and printed in the *R.E. Professional Papers* of 1882. In these he advocated several new features in connexion with Land Fortresses ; the most important was that any detached forts should be considered as pivots only of the Infantry defence. The guns for the land defence should not be placed in these forts, but should be put in position on the outbreak of war and distributed in the intervals between the forts in field emplacements which could be varied as necessary. In the design of the forts, Lewis advocated concealment by the avoidance of defined outlines, together with a careful consideration of the background and judicious planting of trees.

In connexion with Coast Defence, Lewis pointed out the necessity of following Naval opinion as to the nature and size of any probable attack, and in the arrangement of the gun defences he pointed out the advantages of dispersion and concealment. He also advocated the use of high sites for coast batteries which would make it more difficult for ships to drop shells into the batteries and would enable the defence to bring a plunging fire on the attackers.

Although all the modern developments of Coast Defence were not foreseen, it may be said that these papers of Lewis's were the beginning of a new system of coast fortification, evolved by British

engineers, which was not only much cheaper, but proved so effective that direct attacks on forts by the larger ships were abandoned as a practical method of warfare.

In 1881 Lewis was lent to the Indian Government to prepare schemes for the defence of Indian ports, including Aden, and, after a visit to India, was employed for some years in the War Office in preparing schemes for the new defences, working in close touch with the group of officers who were devising the defences of our home ports and coaling stations. He gave a further series of lectures in 1884 which, with the preceding series, were printed in book form in 1890 under the title of *Fortification for English Engineers*.

In his first lectures Lewis explained that though the large schemes of fortification, which were started in 1859, were approaching completion, there were new developments for the defence of commercial ports at home and coaling stations abroad which would give much work to the Engineers. The defences of the Colonies had been under investigation since 1879 by a Committee of which the Earl of Carnarvon was President and Lieutenant H. Jekyll, R.E., Secretary; this Committee finally reported in July, 1882. The defence of the commercial harbours at home was investigated by a Committee which was assembled under the Presidency of Lord Morley in 1880.

In 1882 there occurred the bombardment of Alexandria by the British Mediterranean fleet, which emphasized much of Lewis's teaching and proved one of those epoch-making events of which we have many examples in history. The defences of Alexandria were of old-fashioned type, mounting 300 guns of various sizes, manned by very poorly trained troops. Our Mediterranean fleet was composed of eight battleships and six gunboats, with well-trained crews, but they had great difficulty in silencing the forts. When these were at last occupied by landing parties, it was found that only about twenty guns had been actually dismounted and very little damage had been done to the earthworks of which the forts were composed.

The bombardment was followed by a military expedition commanded by Major-General Sir Garnet Wolseley, which first occupied Alexandria, then advanced from the Suez Canal to Tel-el-Kebir and Cairo. Among the Engineer officers detailed for this force was Captain G. Sydenham Clarke, then serving with a company at Gibraltar. Captain Clarke was in his thirty-fifth year and had become well known as a writer on military affairs; he had contributed articles to the *R.E. Professional Papers* on the defence of

Plevna 1878, and numerous other questions. On arrival at Alexandria, Clarke was detailed, in company with an officer of the Artillery, to report on the results of the Naval bombardment. This he did in great detail, tracing as far as possible every shot and recording its result. His report, which was at the time highly confidential, was of great interest to both services.

The shooting of the Naval guns and the training of their crews was no doubt up to the best standard of the day, but the results were quite inadequate, even though some of the ships fired at ranges as low as 1,300 yds. The defences, though old in type and incomplete, were very little damaged by the Naval fire and had the defence guns been of better type and better fought, the damage to the ships at the short range would have been severe. The most interesting fact, from the Engineers' point of view, was the failure of the Naval gunfire to damage the earthworks of which the forts were composed. Shells which hit the works failed to penetrate or, if they hit a slope, glanced off to burst in rear; it was evident that with the increase in size and power of guns, the resisting power of the earth parapet had increased enormously, thus confirming the lessons drawn from the defence of Plevna. Clarke's report was received at the War Office with great interest by the Inspector-General of Fortifications, Sir Andrew Clarke, and on the conclusion of the operations in Egypt, Clarke was ordered to London.

On receipt of the reports of the special Committee under Lord Carnarvon, the I.G.F., Sir Andrew Clarke, assembled a small group of officers to prepare projects for the defence of coaling stations. The group, which started work in February, 1883, was composed of Captains H. Jekyll, G. S. Clarke and G. W. Bartram, with Lieutenant M. Nathan, and a little later, Captain D. O'Callaghan, R.A., and Captain T. S. Jackson, R.N., were attached to the branch. In 1883 Jekyll was sent to Singapore to select sites for the new defences and Nathan was sent to Sierra Leone on a similar mission. The work was interrupted in 1884 by the dispatch of Captain G. S. Clarke and M. Nathan on active service in Egypt, but both officers rejoined the War Office on the completion of the operations.

In 1883 Colonel H. Schaw was the Deputy Director of Works in charge of the Fortification branch, with Colonel A. G. Durnford as Assistant Director, and other officers employed were Major J. G. S. Davies, Captains J. F. Lewis, G. Barker, E. S. E. Childers, and J. Dallas. In addition, Colonel T. Inglis, Major T. English and Captain H. B. Willock were employed in the branch of Iron Structures,

and Major R. Y. Armstrong was the Inspector of Submarine Defences, with Captain R. M. Ruck as Assistant Inspector. At the end of 1884 Inglis retired and Durnford was employed on special duty as C.R.E. of Sir Charles Warren's expedition to Bechuanaland.

In the same year, 1884, the appointments of an Artillery officer and of a Naval officer as advisers to the I.G.F. were made permanent.

In May, 1885, relations with Russia were strained over the Penjdeh incident and, on the initiative of the Colonial Office, a small Committee called the Colonial Defence Committee was formed under the Presidency of Sir A. Clarke with Captain H. Jekyll as Secretary. When Jekyll left a few months later for work in Ireland, Captain G. S. Clarke succeeded him as Secretary.

Another creation by Sir A. Clarke, the R.A. and R.E. Works Committee, dates from this period. Captain G. W. Bartram was the first Secretary.

In June, 1886, Sir A. Clarke formed a special section of the Fortification branch to deal with " the design of the defences of coaling stations and commercial harbours," and Colonel A. G. Durnford was appointed an additional Assistant Director of Works to take charge of this branch. The officers under him were Majors G. Hildebrand and G. R. Walker, with Captains J. F. Lewis, H. d'A. Breton and T. J. Tresidder. In the following year, 1887, Colonel A. G. Durnford was appointed Deputy Director, *vice* Schaw, and the special section was amalgamated with the Fortification branch, which was organized under two Assistant Directors, Lieut.-Colonels R. H. Vetch and E. M. Lloyd. Major English remained as Inspector of Iron Structures until 1888, when he was appointed Superintendent, Royal Carriage Factory. He was succeeded by Captain A. B. Willock and on the latter's death, in 1889, Captain C. McG. Bate was appointed I.I.S.

Design of Coast Defences

As a result of the study of the experience of Alexandria, which was confirmed by experiments at Shoeburyness and elsewhere, this group of officers evolved the new system of Coast Defence in which the use of iron plating was abandoned and a type of fort was designed based on the use of earth cover and concrete, combined with the dispersion of the heavy armament and the concealment of guns and observing posts. Added to this rearrangement of the main armament there was an inner defence of a minefield or dirigible torpedo, and a system of quick-firing guns and electric lights.

The essential feature of the type of fort was the glacis parapet, a long earthen slope which extended in front of the gun positions to a substantial iron fence concealed by an earthen bank. The slope of the parapet was such that shells from any naval guns, fired at the short ranges then in use, which up to 1904 did not exceed 4,000 yds., would ricochet upwards. The gun itself was protected by concrete and at first was placed on a mounting which allowed the gun to disappear below the parapet after each shot. The magazines were constructed of concrete covered with earth, with a bursting layer of concrete and sand on top. The guns were usually placed in pairs, each pair constituting a self-contained battery with its separate magazines, artillery stores and casemates to provide shelter for the garrison. Another feature of this form of defence was the concealment of the batteries by the avoidance of sharp angles or slopes, by careful selection of the background and by the use of trees and planting to provide concealment.

The use of concrete as a form of defence against gunfire first came into extensive use at this period. It had been rendered practicable by improvements in the manufacture of cement and its use for massive structures had been illustrated by the work of a civil engineer—Mr. Bernays—in the construction of Chatham Dockyard. The thicknesses required and the arrangement of the bursting layers over the magazines were arrived at by experiments by the Royal Artillery and Royal Engineer Works Committee at Shoeburyness and elsewhere.

In connexion with this form of defence special types of breech-loading guns were designed of 9.2-in. and 6-in. bore, to which were later added a few 10-in. guns. These guns were much improved as designs of mountings and explosive were developed, but the sizes remained the standard up to the Great War. The 9.2-in. gun constituted the main armament, while the 6-in. was used to cover shallower waters and on the flanks of the main defence.

For the land defence of the larger fortresses a new form of fort was designed, of which one example was constructed at Fort Twydall, between Chatham and Rainham. It was designed by Major G. R. Walker and consisted of a pair of Infantry redoubts, each with a glacis parapet sloping to a concealed fence, and containing store rooms and casemates for cover for the garrison. Before the days of observation from the air such a defence would have been very inconspicuous and difficult to demolish by artillery fire.

But by the time this fort was completed, in 1888, the whole theory

of a possible attack on the land defences of our Coast Fortresses was being vigorously attacked by Sydenham Clarke and other Naval and Military writers. They pointed out that a landing force of any size could not be transported across the sea unless our own fleet had been defeated and that even if such a force reached our shores it would be open to attack by superior land forces. Any landing could only take the form of a *raid*, not of a prolonged operation. This new view of the power of the Fleet, which became known as the Blue Water School, was reinforced by the writings of Captain A. T. Mahan of the United States Navy. As a result of this criticism no more permanent defences of land fronts were constructed in any part of the Empire, but in defended ports, where a raid might be attempted, schemes of field defences were prepared, which could be put into effect on the threat of hostilities.

To return to the narrative of events, the year 1885 was a very busy one on account of the Russian war scare, during which mines were actually laid in the Australian ports. The Admiralty were anxious about the defences of the commercial ports at home and detailed Vice-Admiral Vesey Hamilton to visit and report on these ports; Admiral Hamilton was accompanied by Captain R. M. Ruck, R.E.

From this year also begins the large growth of the Submarine Mining Service, described in Chapter I of this volume and in the *History of Submarine Mining*.

In October, 1885, a Committee was assembled to report on Colonial Garrisons under the Presidency of the Hon. G. C. Dawnay, the Surveyor-General of the Ordnance. The members were General Sir A. Herbert, the Quartermaster-General, Major-General Sir Andrew Clarke, I.G.F., Major-General Sir R. Buller, D.A.G., Major-General R. J. Hay, D.A.G., R.A., Mr. R. H. Knox, Accountant General, and Mr. Bramston, Assistant Under Secretary of State for the Colonies, with Colonel Maurice, R.A., as Secretary.

This Committee reported in August, 1886. They considered all the coaling stations and commercial ports abroad and laid down as a standard that the defensive works required should be sufficient to forbid a *coup de main* by an enemy's cruisers. They recommended a minimum garrison for each port after making full allowance for local forces.

They dealt with the ports by groups :—

Eastern : Hong Kong, Singapore and Ceylon (Trincomalee and Colombo).

Southern : Cape Colony, Simons Town, St. Helena, Mauritius.
West Coast : Sierra Leone, a minimum garrison to be reinforced from home on emergency. No permanent garrison for the Gold Coast.
West Indies : Defences to be concentrated at Jamaica and St. Lucia, the garrison of St. Lucia to be quartered at Barbados in peace.
Canada : Halifax, Nova Scotia, and Bermuda to be retained, Esquimalt under consideration.
Mediterranean : Malta and Gibraltar. Aden to be garrisoned by India.
Australia : To be garrisoned by Colonies.

This Committee was followed in 1887 by an important Consultative Committee under the Presidency of the Rt. Hon. E. Stanhope, Secretary of State for War ; the members were Sir W. H. Holdsworth, Bart., M.P., Admiral Sir W. M. Dowell, Lieut.-General Sir E. B. Hamley, Sir F. Bramwell, M.I.C.E., Mr. J. W. Lowther, M.P., Mr. G. L. Ryder representing Treasury, Mr. S. Whitbread, M.P., and Mr. E. R. Wodehouse, M.P. The Secretary was Captain J. J. Leverson, R.E.

This Committee was to report on the fortification and armament of the military and commercial ports and the provision of the necessary funds.

Estimates were submitted by the Committee.

To complete defence of	*Works* £	*Armament* £	*Total* £
Military Ports	1,561,302	1,576,500	3,137,802
Mercantile Ports	735,500	1,022,000	1,757,500
	2,296,802	2,598,500	4,895,302

A separate estimate was submitted for the expenditure on the Submarine Mining Defences, which was not included in the above figures.

	Expenditure to 31st March, 1887 £	*Required to complete* £
Military Ports	415,982	56,957
Mercantile Ports	134,443	181,511
	550,425	238,468

This Committee reviewed again the defences of the whole Empire and confirmed the recommendations of previous Committees as regards the ports to be defended. They included Harwich among the ports of military importance at home, and among mercantile ports included Falmouth, Dublin,* Belfast* and Holyhead.* Abroad they commented that Gibraltar contained no dockyard so that Malta was more important and the garrison of the latter should be increased.

Among recommendations which accounted for the increase in the Estimates were the provision of the new breech-loading guns, also of smaller quick-firing and machine-guns and position-finding stations.

This report was accepted by the Government and arrangements were made for the inclusion in the Estimates for 1888–9 of a loan of £2,800,000 for the improvement of the defences.

In addition to this sum, arrangements were made under which the various Colonies contributed materially to the cost of their own defence, generally on the basis of the Colony paying the cost of the fortifications and barracks for the increased garrisons and the home Government providing the armament. In addition several Colonies had for some years made a grant to their garrisons, known as Colonial Allowance, and also made an annual contribution, known as a Vote-in-Aid, to the Imperial Budget.

All the work on fortifications and barracks was carried out by the Royal Engineers, and additional officers were posted to stations abroad for this duty. The only exception to this was in Australia, where each Colony constructed its own defences. Each was, however, assisted by an officer of the Royal Engineers who was the adviser of the Government and especially of the local Submarine Miners.

Meanwhile, a great deal of work had been done in the War Office in preparing the various schemes and estimates. The Colonial Defence Committee at first dealt with mercantile ports only, but later the four " fortresses " of Malta, Gibraltar, Halifax and Bermuda came under their purview. In 1886, Captain G. Sydenham Clarke and an Artillery officer were sent to report on the defences of Malta and Gibraltar and as a result of their discussions many obsolete guns were removed from the defences. At Malta, out of 831 guns, 581 were recommended for removal, but 152 guns of modern type were added.

* No defences were provided at these three ports.

In the same year Major G. Barker, R.E., was detailed to accompany Colonel Ellis, R.A., in a tour of the coaling stations abroad and their report formed the basis of all later schemes of defence.

One important improvement which dates from this period was the formation in each defended port of a Local Defence Committee to include representatives of the Government, the officer commanding troops, and the senior Naval officer with some of their staff. This Committee was required to review every form of action which might be necessary on the outbreak of war, such as regulation of traffic, censorship, action of police, mobilization of local forces, and distribution of garrison to their war stations. The action to be taken by each department was embodied in a defence scheme, which was sent home for review and gradually developed into a very convenient and practical form which was adopted for all defended ports. An important feature was the provision in each scheme of a "precautionary" period of work, which could be put in hand when hostilities seemed imminent, but before full mobilization had been ordered.

These schemes included the steps to be taken for the defence of Land Fronts. Preliminary work in peace usually included a complete survey of the position of the proposed defences, the construction or improvement of roads and the provision of water. Plans of the works to be constructed were worked out in detail, the tools and materials required were stored ready and details prepared of the transport required to get these to the site of the work.

Defence Against Torpedo Boat Attack

While the work of constructing the new defences was proceeding, a new element was being introduced into naval warfare in the development of torpedoes. As these took practical shape, it was evident that their use could be extended by discharging them from a ship and, from about 1877, a special torpedo boat was designed for this purpose. At first this boat was of small size and capable of being carried on the deck of a battleship, by which it was transported where required. A practical design for the torpedo had been developed but its steering was erratic and the effective range was only 400 yds. A little later a larger boat called a first-class torpedo boat with sea-going capacities was designed. This was supplied with small guns for its own protection.

In the combined naval and military operations referred to above,

the attacking vessels included a number of torpedo boats which from their small size were difficult to see at night. This caused a demand for defence boats to protect the minefields and for many years the question of these armed guard boats was the subject of acute controversy. It was at first decided they were to be in the charge of the Royal Engineers, but finally they were omitted from the schemes and the Navy became responsible for all defences afloat.

The Naval method of attacking a minefield was by laying rows of countermines with the object of blasting a way through the defence and so forming a passage up which the attacking vessels could move to engage the forts. But after the operations at Milford Haven in 1886, it was gradually realized that, given a reasonable prepared and efficient defence, the risk to any fleet attacking forts was so great that such an operation could only be carried out by a fleet in absolute command of the sea. This view was one of the principles laid down by the Blue Water School and was no doubt reinforced by the increased expense and complexity of the modern battleship. But meanwhile the growth of the torpedo boat had continued. Such enlarged torpedo boats would obviously be a menace to defended ports on account of their greater speed and seaworthiness.

Experiments were carried out at Langston Harbour in 1887, and at the Needles entrance to the Solent in 1889 to 1892, with a series of attacks made by torpedo boats and it became evident that to ensure an adequate defence the number of small quick-firing guns and electric lights must be largely increased.

This use of electric lights produced a new technique. At first these were arranged as a series of concentrated beams, each light or pair of lights being allotted to a battery or group of batteries, the Battery Commander being responsible for the instructions to the lights. But it was soon found that the crossing of several moving lights caused confusion, the tendency being to concentrate fire on the leading boats of an attack, while the boats in rear were often able to slip through without notice. An arrangement was then tried using dispersing lenses to open each beam into a fan of light so that by placing several fans side by side an illuminated area was formed through which all attackers must pass. It was found best to place in front of each area two or more concentrated beams of which one was kept on a fixed bearing across the channel as a sentry beam and the other was used as a searchlight in front of the whole defence.

This arrangement gradually crystallized into a form of defence which was adopted for all defended ports.

It will be noted that these inner defences were supplemental to the main gun defence, which had its greatest use in daylight. On the other hand a defence by light quick-firing guns only would have been open to attack by day or night by any armoured vessel, so that, though the tendency of Naval thought was against the employment of ships to attack forts, this did not imply that heavy guns could be dispensed with, but only that the defences provided should be of the minimum strength to deter attack.

In 1892 Major G. Sydenham Clarke was ordered abroad to Malta. Although he is rightly regarded as one of the pioneers of the British School of Fortification, he had not always been in accord with the procedure adopted by the War Office, especially as regards the use of mines and electric lights. As Secretary of a Committee working largely under the Colonial Office, he was in a quasi-independent position and was employed in various other duties. Thus in 1888–90 he was sent on special missions to New York, where he met Admiral Mahan and the inventor of the Zalinski gun. In 1890 he visited and reported adversely on the new Belgium land fortifications of Liège, Namur and Antwerp. He was also a prolific writer and acted for some years as a special correspondent of *The Times* and in some of his articles criticized Military policy and practice. He gave a series of lectures at the Royal Artillery Institution, setting forth his views, and in 1890 published these under the title of *Fortification, Past, Present and Future*. In one of his lectures he attacked the system of submarine mines. This is discussed in the *History of Submarine Mining*, Chapter V. In the preface to his book, Clarke admits that his criticism was more destructive than constructive, but this was inevitable. The book was one of the earliest attempts to put before the public the position of a Supreme Navy in relation to defences. The general claim later crystallized into the tenets of the Blue Water School with which the leading British engineers were in sympathy. But at the time, controversy was only beginning and in the preface to the second edition of the work, published in 1907, when the writer was Secretary of the Imperial Defence Committee, Clarke writes :—

"With years and much thought, there comes a softening of the judgment, and some sentences—the echoes of strenuous controversies long dead—now seem too harshly phrased."

While some of Clarke's contentions proved untenable and were

not borne out by the experiences of the Great War, many others, such as the inviolability of these islands from invasion, were fully justified.

Meanwhile the whole controversy was stimulating interest in the Navy, there was an Imperial Conference in 1887, and in 1890 a Naval Defence Act was passed approving a large expansion of the Fleets.

Defence Committees

It will be seen there had always been various Naval and Military Committees to discuss defence questions, but in 1892 a permanent Committee was appointed, called the Joint Naval and Military Defence Committee, under the Chairmanship of the Under Secretary of State for War, with three Military and three Naval members. The Military members were the Adjutant-General, Inspector-General of Fortifications and Director of Artillery. The joint Secretaries were the D.I.G.F. (Fortifications), who was then Colonel R. H. Vetch, and the Naval Adviser to the War Office. As the I.G.F. was also President of the Colonial Defence Committee, he took a leading part in all defence questions and the then holder of the appointment, Lieut.-General Sir Robert Grant, was keenly interested.

The Joint Naval and Military Committee published its first report in 1893, in which it reviewed the principles on which our defences were being designed. Some details are given in the *History of Submarine Mining*, Chapter V. The main principle in this report was that all questions of defence must be considered from the Naval point of view, and the Admiralty must be consulted as to the arrangement of minefields and defences generally. It also laid down that the Admiralty were responsible for any mobile defence of torpedo boats, which might be allotted to ports, and for the control of traffic.

With the formation of this Committee, the first stage in the organization of our Coast Defences may be considered as reached and, up to 1904, work proceeded in all branches in the improvement of the design of guns and mountings, the arrangement of minefields and the installation of additional quick-firing guns and electric lights to meet the increasing menace from the improved torpedo craft, now growing into the Destroyer type. In this connexion the Admiralty abandoned their principle of non-interference and provided booms at the principal Naval ports. These were of steel wire hawsers supported by old gunboats and their use necessitated additional defences to prevent the booms being attacked and smashed.

Of the Royal Engineer officers connected with Fortification work up to this date, mention should be made of H. P. Knocker, T. Fraser, H. W. Smith-Rewse, Louis C. Jackson and W. J. Mackenzie. On the retirement of Captain Bartram in 1887, Captain H. Jekyll succeeded him as Secretary, R.A. and R.E. Works Committee, and was followed in 1892 by Captain W. Peacocke. Captain Peacocke also succeeded Major Clarke as Secretary, Colonial Defence Committee, in 1892, and he was followed in 1895 by Major M. Nathan, and in 1899 by Captain J. E. Clauson.

To these names must be added the heads of the Submarine Mining Service at the War Office, of whom R. M. Ruck, C. Penrose and F. Rainsford-Hannay were prominent.

Of work outside the War Office, mention may be made of Colonel J. F. Lewis and Colonel E. R. Kenyon at Gibraltar, of Colonel Elliot Wood at Malta and of Colonel L. F. Brown and Major R. P. Littledale in the defence of the new territory added to Hong Kong in 1889. But there were many others.

In addition to the original defence loan referred to above, additional amounts were added: in 1897—£1,120,000; in 1899—£1,000,000; in 1901—£750,000; and in 1903—£594,000.

Brennan Torpedo

Among the changes deserving mention was the introduction of the Brennan torpedo, which was finally purchased in 1887 following a spectacular test in the Needles channel, in which Mr. Brennan, after launching his torpedo, passed astern of the target boat and then turned and attacked the target from the farther side. In the case of this weapon, the Royal Engineers were responsible not only for its working but for its manufacture. It was finally installed at eight ports. The first superintendent of the Brennan Factory at Gillingham was Mr. Brennan himself; he was followed in 1896 by Captain W. McAdam, R.E., who was succeeded later by Captain E. C. Seaman, R.E., and Captain C. F. Rundall, R.E.

Electric-Light Plant

The development of electric lights also called for new plant, and in 1894 the internal combusion oil engine was introduced into the service, which was followed by the design of a standard type of generator and an automatic lamp. The design adopted for the

latter was proposed by Mr. R. E. B. Crompton, the head of the firm of Crompton & Co., and later Colonel of the London Corps of Electrical Engineers. Another improvement was the introduction of the parabola ellipse reflectors which produced a dispersed light of any required angle up to 45 deg. in the horizontal plane, but with only a dispersion of about 3 deg. in the vertical plane. The form given to these components endured till after the Great War and the engines and plant purchased at this time stood the test of continuous work for the four years of the war. Among the officers responsible for these improvements were Major G. A. Carr and Captains A. M. Stuart and W. Baker Brown.

Another duty of the Royal Engineers was the provision of electrical communications, which took two forms: (1) Fighting lines for Artillery and position finding stations and (2) Intelligence lines to enable the Commander to communicate with all parts of a defence.

Meanwhile there had been continual improvement in the design of guns and mounting. Lieut.-Colonel Sir George Sydenham Clarke (who was promoted K.C.M.G. in 1893) was appointed in 1894 the Superintendent of the Royal Carriage Factory. During the next seven years Clarke was able to improve the mountings for the heavy guns and to provide quick-firing mountings for smaller guns up to 6-in. A practical form of automatic sight was also produced. In this form, the sight is connected to the gearing of the gun in such a way that when the sight is directed on an objective, the gun is brought automatically on the correct bearing and elevation. As the automatic sight works on a vertical base, the guns must be mounted in position at least 100 ft. above the water. This involved the reconstruction and extension of the quick-firing defences at all ports.

During the South African War there was a continual strain to supply the officers and men for the Field forces, and the Submarine Mining Militia were mobilized at home ports, thus releasing regular officers and men for Field service. The only change of note in this period was the occupation of the port of Wei-hai-wei at the entrance of the Yellow Sea, as a set-off to the Russian occupation of Port Arthur, and to the German occupation of Tsing-tau. Wei-hai-wei was at first fortified on the scale for a small coaling station, but the defences were stopped in 1902, though Wei-hai-wei continued to be used till 1914 as the summer base for our Eastern fleet.

The Russo-Japanese War of 1904–5 gave some practical demon-

stration of the actions of hostile navies, and seemed to show that our defences were following the right lines. At Port Arthur, the Japanese made no attempt to force the sea defence, but captured the fortress by an attack from the land. Although the Russian fleet was at sea the Japanese trusted to the efficiency of their own defences to prevent the Russians doing any damage.

Reorganization in 1904

The changes introduced in Army organization following the report of the Esher Committee are dealt with in Chapter II of this volume. Among these changes the organization for the control of Fortification, which had grown up during the preceding twenty years under the fostering care of the Royal Engineers, was abolished, and although a General Staff for the Army as a whole began to be formed, there was no branch of this Staff specially allotted to the consideration of Defence questions, the duty of considering proposals for Home Defence being placed under one Director, while the defence of fortresses and coaling stations abroad were under another Director.

The Joint Naval and Military Committee and the Colonial Defence Committee had been reformed by Mr. Balfour in 1903 and placed under the Presidency of a Cabinet Minister, the Duke of Devonshire. But in 1904, on the advice of the Esher Committee, these were amalgamated to form the Imperial Defence Committee and the Prime Minister himself became *ex-officio* President.

The first Secretary of this Committee was Colonel Sir G. Sydenham Clarke who had been a member of the Esher Committee. The new Committee did not, however, really replace the old one. The Joint Naval and Military Committee had been a working body on which the actual heads of the principal Naval and Military departments could meet and discuss defence problems sometimes in considerable detail. The Secretaries were members of the War Office and all War Office papers were readily accessible.

The new Imperial Defence Committee, as it was called later, was a Committee to bring the Prime Minister and leading politicians of home and Colonial Governments into touch with the heads of the Admiralty and War Office, and it was primarily concerned with policy. As a Committee it was not a suitable body to discuss details and this was partly recognized later by the retention of the Colonial Defence Committee with a Secretary drawn from the Royal Engineers; this Committee acted as a sub-Committee of the main

Committee to deal with details which concerned the Colonies. It seems unfortunate that a modified Naval and Military Defence Committee was not retained to deal with details at home ports.

The Secretaries of the Colonial Defence Committee from the change of status were :—

Major J. E. Clauson, R.E., C.M.G.	1900 to 1906
Captain J. R. Chancellor, R.E., D.S.O.	1907 to 1911

The title of the Committee was changed to the Overseas Defence Committee in December, 1911, when Captain S. H. Wilson, R.E., was appointed Secretary.

Transfer of Mine Defences to Admiralty

The new organization had almost at once to advise on the question of the charge of the Submarine Defences which the Admiralty wanted to take over, mainly with the object, as it turned out, of using the Submarine Mining stores depots and barracks as centres for submarine boats. These had reached a practical form but were of small size, not seaworthy, and not yet fitted for offensive operations at sea. Some Naval officers, even then, saw the possibilities of this new weapon as a menace to our seagoing shipping, but Admiral Sir John Fisher, who had become First Lord of the Admiralty, took the view that the proper use of submarines was to station a number at each defended port, when the threat of their existence would enable all other defences to be withdrawn. This was just the sort of question which would have been discussed in detail by the old Joint Committee, but the form in which it was submitted to the Government was a proposal that the Admiralty should take over the responsibility for the mine defences and in this form it was approved by Mr. Balfour, after consulting Sir G. Sydenham Clarke, and was accepted by the Army Council. It was not until the transfer had taken place that the Admiralty announced that they proposed to withdraw all minefields.

The experience of the Great War hardly enables the present generation to say whether this change was justified or not. The preponderance of our Fleet over that of the Germans was so great that the latter never at any time made any attempt to force any of our defended ports or to land troops on any part of the Empire. But in spite of this the Navy made an extensive use of mines as an adjunct to our Coast Defences.

Owen Committee

As soon as it was realized that all mines were to be removed it was evident that this might seriously affect the arrangement of our defences. In 1905 a special Committee was formed to investigate and report on all defences abroad. The President was Major-General J. F. Owen, R.A., and the members were Brigadier-General R. F. Johnson, R.A., Captain G. A. Ballard, R.N., Lieut.-Colonel H. N. Dumbleton, R.E., who acted as Secretary, Major W. T. Furse, R.A., General Staff, Major M. P. A. Hankey, Royal Marine Artillery, and Lieutenant F. E. Seymour, R.N. This Committee visited most of the defended ports abroad. They worked on the basis of a memorandum from the Admiralty of which a few paragraphs may be noted: "Maritime supremacy rests with Great Britain. Fixed defences should be capable of inflicting sufficient damage to put an enemy at a disadvantage in subsequent naval fighting. At remote ports, the damage to be sufficient to deter attack or to compel an enemy to return to his base for repairs. Attacks by torpedo boats on commercial ports are too unlikely to justify special expenditure. Attacks by blockers or boom smashers may be attempted. Defence of inner waters is not required."

It does not appear that this Admiralty memorandum was ever submitted to the Imperial Defence Committee or to the Army Council.

The Committee rendered a first report in July, 1906. They began by classifying ports according to their importance as to whether the attack would be conducted by a fleet containing battleships or by a group of armoured cruisers or by unarmoured cruisers.

Against attacks by armoured ships, they considered that the 9.2-in. guns were sufficiently powerful, but that any engagement would take place at a range of at least 10,000 yds. so that to keep an enemy at a safe distance the gun defences should be pushed out well in front of the harbour. Where 9.2-in. guns were provided, 6-in. guns were not required to take part in the daylight battle. For small ports, only likely to be attacked by unarmoured cruisers, 6-in. guns would be sufficient. Where attacks might be made by blockers or boom smashers or in certain places where the enemy might run past the defences at night, 6-in. quick-firing guns would be required, supported by concentrated electric lights. The Brennan torpedo installations were no longer required. All electric lights to be fighting lights. The Committee made detailed recommendation

for the removal of the older types of guns which had been retained to fire over inner waters.

The Committee's recommendations involved very considerable changes. They claimed that, taking all defences together, they had reduced the guns from 321 of 14 different natures to 144 guns of only 6 different natures, the number of works from 127 to 68, and the number of electric lights from 85 to 74. This report was accepted by the Government and by the Army Council.

Defence of Dock Gates

In 1912, after these changes had been in progress, it began to be recognized that the abolition of the anti-torpedo-boat defence had left all our vulnerable establishments, and in many cases the defence works themselves, exposed to raiding attacks at night by small parties which might be launched from merchant vessels or even formed among the civil population. This question was investigated by a small Committee under the Presidency of Brigadier-General H. H. Wilson (later Field-Marshal), the Director of Military Operations. The members were Colonel A. M. Stuart, Assistant D.F.W., and Colonel C. G. Fuller, General Staff. This Committee reported that there were many places liable to this form of attack. and discussed the nature of works required under the two heads of erection during peace or during the precautionary stage. In some cases the latter would suffice, but in others, such as the defence of dock gates, it was considered advisable to install fixed defences, comprising 4.7-in. and 12-pr. quick-firing guns, and electric lights, on much the same principle as the old anti-torpedo boat defences, abandoned in 1906. This report was approved and the work was still in hand at many ports in August, 1914.

Without anticipating the history of our Coast Fortifications during the Great War, it may be simply stated that they did everything required of them. All the arrangements for putting the defence schemes in force worked smoothly and quickly and the defences, including guns, lights and communications, proved fully capable of meeting the strain of four years of war.

Field Fortification

To complete the story of British Fortification a few words may be added on the use of fortification by an army in the field. As stated above, the Empire had no fortified land frontiers, other than local defences, but from the days of the Peninsular War the British

Engineers had been keenly interested in the construction of siege works and instruction in this branch of the military art had been included in the courses for officers and men at the School of Military Engineering. The experience of the Crimea increased the interest in siege warfare, and the American War 1866–9 gave practical examples of the use of extemporized defences in attack and defence. The Franco-German War of 1870–1 was closely watched by the British Engineers and, as mentioned above, parties of R.E. officers visited Paris towards the end of the fighting. These visits impressed all ranks with the importance of field entrenching, not only in siege operations, but in offensive and defensive field fighting. On the initiative of Colonel Lennox, steps were taken to extend the knowledge of Field engineering to the whole of the Infantry and Cavalry, and in October, 1870, a special class of N.C.Os. and men of the Foot Guards was assembled at Chatham. This was followed by special classes of Infantry and Cavalry officers, which were formed twice a year at the S.M.E. Later a knowledge of field engineering was included in the qualifications for promotion for all officers.

Stimulated by these experiences, the whole of the courses of instruction at the S.M.E. were revised and extended. Among other details, all the operations connected with military mining were standardized during a series of experiments carried out by Lieutenant Thomas Fraser, the standard sizes of mines and gear then introduced remaining in use till 1914.

The study of the use of earth cover had always formed an important part of the instruction given to officers and men of the R.E., both in the form of siege works and in the lighter form of entrenchment to provide cover in the field, and from this date experiments in various forms of field redoubts and trenches were carried out almost continuously at the experimental Artillery station at Lydd and also at Shoeburyness. In 1908, as the result of experiments carried out by the R.E. Committee, a portable form of entrenching tool was adopted and issued to the whole Army.

The use of obstacles, especially wire entanglements, had been emphasized by the experience of the South African War, a pattern of wire had been adopted and numerous trials made with wire cutters for use in offensive operations. Experiments had also been made in the destruction of entanglements by such means as the Bangalore torpedo or by gunfire. Some Engineers had envisaged the possible development of trench warfare, with its accompaniment of hand grenades and trench mortars. Up to 1904, it had been one of the

duties of the I.G.F. to watch the development of all engineering science, but under the reorganization of 1904 this duty devolved on the General Staff, which was firmly of the opinion that the war, if it came, would be a war of movement and could not last more than a few months. So no provision was made for trench warfare, but the fact that the possibility of such warfare was known to all R.E. officers undoubtedly helped when the demand arose.

Attack from the Air

Although the possibilities of attack from the air had begun to be realized with the formation of the Royal Flying Corps, no practical steps in developing a defence against this form of attack had been taken up to August, 1914.

In April, 1914, Colonel Louis C. Jackson, who had just been placed on the retired list, gave a lecture at the Royal United Service Institution in London at which he pointed out that, though aircraft was still in the experimental stage, the Germans were pushing on their experiments with the Zeppelin and the aeroplane, and it could only be a matter of two or three years before the aeroplane became a practical weapon capable of dropping bombs and even, possibly, of carrying machine guns. Even at the date of his lecture, the effective range of the Zeppelin was 1,000 miles and it could remain in the air for three days. He considered that an attacking vessel would have to hover over its objective to obtain accurate hitting and would have to descend to 600 ft. He suggested that a town like London with its many military and civil establishments would not be protected by any convention covering the attack of unfortified towns, and would be liable to bombardment from the air.

Other R.E. officers had also begun to consider the best form of defence against air attack, and the R.A. had begun to consider the design of a gun mounting which would allow a gun to fire vertically upwards. The R.E. electric-light plant which had been developed by the Field Searchlight Company (disbanded in 1912) was well adapted for use in any position and included a form of portable engine fitted for horse transport. The London Electrical Engineers and the Tyne Division Electrical Engineers had each designed a form of equipment using mechanical transport.

But the general question of defence against aircraft was still in embryo when war broke out in August, 1914.

CHAPTER XII

WORKS

Barracks—Royal Commission 1857—Army Sanitary Committee formed—Hut-camps—Barrack Loan of 1890—Criticism of construction of barracks by a Military Corps—Reply to critics—Barrack Construction Department 1905—Abolition 1917—Co-operation between Military and Civil Engineers—Hospitals—Early design by Douglas Galton—Army Ordnance Buildings—Superintendent of Building Works—Army Service Corps Buildings—Churches and other buildings—Military lands—Purchase of Salisbury Plain—Lands transferred to a civilian Controller—Rifle and Artillery Ranges—Ordnance Survey—Electrical work—Submarine Mining—Defence Electric Lights—Telegraphs and Telephones in war—Organization of R.E. Telegraph Division under G.P.O.—Transfer to Ireland 1909—Electrical communications in Fortresses—Telephones—Telegraph work in various campaigns—Protection against lightning—Electric light in barracks—Control of Electrical services by I.S.D.—Major A. M. Stuart in India—Mechanical branch of R.E.—Inspector of Iron Structures—Special training for selected officers—Mechanical work in the S.M. Service—Mechanized transport—First Steam Sapper—Steam Sapper in Ashanti—Use of steam transport by Balloon School—Lieut.-Colonel Templer—Steam transport on manœuvres 1893—Use in South Africa—45th Company formed—Mobile electric plants—Mechanical Transport Committee—Training of A.S.C.—Road Transport handed over to A.S.C.—Railway work Egypt 1882—8th and 10th Companies—Officer in charge of traffic Royal Arsenal—Girouard appointed—Railways in India—Railway work under Girouard in Egypt—South Africa 1899–1904—Control of railway work transferred to Q.M.G.—Army Railway Council—Railway Executive Committee—Captain H. O. Mance—Longmoor Camp—Railway to Bordon—Courses for railway work—Disbandment of 53rd Company and Cheshire Railway Battalion.

This chapter links up with Vol. II, Chap. VII, Vol. III, Chap. V, and *History of Submarine Mining*, Chap. XIV.

THE term "Works" or "Engineer Works" has been used for a number of years to describe the duties of Engineers connected with building construction and the use of materials. The works connected with Fortifications have been described in the last

chapter. Of the remaining Military works the largest section is that which deals with the construction and maintenance of barracks.

Barracks

A short history of the provision of barracks has been given in Volume III, Chapter V, from which it will be seen that, prior to the commencement of the eighteenth century, the only permanent barrack accommodation in existence was in the fortified posts in the United Kingdom.

In 1704 permanent barracks were constructed in Ireland for the troops in occupation of that country. The first of these was the Royal Barracks in Dublin, begun in 1704, and this was followed by a series of barracks in all parts of that country, many of which still exist. Barracks in Great Britain, up to 1792, only accommodated about 20,000 men, but in that year, to provide accommodation for the increase of the Army necessitated by the Napoleonic Wars, a new policy was inaugurated by Mr. William Pitt, the Prime Minister. Under this scheme the duty of providing barracks was taken away from the Board of Ordnance and entrusted to a new department which was put under the control of an officer of the Cavalry, who held the appointment of Deputy Adjutant-General. This new organization carried out the construction of 203 barracks accommodating 17,000 cavalry and 146,000 infantry. While barracks were thus provided, the procedure adopted proved very unsatisfactory, as all the financial control, which had been devised by the Board of Ordnance, was put on one side, and no proper accounts were rendered to Parliament. By a change in the Royal Warrant, which was made soon after the initiation of the new Department, the barracks required for the Artillery and Engineers were put back under the control of the Board of Ordnance and were constructed by the Royal Engineers. Among the barracks built by the Royal Engineers at this period were Brompton Barracks, Chatham, which were begun in 1804, for use by Artillery units.

In 1822 the Duke of Wellington, then Master-General of the Ordnance, arranged for the whole responsibility for the provision of barracks in Great Britain and Ireland to be placed on his department and from that date, till 1904, the duty of providing and maintaining all barracks at home and abroad rested with the Royal Engineers.

With the appointment of Sir John Burgoyne as Inspector-General of Fortifications, in 1845, a new impetus was given to barrack build-

ing, though the amount of new construction was not great owing to lack of funds. There were, however, improved methods of control of finance, and various improvements were introduced in design, including separate accommodation for married men.

In October, 1857, an important Royal Commission was appointed, of which Captain Douglas Galton, R.E., was an active member. This Commission found that many barracks were much overcrowded (for which the Royal Engineers were in no way responsible) and made recommendations for the improvement of ventilation, drainage and other details. From the report of this Committee, there came the formation of the Army Sanitary Committee which did most excellent work. It was reformed in 1904, under the title of the Army Medical Advisory Board. The Colonel at the head of the branch of the I.G.F's. office, which controlled the expenditure on barracks, was an active member of the Sanitary Committee and the Secretary was one of the Civil clerks in the I.G.F's. office.

Meanwhile, during the progress of the Crimean War, training camps were erected at Aldershot, Colchester, Shorncliffe and the Curragh. These were composed of wooden huts, which were used for reasons of economy and for ease and rapidity of construction. After the war it was decided to maintain these stations as training centres, so the hut accommodation was improved by the provision of sanitation and water supply and the construction of roads. It was expected that the huts would last for twenty years, but the small amounts provided by Parliament made their replacement impossible and it was not till 1888, after a very strong case had been made for improvement by General Lothian Nicholson, the I.G.F., that a beginning was made with new construction. This was accelerated by the Barracks Act of 1890 and the formation of a special branch of the I.G.F's. office to administer the Act. Under this procedure Aldershot was entirely rebuilt, but in other places some huts remained and at the Curragh camp fifty of the original wooden buildings were still in use in 1919, after a life of over sixty years !

This procedure of using wooden huts to provide temporary accommodation was repeated during subsequent campaigns, some wooden buildings being in existence at stations dating from the Egyptian campaign of 1882, while a much larger number of huts came into use after the conclusion of the South African War in 1902.

The story of the work under the Barrack Loan Acts, given in

Volume III, need not be repeated here, but under these Acts improvements were effected at every station at home and abroad. The designs of barracks themselves were subject to continual improvement and accessories, such as Recreation Establishments, were added. The methods of heating and lighting and sanitary services more than kept up with the standards adopted for the country as a whole.

It must however always be remembered that in spite of the various Loans Acts, a very tight hold was maintained over expenditure by the Treasury and the Finance branch of the War Office. Every improvement, however desirable, was criticized from the point of view of expense before it could be included in the Schedule of Barrack Accommodation approved for the different units and services of the Army.

The system under which the construction of barracks was vested in a Military Corps has been much criticized and was the subject of numerous Committees and inquiries. It was objected on the one hand that the Corps had to give so much of its time to learning its military duties that it could not master the details of building work, and that this work should be given to trained architects, who had made a lifelong study of building in all its branches. On the other hand it was urged that the work of the Royal Engineers in war required considerable knowledge of building and the use of materials, and also of such branches of engineering as sanitation, water supply, drainage, and the construction of roads and bridges, and that practice in such work in peace-time could be given very effectively by the construction and maintenance of barracks. Also that it would be difficult and expensive to provide a body of civilian architects to carry out the barrack work in India and other places abroad. By employing the military engineers on barrack work, they not only obtained good practical training, but recovered nearly the whole cost of this arm of the service.

On the grounds of efficiency also, the Royal Engineers can fairly claim that their work has been justified by results and that the barracks constructed under their supervision compare in efficiency, economy of construction and speed of execution with any similar buildings in this or any other country; while the methods adopted for the placing of contracts, the purchase of stores and the general finance of the various schemes, have received the approval of our own Treasury officials and have run the gauntlet of many Parliamentary inquiries.

In 1903 a proposal to place the construction of barracks under a special department was considered by a small Committee, of which Lord Esher was the Chairman and dominant member. In 1904 this proposal was incorporated in the changes in Army organization based on the recommendations of the Committee of Three under Lord Esher's Chairmanship.

Effect was given to this proposal in the same year by Mr. Arnold-Foster, but in a modified form. Instead of being a joint Military and Civil organization, the new department, under the Director of Barrack Construction, was on an entirely civilian basis. An attempt was also made to keep the cost of the supervising staff as low as possible. The principal group of barracks erected by this new department was at Tidworth, but these barracks followed the schedule prepared by the Royal Engineers. Probably the best group of buildings erected by the Director of Barrack Construction was the hospital and headquarters of the R.A.M.C. at Millbank; and the department carried out other hospital services. They also erected the first barracks and officers' messes for the Royal Flying Corps. The question is discussed in Chapters III and IV. The experiment failed largely because a purely civilian department cannot keep in touch with military requirements; also it proved more costly and much slower in working. It was abolished in 1917.

Although the outside criticism referred to above usually took the form of a comparison of Military and Civil control, in actual practice there was never any real disagreement or competition between the Military and Civil Engineer organizations. The Military Engineers followed with keen interest every development of engineering science and in many cases contributed to the growth of the various engineering societies. The Civil Engineers were always ready with advice on technical questions and many individuals helped by lectures on technical subjects, and in the training of selected Royal Engineer officers, while eminent engineers and manufacturers helped in the development of the technical plant. Some details of this are given in Chapter XIV.

Closely allied with the growth of barracks was the question of hospitals. In these the Military Engineers were pioneers. The experience of the Crimean War had shown the necessity for better hospital accommodation in England, and Netley Hospital, on Southampton Water, was commenced in 1856.

The Herbert Hospital at Woolwich, which was designed at the War Office by Captain Douglas Galton, R.E., was of an improved

design and was the first in which the "Pavilion" type was used. This type is now adopted in all hospitals throughout the country. From this time improved hospitals were provided at all stations.

The improvement in the organization and training of the Royal Army Medical Corps, which commenced in the late '80's, brought demands for further improvement in hospitals and for better sanitation in barracks, and these requirements were met by the Royal Engineers. The discoveries of Major Ronald Ross in the life history of the malaria germ made further demands on the Corps and many officers helped in the task of making barracks mosquito proof and of clearing the breeding grounds of the mosquito.

The names of some officers who did useful work in connexion with barracks are given in Volume III, Chapter V, but this list might be multiplied many times and space does not admit of a reference to the work of individual officers.

Army Ordnance Buildings

Another important duty in connexion with Works was the construction and maintenance of Army Ordnance buildings. This included not only the buildings themselves, but the provision and maintenance of fixed machinery and also the construction and maintenance of magazines and buildings for the storage of explosives, involving careful study of precautions against fire and protection against lightning.

For the charge of the Engineer work at Woolwich Arsenal, a senior officer of Royal Engineers was appointed, with the title of Superintendent of Building Works and the rank and pay of a Chief Engineer. He was assisted by one or two Royal Engineer officers. This officer administered the funds provided for Engineer work at the Arsenal and also at Weedon and some other central Ordnance establishments in England. The smaller Ordnance centres in the Commands, and at all stations abroad, were looked after by the local Cs.R.E.

Other Buildings

Buildings required for the purpose of the Army Service Corps, such as bakeries or stores, transport sheds and workshops, were included in the general barrack estimates. There were also special plants, such as the refrigerating plants at Gibraltar and Malta and, at the latter station, a grinding mill for the turnover of the large stock of wheat held in reserve at that station.

Many other accessory buildings, such as churches, schools, offices, quarters for Commanding Officers and certain Staff Officers, were also provided and maintained by the Royal Engineers. Another essential service was the charge of military cemeteries and burial grounds, including the preparation of graves and the appointment and supervision of caretakers.

Military Lands

In connexion with all the above works, there was an organization in each Command for the control of "Military Lands." This term includes the land on which the barracks and fortifications stand, with roads, parades and recreation grounds. The total extent of this property was very large and its control involved the custody of title deeds, the preparation and maintenance of record plans with the fixing of boundary stones and their periodical inspection. There was also much local correspondence on questions of rights of way, and the use of military roads by the public. The general control of these records centred in the Lands Office at the War Office, which held the original records and record plans. Copies of these were held in each Command and the local records were kept by one or more clerks in the Royal Engineers' office under the general control of one of the R.E. officers at the station.

Changes of policy as regards fortifications often resulted in forts being abandoned, and the local R.E. officers had then to try to let the abandoned buildings and obtain some rent from them. The same course had to be followed in the case of barrack buildings and detached quarters, no longer required for military purposes. For such letting the services of local land and house agents were used.

The total annual rental received from such lettings exceeded £50,000 a year.

The increase in barracks and defences required the acquisition of new land, which had to be purchased by the Royal Engineers with the help of local agents. The biggest transaction during the period of this volume was the training ground on Salisbury Plain.

Among the changes recommended by the Esher Committee was the transfer of all land questions to a civil branch under the control of the Under Secretary of State. Difficulties arose in carrying out this recommendation, and in 1909 a War Office Committee, under the Presidency of Major-General R. M. Ruck, recommended that the control should remain with the R.E., but that increased use

should be made of civilian agents for local work. This recommendation was overruled and in 1911 a civilian Controller of Lands was appointed, with representatives in each Command at home. These representatives were under the general supervision of the Chief Engineers and worked as members of their staffs. Abroad the Royal Engineers remained responsible for land questions. At this date the area of land held by the War Office amounted to 150,000 acres at home, with 16,500 acres abroad.

Rifle and Artillery Ranges

Another question closely allied to the above was the provision of Rifle and Artillery ranges. For the latter a range firing partly over the sea was obtained if possible, such as at Shoeburyness or Lydd, but for practice with Field Artillery, land ranges were essential; part of these were provided by clearance rights over cultivated ground, under which local owners agreed to remove all cattle during firing hours, being left in possession during the winter or when firing was not in progress. Artillery ranges were provided on Dartmoor, on Salisbury Plain, in the Wicklow hills in Ireland and at Trawsfynnydd in North Wales.

Rifle ranges were required in all parts of the country, and these became increasingly difficult to provide with the longer range of the modern rifle. Exclusive use was required of the range itself with its butts, but the area behind the butts was often dealt with as for the Artillery range, or if owned by the War Office, was let out for cultivation when firing was not in progress.

A large scheme for rifle ranges for the Territorial forces was initiated in 1913, under the supervision of Colonel J. H. Cowan, R.E., who was a well-known rifle shot.

The design of rifle ranges presented some special problems; the R.E. officer in charge of the buildings and ranges at the School of Musketry, Hythe, was required to make a special study of such problems and acted as adviser to the War Office. All schemes for new rifle ranges at home and abroad, including miniature ranges, were seen and criticized by this officer before approval.

In the case of ranges and training grounds, the R.E. were responsible for their custody, the provision of caretakers and the supply of targets.

Special Branches

All the above duties formed part of the regular work of all R.E. Officers for which they were trained and for which they could be

detailed without notice. But there were various branches of the organization for which special training and knowledge were required. Of these the first to specialize was the Ordnance Survey. An account of the rise and growth of this branch is given in Volume II, Part III, Chapter II, and also Volume III, Chapter VI; and the work in India is described in Volume II of *The Military Engineer in India*. Though the work of the Survey is primarily of a civil nature, it has important duties of a military character in the preparation of maps for military operations and in the survey of our various Colonies. It also has special duties with an army in the field, which side of R.E. work expanded very largely during the Great War.

As explained in Chapter IX, all R.E. officers receive an elementary training in Surveying, sufficient to enable them to carry out any local survey required and this training often proved of use in the early operations in our Colonies described in Chapters V to VII.

The remaining special branches may be usefully considered in two groups, under the general heads of Electrical and Mechanical works.

Electrical Branch

Of the Electrical the largest was the Submarine Mining Service, which was responsible for the mine defences and also for the defence electric lights and the electrical communications in our defended ports. An account of this service, up to 1906, has been given in the *History of Submarine Mining in the British Army*.

Defence Electric Lights

In 1905 the Minefields were handed over to the Navy but the charge of the Defence Electric Lights and Communications remained with the R.E. and the branch was renamed the Electric Light Service. Only officers and men who had been trained in the special courses at the Submarine Mining Schools (later the Schools of Electric Lighting) were detailed for this special work. The history of the Electric Light Service from 1906 to 1914 was mainly one of improvement of details and attention to training, also of the training and organization of Territorials at home, and local forces abroad, to man the extra lights, which had been made necessary by the growth of our defences.

Telegraphs

A second group of Engineer services of an electrical nature was that connected with Telegraphs and Telephones.

The use of the Telegraph in connexion with military operations dates from the Crimean War in 1855, when the Electric Telegraph Company offered its services and stores to the Government and arranged to train a party of Sappers in laying and working telegraph lines. The account of their work is given in Volume II, Part II, Chapter III. Telegraphs were also used during the British occupation of Canton in 1858 to 1860 and in the Ashanti War of 1873, and from that time Telegraphs in charge of the R.E. were used in all our military campaigns. A special unit for telegraph work in the field, called the "C" Telegraph Troop, was formed in August, 1870. About the same time the Government decided to purchase the various telegraph systems in Great Britain and Ireland, which had been constructed and worked by private companies. On the suggestion of Colonel Gossett, then Commanding Royal Engineer at Woolwich, an offer was made to the Post Office of the services of officers and men of the Royal Engineers for telegraph work, on similar conditions to those employed under the Government on the Ordnance Survey. It was suggested that such employment would be of value to the Post Office, while the practical experience would be of great value in building up a body of trained military telegraphists. The suggestion was eagerly accepted, and first the 22nd Company and soon after the 34th Company were detailed for this service. At first these companies were employed in building some of the main lines in Scotland and in the Eastern Counties, but as the Post Office developed a trained staff, the work of the Royal Engineers was concentrated in the South of England. By 1885 the headquarters of the R.E. Division of the Post Office Telegraphs was at New Cross, and for supervision of work, the area was divided into three subdivisions, each under an R.E. officer with junior officers to assist. The centres of these subdivisions were New Cross, Aldershot and Exeter. On the reconstruction of Aldershot Camp, the centre was moved to Basingstoke. Under the officers, each subdivision was divided into areas, each under an N.C.O. as Inspector. The Sappers were mainly employed on maintenance, but there were also permanent civilian parties, under their own foremen, who carried out the heavy work of building the lines. The operation of the instruments rested with the local Postmasters or Postmistresses, but a few Sappers were employed as office Telegraphists in order to provide for military operations. The N.C.Os. and men wore black uniform with lace and badges as for the Royal Engineers; the officers usually worked in plain clothes. All ranks drew the regimental pay of their rank,

but in lieu of Engineer pay, they drew Telegraph pay provided by the Post Office. As this was rather higher than Engineer pay, there were always sufficient candidates.

Vacancies for N.C.Os. and men in the Telegraph Services were filled by posting suitable recruits, after a course in the School of Electricity at Chatham; boys of 16 years were specially enlisted for training as office Telegraphists. The officers were selected from the general list of the Corps, from those who had shown an interest in electrical work or had served with the Telegraph Troop at Aldershot. An arrangement was made to reserve a proportion of vacancies for the officers of the Submarine Mining Service, as these latter had a special training in electrical work and it was thought that it would make the Submarine Mining Service more popular if it were associated with the work of the Field Army in this manner.

In April, 1884, the two companies under the Post Office were combined to form one unit, called the 2nd Division Telegraph Battalion, R.E., with headquarters at New Cross. The "C" Troop was at the same time called the 1st Division, remaining at Aldershot. The O.C., 2nd Division, exercised a general supervision as regards the posting of N.C.Os. and men and the distribution of reservists on mobilization. Many of the N.C.Os. and men, on completion of their service on the active list, went on to permanent employment under the Post Office. There was also a body of Post Office Volunteers who did an annual training with the 1st Division and did very valuable service in the campaigns in Egypt and South Africa and afterwards in the Great War.

In 1905 the 2nd Division Telegraph Battalion was renamed "K" Company. In 1909 "K" Company was transferred to Ireland and employed on work connected with the telegraph lines in that country. This change was partly due to the increased complexity of telegraph work in England, which reduced the value of the training for work in the field, and partly because it was intended to give some portion of the N.C.Os. and men training in the working of instruments for control of railway traffic. In England all such work was in the hands of the various railway companies, but in Ireland it was carried out by the Post Office.

The electrical communications in fortresses and garrisons were in the hands of the R.E. and the general charge formed part of the ordinary work of an R.E. officer, but, as explained in Chapter VIII, there was a group of N.C.Os. with special telegraph qualifications under the title of "Staff for Telegraph Services," who were

employed under the officers in maintaining the lines and manning the telegraph offices.

TELEPHONES

Telephones were first used by the Submarine Miners in 1878, in connexion with their system of testing and for communication with the junction-box boats when mines were being laid. They were also used for telegraphic work in connexion with Cardew's vibrating sounder. Telephones were also used by the Royal Garrison Artillery in connexion with their system of command lines in fortresses and a few telephones were installed for communication between the garrison headquarters and the headquarters of sections. At Aldershot a system of communications was maintained by the Telegraph Division R.E.

At first all these communications were arranged as for a system of telegraphs with instruments in selected positions in each group of buildings, each in charge of a special operator, who was usually drawn from the Infantry or Artillery units in a garrison. The introduction of an exchange system was started by the sealing of a pattern of telephone exchange by the R.E. Committee in 1898 and, soon after, a beginning was made of an exchange system at Aldershot and in the large fortresses abroad. But the Army Staff as a body refused to use the telephone themselves, and each telephone was still attended by an operator, all messages were supposed to be written down and the copies of messages were carefully censured periodically by a Staff Officer. The R.E. were insistent in pointing out the waste of time and staff in this arrangement. In December, 1906, on the opening of the new War Office an exchange of 400 lines was installed in the basement, in charge of operators provided by the Post Office, and telephones were installed in the various offices. Even then, however, the service was strictly limited; desk telephones were only allowed for the senior officer of a branch and in the junior officers only one instrument was allowed for each room. No written messages were, however, required.

In the following year the question of the use of telephones was brought to a head during the annual manning of the defences in the Cork district. As there were no volunteers in Ireland, arrangements had been made to complete the manning by units of Volunteer Garrison Artillery from Lancashire. About sixty or seventy telephone attendants had to be detailed from different units to man the instruments, with the result of a partial breakdown, as the Lancashire speech was so marked that they had great difficulty in

making themselves understood to the men of the regular Royal Artillery and of the regiment manning the Land Defences. On the report of the operations reaching the War Office, the Royal Engineers advised a rearrangement of the whole system of communications and the use of a central telephone exchange in each station, with the sending of messages direct by the officers concerned or one of their subordinates. After some discussion it was decided that certain Command lines must retain direct communication, but that for the ordinary business a system of administrative telephones would be arranged. At first this system was kept separate from any local exchange manned by the Post Office on the ground of possible overhearing, but this distinction was gradually broken down. In 1910, as a result of a Committee under the Presidency of Major E. C. Seaman, R.E., who was then Inspector of Electric Lights, arrangements were made with the Post Office, under which the latter undertook, as a repayment service, the laying and maintenance of all cable and air lines in fortresses or stations at home.

Abroad, in addition to the work in fortresses, the R.E. Telegraph units served in the various campaigns in Egypt, West and South Africa. In Egypt and the Sudan they extended the Egyptian lines to keep communication with Kitchener in his advance on Khartoum and helped later in the development of the telegraph service in the Sudan. Details are given in *The Royal Engineers in Egypt and the Sudan*. Royal Engineer telegraphists were used in the 1873 and 1895 expeditions to Ashanti and valuable assistance was rendered in the opening up of Nigeria (see Chapter VII). In the South African War a large organization developed under Lieut.-Colonel R. L. Hippisley, to take over and work 1,400 miles of communications in the Dutch Colonies, which had been badly damaged with the advance of the British force (see Volume III, Chapter IV).

Miscellaneous Electrical Services

The protection of buildings against lightning was one of the duties of the Corps, and the detailed instructions issued by the War Office were accepted as a standard by Civil Engineers.

The use of electric lighting in barracks and other buildings was always strongly supported by the R.E., but at first the charge for current and the cost of lamp renewals made this system more costly than lighting by gas and a good deal more costly than lighting by oil lamps. At Aldershot, a central electric-light station was

constructed in the South Camp, in 1899–1903, and put in charge of the R.E., who not only supplied the light but took over from the A.S.C. the responsibility for lamp renewals and the recovery of charges for repayment services. The results of the working were very carefully watched by the Finance branch of the War Office and the expenditure of the station was closely costed. The result of several years' working showed that the cost was close to threepence per unit, at a time when the charges by private companies were double or treble this amount. The opposition of the financial authorities being thus appeased, power stations were constructed at Bordon, the Curragh, Tidworth, Bulford and Malta. At smaller places contracts were made with local companies. From 1912 to 1914 the amount included in Army Estimates for electric lighting of barracks reached £150,000.

In 1906 an important advance was made in electrical training by the arrangement of a course of instruction in the best civil practice for selected officers of the Royal Engineers, who for a period of a year to eighteen months were attached to civil electrical firms in this country. The arrangements with the civil firms were made by Sir Alexander Kennedy, a well-known engineer, and many of the leading electrical firms contributed to the success of the scheme. These courses were especially welcomed by the Indian Government, as large schemes of electric light in barracks and for the use of electricity for punkah pulling were being installed in that country.

The general control of all electrical work in the War Office was vested in the Inspector of Submarine Defences. There was an electrical school at the S.M.E. for the instruction of officers and men in Electrical and Telegraph work, but with only two exceptions, the Instructors and Assistant Instructors at this school were drawn from officers who had been trained in the Submarine Mining Service. The exceptions were Major R. L. Hippisley and Major A. H. Bagnold, both of whom started their electrical work in the Telegraph Service.

In addition to the officers who served in the office of the I.S.D., or were Instructors at the Electrical and Submarine Mining Schools, special reference may be made to Major A. M. Stuart, R.E., who was appointed Inspector Submarine Defences in India in 1899 and in 1902 was moved to Simla to form an electrical section in the office of the Director General of Military Works. Among other jobs Stuart, assisted by Captain C. O. Halliday, R.E., designed and carried out with complete success the difficult work of electric lighting of the Central Camp and Delhi Fort at the Coronation Durbar at

Delhi in 1902 and 1903. Stuart's work was followed up by his successor, Major W. P. Brett, R.E., and after the Submarine Mining Defences were abolished in 1907, Major F. Baylay, R.E., was in charge of the electrical branch at Simla.

MECHANICAL BRANCH

The work of the Mechanical branch of the Royal Engineers first took definite shape with the erection of iron-fronted fortifications, which necessitated the formation of a special branch at the War Office under an officer called the Inspector of Iron Structures. This form of defence was abandoned after the attack on Alexandria in 1882, as described in Chapter XI, but the R.E. remained responsible for a considerable amount of engines, boilers and machinery used with pumping and heating plant, machinery in R.E. and Ordnance workshops as also such items as ammunition lifts; an important duty was the responsibility for the efficiency of hot-water boilers in barracks and quarters.

In order to ensure a supply of officers for the supervision of such work, an arrangement was made in 1883 for selected officers to go through a course of Engineering of about fifteen months' duration at the Armstrong works, Newcastle-on-Tyne; the first officers to go through the course were Lieutenant L. J. Dopping-Hepenstal and C. McG. Bate. From this time one or two selected officers went through this course each year.

Captain C. McG. Bate became Inspector of Iron Structures in 1889 and from then on this appointment was always given to an officer who had been through the special course of Machinery work.

As sufficient officers completed the course of Machinery, a qualified officer was detailed to each Command and District, with the title of Inspector of R.E. Machinery, to assist the Commanding Royal Engineer on technical questions.

Meanwhile a second group of mechanically minded officers was formed in the Submarine Mining Service. The work of this branch required the services of a number of small steam vessels up to a size of 150 tons. At first such steamboats were provided and manned by the Navy, but when, in 1884, the first of the successful "Gordon" type of minelaying vessel was constructed at Cowes, it was decided that all the work of manning and running such vessels should be done by the R.E. To ensure a good standard for the men in charge

of the engines and hoisting machinery a retired Naval Engineer Officer, Mr. J. Parry, was appointed in charge of Machinery at Gillingham and did excellent work there for many years. As the Electric Light defences developed, the Submarine Mining Companies had to take over another group of machinery, composed of the boilers and engines for driving the electric-light generators, and to transfer their attention to the internal combustion oil-engines introduced in 1894. A further group of mechanical duties resulted from the purchase of the Brennan torpedo. The officers of the Submarine Mining Service thus had considerable knowledge and experience of mechanical work, and many of them contributed materially to the developments described below, including Major Lindsay Lloyd, Captain Bagnall-Wild, Lieutenant F. E. Harward, Major J. N. C. Kennedy, Lieutenant A. E. Davidson and others.

In addition to the general mechanical duties referred to above, the Royal Engineers had, in 1885, the responsibility for two other technical branches—mechanized transport and railway work.

Mechanical Transport

From the first introduction of the steam locomotive, many engineers realized the advantage of a self-propelled engine which would run on the ordinary roads, and the military engineers, true to their tradition of utilizing new inventions which might be of use for military purposes, followed such development very closely. Thus, in 1833, we find Colonel C. Pasley, the head of the School at Chatham, was a member of a Committee formed to report on Gurney's steam coaches.

The first practical traction engine in this country was constructed by Messrs. Fowler of Leeds in 1857, but the innovation was opposed by public opinion and in 1865 Parliament passed an Act limiting the use of mechanical transport on roads. Under this Act the maximum pace allowed to steam road transport was four miles an hour in open country and two miles per hour in towns, and each engine had to be preceded by a man on foot carrying a red flag!

In 1868 the R.E. got permission to purchase their first traction engine, made by Messrs. Aveling and Porter of Rochester. This was called Steam Sapper No. 1 and was named "Prince Arthur" after H.R.H. the Duke of Connaught, who had joined the Corps in the same year.

In 1871 Major-General Lintorn Simmons, who was then the

Governor of the Royal Military Academy, was made the President of a War Office Committee to investigate the merits of various types of traction engine.

In 1872 Steam Sapper No. 2 was purchased and five more were ordered, of which two were sent to Shoeburyness where they were used for many years in transporting heavy guns. They were driven and maintained by the R.E. In the following year, a Steam Sapper was sent on active service for the Ashanti campaign. This was due to the initiative of Colonel R. Home, who was the C.R.E. of the force and who had been Secretary, R.E. Committee. The Steam Sapper was safely landed at Cape Coast Castle, but the nature of the country and the absence of roads prevented it proceeding farther ; it was, however, usefully employed in sawing timber. In 1877 Steam Sappers were used in the siege operations at Chatham and proved themselves very useful in bringing the heavy siege guns into position. For the next few years a small group of Steam Sappers was employed at Chatham for various purposes, including the instruction of officers and men ; they were under the Officer in charge of Workshops. The workshops were originally started for the employment of men at their ordinary trades, such as carpenters, smiths or bricklayers, but by this time there was a fair amount of machinery in the wood-cutting shops and there was a fitters' shop with mechanical tools for the repair of machinery and the training of engine-drivers.

The use of mechanical transport received a further impetus from the growth of the Balloon Service. This was in the hands of Lieut.-Colonel J. R. B. Templer (7th K.R.R.), who, as described in Chapter XIII, was developing the system of ballooning which was in use in the Army up to 1912. Among other inventions, he designed a system of carrying hydrogen in the field, compressed in large steel tubes. These tubes packed on a wagon made a load which was very heavy for horse transport ; Templer therefore resorted to steam road transport. From his experience of the advantages he obtained, he became a keen advocate of its use for other military purposes and when the Balloon School and factory was moved to Aldershot in 1887, Templer continued to advocate the use of this form of transport. In 1893 a trial on a larger scale was made during the annual manœuvres, eight Steam Sappers and three hired machines, all manned by the R.E., being employed ; and from then up to 1898 steam transport had a place in the annual manœuvres. In 1896 a new Act was passed regulating the use of mechanical transport

on roads, under which a reasonable pace was permitted and the "man on foot" abolished.

Meanwhile the growth of mechanical plant had been closely watched by the Royal Engineer Committee and various experiments were carried out to enable the Steam Sappers to be taken across country. One of the early experiments was the attachment to the periphery of the large driving wheels of hinged flat plates, which coming in succession under the wheels, increased the bearing surface. Trials were also carried out with various forms of caterpillar attachment such as was used later on the tank. The officers who were responsible for these experiments were the Inspector and Assistant Inspector of Iron Structures at the War Office and the Officer in charge of Workshops at Chatham. Among officers who contributed materially, mention may be made of Captain H. F. Gaynor, R.E., who was at the S.M.E. 1893 to 1898, and his successor Lieutenant F. E. Harward, R.E.

The term Steam Sapper disappeared in 1894, being replaced by "Traction Engine."

The first use of mechanical transport in warfare occurred in the South Africa campaign in 1899, when Colonel Templer who, as explained above, had been insistent on pressing the use of mechanical transport on the War Office, was appointed Director of Steam Road Transport in South Africa. A new Company, the 45th, was specially formed for this work under Captain G. P. Scholfield, R.E., with Lieutenant E. Barnardiston, R.E. It had a strength of one hundred and included many men drawn from the Submarine Mining Service. There were also three civilian engineers and a few civilian drivers. In April 1900, a repair workshop and store depot for steam road transport was established at Cape Town under Lieutenant F. E. Harward, R.E. In October, 1900, Colonel Templer returned home to resume his work at the Balloon Factory and Captain Scholfield became Director S.R.T. in South Africa.

At first the steam transport was tried with mobile troops, but later it was used mostly in depots and stores, but it proved so useful that on 1st June, 1902, the strength had grown to ten officers, 326 R.E. other ranks, 156 civilians and 238 natives, a total of 730, with forty-six steam tractors, two steam lorries and 250 trucks.

A further use of steam transport arose in connexion with the mobile electric lights. The first R.E. company sent out for this work was equipped with horse transport, but in 1900 Lieut.-Colonel Crompton,

commanding the London Electrical Volunteers, formed from this Corps, and took out, a group of mobile electric lights, which used steam transport as their motive power. Captain Lindsay Lloyd, R.E., accompanied this Corps as Adjutant. Later the searchlights and transport in South Africa were taken over by Captain R. S. Walker, R.E., and formed into a unit ; the subalterns with this unit were Lieutenants D. S. Collins, A. E. Davidson and W. H. E. Forsyth, all of the R.E. Captain Walker was a keen advocate of the use of mechanical transport and was one of the first to advise the use of the petrol I.C. engine not only for transport but for flight.

The reports of the use of this transport on manœuvres in 1899 and in South Africa were so satisfactory that General Sir R. Harrison, the I.G.F. at the War Office, proposed that a Mechanical Transport Committee should be formed to study the question of the use of mechanical transport in the Army and to carry out experiments. This was supported by the Adjutant-General, Sir Evelyn Wood, and the Committee was constituted in 1900 as a branch of the R.E. Committee. The Secretary was Major Lindsay Lloyd, R.E. The Committee was given a grant of £4,000 for experiments.

The work of the Committee was divided into three sections, for work with R.A., R.E. and A.S.C. The first two of these required machines which could move across country and, though much useful preliminary work was accomplished, no solution of the problem had been found up to August, 1914. For the A.S.C. work along roads, the results were so satisfactory that the War Office decided in 1902 that the A.S.C. should drive and maintain mechanical transport for the Army and, as a consequence of this decision, a section of an A.S.C. Mechanical Transport Company was formed at Aldershot in 1902 under R.E. tutelage, and in 1903 and 1904 two complete Mechanical Transport Companies A.S.C. were formed and trained for a year at Chatham under the Instructor in Workshops, Major J. N. C. Kennedy, R.E. A stiffening of R.E. N.C.Os. and other ranks were transferred to the new units. From this time, up to 1914, the responsibility for mechanical transport was gradually transferred from the R.E. to the A.S.C.

In 1903, a course of training for officers was arranged in Messrs. Thornycroft's Mechanical Transport factory. The first officer to go through this course was Lieutenant A. E. Davidson, R.E.

In 1905, on the abolition of the office of I.G.F., the responsibility for the Mechanical Transport Committee was transferred to the

Quartermaster-General and the Committee was reconstituted. The successive Secretaries were Captain J. K. Bagnall-Wild, R.E., 1906–9, and Captain A. E. Davidson, R.E., 1910–14.

The I.I.S. at the War Office remained an active member of this Committee. Although the R.E. were thus associated with the future development of this service, it ceased to form one of the normal services of the R.E., so the record of its future development may be broken off at this point.

Of other R.E. officers who had contributed to the development of this service, mention may be made of Major C. H. H. Nugent, as I.I.S. from 1899 to 1905.

On leaving the War Office, Nugent was ordered to India, where he was put in charge of a new machinery branch in the office of the D.G.M.W. at Simla.

Railway Branch

The growth of the Railway branch of the Royal Engineers at home may be said to date from the formation of the 8th Railway Company for Sir Garnet Wolseley's campaign in Egypt in 1882. A second company, the 10th, was formed in 1886 in connexion with the proposed construction of a railway from Suakin to Berber. An account of the work of these companies is given in Volume II, Part I, Chapter XXVI and Part II, Chapter III.

On the conclusion of these campaigns, the two companies returned to England, the 8th Company to Chattenden, the 10th Company to Woolwich. Chattenden was the centre of a group of Ordnance magazines and was connected with the hard at Upnor by a 30-in. railway, which was used for the transport of munitions and also for parties of R.E. under instruction, who carried out part of their training in making fascines and gabions in the woods on the W.D. property. The railway, which had a length of about five miles, thus provided facilities not only for laying and maintenance of the permanent way but for simple forms of traffic. At Woolwich the 10th Company was mainly employed in the Arsenal, but for discipline it was under the orders of the C.R.E., Woolwich, and the O.C. Company was in charge of one of the R.E. Divisions of that District. The gauge of the small railway connecting the various sheds and workshops in the Arsenal was 18-in., but there was considerable traffic and some of the loads to be moved were very heavy.

All traffic movements in the Arsenal, which involved, in some cases, regular train movements to take workmen to and from their

work, were controlled by an officer of R.E. This appointment in the early '80s was held in succession by Lieutenant C. McG. Bate and Lieutenant J. H. L'E. Johnstone, R.E., both of whom were later appointed Inspectors of Iron Structures and Railways at the War Office. In 1890 Johnstone was followed by Lieutenant E. P. C. Girouard, R.E., who held the appointment for five years, thus commencing a phenomenal career in the history of military railways. Girouard was of Canadian extraction and received his early training at the Royal Military College, Kingston, Canada. On leaving the College in 1886, he took up employment with the Canadian Pacific Railway, but in 1888, in response to an offer of more commissions in the R.E. for cadets from Kingston, he accepted a commission in the R.E. He was then in his twenty-second year, about three years older then the average Woolwich cadet. On completion of his courses at the S.M.E., Girouard, on account of his railway experience, was sent to Woolwich, where, in addition to his military duties, he made a special study of the general working of railways and their use in warfare.

Up to this time the R.E. had not been much interested in railway development at home, though from 1865 there had been in existence a body called the Engineer and Railway Staff Corps, consisting of senior members of the railway and engineer professions. This was an advisory body and intended mainly to co-ordinate the use of the home railways in an emergency. After the Egyptian campaign of 1886 this Corps was reformed and Colonel D. A. Scott, R.E., who had been in charge of the railway work on the Nile, was made Commandant. This body did useful work in connexion with the movement of troops for the South African War.

In addition to the two regular companies, the R.E. had a few short lines of narrow gauge railway at Chatham, Gosport and elsewhere, and instruction in the use of such lines was included in the courses for officers and men in the Fortification School at the S.M.E.

Meanwhile in India the Corps had taken a prominent part in the development of railways in that country, which is described in *The Military Engineer in India*, Volume II, Chapters VII, VIII and IX, and there had grown up a group of R.E. officers with very large experience of railway work on the frontier, both in construction and management.

In 1895 the British Government decided to begin the reconquest of the Sudan and Colonel Sir Herbert Kitchener, the Sirdar of the

Egyptian Army, was ordered to make a limited and gradual advance up the Nile to Dongola. This involved an extension of the railway. Kitchener sent for Girouard, who had just completed his term of service at Woolwich, and appointed him Director of Railways in the Egyptian Army. The full story of his work is told in *The Royal Engineers in Egypt and the Sudan.*

Girouard was assisted in his epoch-making task by a group of young R.E. officers : Lieutenants A. G. Stevenson, H. L. Pritchard, R. Polwhele (died 1896), R. D. B. Blakeney, E. H. S. Cator (died 1897), H. A. Micklem, G. C. M. Hall, E. C. Midwinter and E. O. A. Newcombe. He also had the assistance of small detachments from the 8th and 10th Railway Companies, R.E.

Meanwhile the Egyptian railways were very inefficient, and in July, 1898, Girouard was appointed, while still a subaltern in the Army, " President of Egyptian State Railways."

* In 1899 Girouard visited America and England to order equipment for Egypt and while in England happened to meet Colonel the Hon. George Gough, Private Secretary to the C.-in-C., Lord Wolseley. The force for the South African War was then being organized and Girouard wondered, in the course of conversation, if the Government had realized the size of the railway problem which our Army would meet in South Africa. His remarks were brought to the notice of Lord Wolseley, who interviewed Girouard, and the result was his appointment as Director of Railways to the British Force. On starting work he found, as he had anticipated, that the problem had been seriously underestimated. There was no staff allotted to the Director of Railways, other than one batman, and the only troops provided were the two small Railway Companies R.E. He demanded a staff of eight R.E. officers, the addition of four Fortress Companies, and a first allotment of £100,000 for the purchase of railway and engineering stores and material. He also suggested that a cable should be sent to South Africa ordering that any British employees who left their employment on the railways of the Boer Republic should be taken into pay at once and placed at his disposal. These demands were granted after a sharp but short struggle with the War Office and Finance branches, during which the help of the C.-in-C. and the Secretary of State himself had been obtained on the side of the new Director.

* This account of the organization of the railway branch in South Africa is taken from the Memoir on Girouard in the *R.E. Journal* for June, 1933, which was written by Major-General H. L. Pritchard.

Girouard arrived at Cape Town in November with the local rank of Lieut.-Colonel, and a letter of credit on the Command Paymaster at Cape Town for £1 million.

On arrival he at once started the organization of the Railway Pioneer Regiment, formed from refugees from the Rand Goldfields. This was commanded by Major J. E. Capper, R.E., with Captain E. D. Swinton, R.E., as Adjutant, and reached a strength of thirty-five officers and 1,000 men. Girouard's anticipation of the work to be done had been more than justified, the enemy had blown up every bridge and culvert and several miles of railway, and 1,800 miles of line were denuded of any employees. How the Royal Engineers succeeded in restoring the line is told in Volume III, Chapter IV. Girouard had the assistance of most of the subalterns who had helped him in Egypt, and also received a very valuable reinforcement of R.E. officers of railway experience from India, headed by Captain V. Murray, R.E.

For his services in this campaign, Girouard was made a Brevet Major and given the K.C.M.G., and at the conclusion of the campaign was appointed Commissioner of Railways in South Africa, to organize the railways in the newly conquered Colonies, retaining the services of a number of R.E. officers, most of whom were withdrawn towards the end of 1904. During the campaign a third Railway Company had been formed, the 53rd. During the fighting a valuable addition to the Army had been made by an organization of armoured trains, which was developed by Captain H. C. Nanton, R.E.

In 1904, as described in Chapter III, the general control of Railway work was transferred from the I.G.F. to a new Director under the Q.M.G., and Captain H. L. Pritchard, R.E., who had been with Girouard in Egypt and South Africa, was appointed Deputy Assistant Director for charge of a sub-branch, which was responsible for the general organization of the Railway Service for war, traffic arrangements with the home Railway Companies in peace, technical training of Railway troops, railway manuals and supply of railway stores. This new branch did most valuable work in developing the Railway Service and making preparation, which expanded enormously during the Great War. Captain Pritchard was succeeded in turn by Captain C. G. Fuller, R.E., and Major G. Lubbock, R.E. In December, 1912, the grading of the officer in charge was reduced to Staff Captain and the appointment was given to Captain H. O. Mance, R.E., who was holding it at the opening of the Great War.

Meanwhile the organization for liaison with the civil railways had been strengthened. In 1901 the Army Railway Council was formed under the Presidency of Colonel D. A. Scott, R.E., with six members drawn from the Engineer and Railway Staff Corps, three of the R.E. Inspecting Officers for Railways and two from the Staff of the War Office. In 1903 this was again changed, the President was a D.Q.M.G. from the War Office, while the members included the head of the Railway Inspection Staff, Major H. A. Yorke, R.E., and one other R.E. officer, Major J. H. Twiss, R.E.

In 1908 this body was renamed the War Railway Council.

In 1912 the arrangements were again revised, a railway executive Committee was formed, consisting of nine General Managers, with a view to undertaking executive functions and co-ordinating the working of the railways in war. The acting Chairman was Sir Herbert Walker, General Manager of the L.S.W. Railway. It had been decided that, in the event of general mobilization, all essential railways would be taken over, and a Communications Board was formed under the Presidency of the Quartermaster-General, of which the Military Secretary was Captain H. O. Mance, R.E. This Board prepared a detailed programme for the movements by the Expeditionary Force; this programme was reviewed annually. In some cases additional railway sidings were constructed in peace and other facilities were to be arranged on mobilization. Arrangements for the shipment of the Expeditionary Force were made with the Admiralty.

Further details of the working of the railways during the war will be given in a later volume.

Railway Training Centre at Longmoor

At the conclusion of the South African War, it was realized that some improvement was necessary in the arrangements for training the Railway Companies at home, so that they could have experience in the working of a railway line of full gauge. It was, therefore, decided to form a railway training centre at Longmoor. In 1905 the three Railway Companies, 8th, 10th and 53rd, were concentrated at this station under a Commandant, and the station developed as a training centre for the regular R.E. personnel, to give military training to Special Reserve units (see Chapter VIII), and to form a Railway depot in time of war.

Successive Commandants were: Major F. G. Fuller, Captain C. G. Fuller, Major D. H. Ridout, Major C. G. W. Hunter, Lieut.-Colonel J. H. Twiss.

A new railway was projected called the Woolmer Instructional Military Railway from Bordon to Longmoor, which was gradually constructed and developed by classes under instruction. Well equipped workshops and a certain amount of special plant for training were established at Longmoor.

The railway training centre was an R.E. unit under the command of the C.R.E. Bordon, and the Commandant was responsible for the execution of Engineer services in the hutments in which the men were quartered.

The training of selected R.E. officers for machinery duties referred to above had been continued, but the training was shifted from Armstrongs' works to the Midland Railway Company's works at Derby. Also a special course for Railway Traffic was started; Captain C. G. Fuller, R.E., was the first officer to undergo this course.

On the recommendations of the Kitchener Committee, the 53rd Railway Company and the Cheshire Railway Battalion (Territorials) had been disbanded in 1912, so that the only units remaining on the outbreak of war were the 8th and 10th Railway Companies and the Railway Companies of the Special Reserve Anglesey and Monmouthshire Battalions, R.E. The Railway branch at the War Office had, however, prepared in detail the establishment of units to be formed from the staff of the home railways, if required, and these proved very useful later when the emergency arose.

Under the arrangements made by the General Staff of the War Office with the French authorities, however, the latter undertook all railway movements in France for the British force, so that although a Director of Railways was appointed for the British Expeditionary Force, he was at first employed only as a liaison officer with the French Railway Staff.

CHAPTER XIII

FIELD ENGINEERING—INSPECTION OF R.E. STORES —R.E. COMMITTEE

Field Engineering—Adaptation of Civil Engineer practice—General grounding in engineering essential—Transport in the Field—Necessity for special transport being allotted to Engineers—Four groups of Engineer units in Field Army—Selection of tools—Special patterns of vehicles—All vehicles horse-drawn—Details of equipment up to 1902—Bridging—Pontoons—Trestles—Superstructure—Field units—Field Companies—Toolcarts—Field Troop—Telegraph units—Wireless—Aeronautics—Balloons—Searchlight sections—Changes after 1902—Standardization of parts of vehicles—Tools and equipment—Blocks and cordage—Gun-cotton—Bridging equipment with Field Companies—Collapsible boats—Telegraph units reformed—Aeronautics—Kites—Dirigibles—Aeroplanes—Formation of R.F.C.—Searchlights—Field Parks—Unit for Line of Communications—Reserves of stores—Inspection—I.R.E.S. Woolwich—R.E. Committee—Members—Headquarters moved to London—List of Secretaries

This chapter links up with Vol. II, Part II, Chaps. II, III and V.

In the last two chapters some description has been given of the two branches of Military Engineer work which come under the headings of " Fortifications " and " Works." In the present chapter it is proposed to consider the work of the Military Engineer with an army in the field. This must not be taken as implying that the actual fighting work of the Engineer in war is inferior in importance to the more detailed and in some ways the more scientific work required in peace.

Some people, including a few Engineer officers, have argued that as the Engineer works which are possible in the field are on a small scale, owing to the limitations of time and materials, only an elementary knowledge of engineering principles and practice is necessary for field engineers. But the great body of Engineer officers have always resisted this suggestion and claimed that the only safe foundation for the training of a Military Engineer was a sound grounding in all the general branches of engineering, and this view has been amply supported by the experience of the 1914–18 war.

Transport for Engineer Units

An essential factor in the conduct of all operations with a Field Army is the question of transport. In peace the daily transport of supplies to consumers has become so much a matter of course that few people realize the work involved. With an army conducting mobile operations over a large area of country the movement of supplies or munitions requires much careful organization by a highly trained staff, and the provision of large trains of transport vehicles. The regular daily demand on such vehicles is, firstly, for the supply of food, and secondly, the supply of ammunition, while the Engineer stores come only third, so that it has always been found that if the supply of transport is deficient, which is frequently the case, the Engineer arm will find itself short of materials and with an inadequate supply of tools. It is for this reason that in all campaigns there has been a continual demand from the Engineer officers for sufficient transport to be set aside for Engineer work. The want of such an organization is emphasized in the account in Volume II, Part II, Chapter II of our *History*, which shows how an Engineer train was formed during the Peninsular War, only to be broken up after Waterloo, with the result that the Engineers entered on the Crimean War with no means of transport for their material ; the operations of the siege of Sebastopol were seriously hampered by the delay in bringing up siege material, and the need for a better organization became so obvious that at last, in 1856, a small body of 130 drivers and 120 horses was formed and sent out to the East, though the unit did not arrive in the Crimea before the conclusion of peace. After the war, reduction was again the order of the day, but the small R.E. unit, now called "A" troop, maintained a precarious existence at Aldershot until 1863. During this time there was a battle going on in the War Office between the branch of the Quartermaster-General, who wanted to make all horsed transport a part of the military train, and the branch of the Inspector-General of Fortifications, led by Sir John Burgoyne, who argued that experience had shown that if the Engineers had to rely for their transport on a general train, such transport was likely to be withdrawn when most wanted. They also pointed out that the drivers required special training to enable them to co-operate in the Engineer work, and practice for all ranks in the use of such transport could only be given by posting horses and drivers to Engineer units in time of peace. In the end the Engineers obtained the support of the Secretary

of State and on the 22nd May, 1863, an order was issued for the formation and equipment at Aldershot of two troops and a mounted depot. The senior called "A," or Pontoon Troop, was to be equipped with Bridge equipment, the second, called "B," or Field Equipment Troop, was to carry tools and miscellaneous stores. In 1870 a third, called "C," or Telegraph Troop, was formed. With the growth of the use of balloons, it became necessary to form a special unit for this service, called a Balloon Section, thus making four distinct groups of Engineer units with a Field Army.

Tools and Materials—Vehicles

The selection of tools and materials to be carried with each unit must depend not only on the number of each article required but also the pattern, so that the maximum efficiency could be obtained with the minimum of weight. All questions of the type and pattern of equipment were, therefore, considered by a body called the Royal Engineer Committee, which had been in existence since 1792 (see Volume II, Part II, Chapter V). This body was reconstructed in 1866 and a paid Secretary was appointed; while the officer commanding the train at Aldershot was made an Associate Member of this Committee.

It was found early in their investigation that, in addition to the selection of the patterns of the equipment, considerable advantage would be obtained by special designs for the military vehicles which were allotted to the train. This was obviously necessary to carry the bulky pontoons of the Bridging Troop and was also found necessary for the Telegraph units.

Up to the opening of the Great War, all vehicles in use by the Field Army were horse-drawn; although mechanized transport had reached the stage where this type of vehicle could be included in supply columns, it had not been found practicable to apply it to any R.E. vehicles, not even in the R.E. units for work on the Line of Communications.

There is always some difficulty in getting practical experience of the use of different forms of equipment on field service and this is peculiarly the case with R.E. work. It is not, therefore, surprising that any actual operations under the conditions of active service were followed by a period of revision of the patterns and numbers of articles carried in the field. The first campaign which affected the period covered by this volume was the operations in Egypt, 1882 to 1886, and the subsequent thirty years up to the Great War

was broken into two parts by the South African campaign. It will be convenient in considering details to deal with each period separately.

Details of Bridging Units up to 1902

The primary object of the bridging equipment was the formation of a floating bridge. This required the use of floats spaced at regular intervals with a superstructure or roadway. The floats first used took the form of portable boats or pontoons, but many other forms were tried, such as buoys or casks fixed together in a suitable framework; and a form of cask pier was given a place in the drill book.

The pattern of service pontoon used up to 1870 was designed by Major T. Blanshard, R.E., and was adopted in 1836; this was a round metal pontoon like a big sausage and had to be used in pairs, each pair forming a raft on to which the superstructure was attached. This pontoon, though an advance on its predecessors, was not altogether satisfactory; being of metal it was easily damaged, and was also heavy to handle and bulky.

On the formation of the Bridging Troop in 1863, the R.E. Committee got busy and experiments were tried with new forms of boat pontoons, until a model designed by Lieutenant Bindon Blood* was adopted in 1870. This model was a boat-shaped pontoon with covered ends, the body being constructed with a wooden framework of keelson and ribs covered with layers of canvas and india-rubber solution, coated with marine glue. This pattern was lighter than the old metal pontoons and much easier to repair, a bullet striking the pontoon drilling a small hole which was easily plugged. An innovation introduced with this form of float was the use of a central saddle to carry the ends of the baulks which support the roadway. At first these baulks rested on the gunwales, so that the bridge, when lashed in place, could not give to any movement of the water. With saddle loading, each boat can rock from side to side without affecting the stiffness of the roadway.

In 1889 various improvements were introduced by a Sub-committee of the R.E. Committee, under the Presidency of Major J. W. Savage, R.E., Lieutenant J. E. Clauson, R.E., of "A" Troop, carrying out an interesting series of experiments. As a result the pontoon was cut into two parts, each of which could be used independently, the parts being fitted with clips so that two or three parts could be clipped together as required. This enabled three types of bridge, light, medium or heavy, to be made from the same equipment.

* Later General Sir Bindon Blood, Chief Royal Engineer.

Although it was intended that the greater part of any bridge should be formed of pontoons, provision had to be made for bridging shallow water such as often occurred at the ends of a floating bridge. For this purpose various forms of trestle were tried, consisting of a cross transom supported on two legs. The transom had to be so fitted that it could slide up and down on the legs to allow for variation in the depth of water and the alteration of level due to tide or rain. Considerable ingenuity was displayed in the development of a suitable design and trials continued until finally a design submitted by Colonel Weldon was adopted. The roadway also called for care in design and construction. For a medium bridge the distance between the centres of saddles was fixed at 15 ft. and this was bridged by five baulks each 15 ft. 6 in. long, 6 in. deep and $3\frac{1}{4}$ in. wide. These were made of specially selected Kauri pine and fitted at each end with metal claws to fit over the saddle. The roadway was fixed at 9 ft. wide in the clear and was formed of wooden chesses, each 10 ft. long, 12 in. wide by $1\frac{1}{2}$ in. thick. These were placed side by side on the baulks and secured by side lashings.

In 1900, on the suggestion of the then Instructor in Fortification at the School of Military Engineering, Major Louis Jackson, the design of the baulks was altered by tapering the ends and hollowing the sides. This gave a baulk of the same strength as before, but with a considerable saving of weight.

To carry the bridging equipment two special wagons were designed called Pontoon Wagon and Trestle Wagon. The pontoon or trestle was carried on the body of the wagon, the baulks and chesses being carried in racks under the body, so designed that they could be unloaded quickly. The wheel track of these wagons was 5 ft. 10 in. In addition to these main components there were numerous minor components, such as anchors and anchor lines, guy ropes, lashings, small portable boats used for putting out anchors and sets of tools for repair of the bridge equipment, vehicles or harness.

The original unit of bridging train adopted in 1863 was for 100 yds. of bridge and as the new patterns of pontoon and trestle were introduced, this was divided into 80 yds. pontoon and 20 yds. of trestle, each wagon carrying enough superstructure for 5 yds. of medium bridge.

Details of Field Units

The original " B " Troop was for the carriage of field equipment only. This included artificers' tools and entrenching tools, explosives for demolitions, and miscellaneous tools and materials. The unit

was divided into three sections and a Field Park. Each section contained the stores required by one R.E. Company, while the Field Park held the heavier stores and was intended to form an administrative centre from which the companies could draw tools and materials and to which such special units as the Printing Section could be attached. This group was the proportion of Engineers to be allotted to a force of 10,000 men.

In order to enable the troop to practise the work they would have to do in war, sections were attached during the training period to some of the ordinary general service companies. In 1877 this arrangement was made permanent and the companies who were provided with this equipment were called Field Companies. The Field Park Section of the "B" Troop was formed into a separate unit and was in time of peace amalgamated with the mounted depot at Aldershot.

In 1885 the proportion of Engineer units to an Army Corps of 30,000 men was fixed at four Field Companies and one Field Park, a considerable reduction on the earlier proposals.

The artificers' tools were issued in sets, each in a tool-chest. The entrenching tools were carried loose packed, either in carts or on pack transport. Two sizes of picks and shovels were in use, one was the light pattern issued to the army as a whole, the other was a heavier set for use by the better-trained sappers. The explosive carried was wet gun-cotton, with dry gun-cotton primers and detonators; these were fired by Bickford fuse or electrically.

Up to the Egyptian War of 1882, the transport allotted to the Field Companies consisted of carts and wagons of general army types, but experience of the campaign in Egypt with the 24th Company, R.E., led Lieutenant J. C. Tyler, R.E., to design a form of four-wheeled tool-cart which had several novel features. The general arrangement was based on the limber principle, which had proved so successful for field artillery. The vehicle was drawn by four horses and was in two parts, the front or limber consisted of boxes with seats on top, the body was a framework on to which the different tool-chests could be fixed. The pole connecting the body and limber could be split to form two shafts so that the vehicle could be divided into two carts, each drawn by two horses. The four wheels were made interchangeable. Careful experiment was necessary before all the details could be settled, but the design proved very successful, the limber attachment enabling the vehicle to be taken across country with as much ease as a field gun. This

pattern continued in use up to the end of the war in South Africa.

Various additions were made to the equipment carried by the old "B" Troop, among others a portable water pump and canvas tank were added.

A short Bridging train consisting of two pontoon wagons was added to each Field Company. The details were interchangeable with those of the Bridging units.

Details of Field Troop

The successful employment of Field Companies led to the suggestion that a mounted detachment of the R.E. should be organized to accompany Cavalry, and, in the Sudan campaign of 1885, a detachment of the 11th Field Company, consisting of Lieutenant Sandbach and twenty-seven men, was formed for service with mounted Infantry outside Suakin. This proved successful, and a unit was formed later called a Field Troop; this was organized like a Field Company but with a lighter equipment. The first of these units served in the South African War under the command of Captain A. G. Hunter-Weston, and was so successful that three more troops were formed during the campaign.

Details of Telegraph Units

Though telegraphs had been employed in the Crimean War and subsequently in operations in China and Abyssinia, it was not till 1870 that a special Telegraph Troop was formed.

The equipment of this troop included office wagons, which had to be fitted with springs, each containing all the instruments necessary for a telegraph office, and other wagons containing the insulated wire which was laid out along the ground as the troops proceeded. It was early evident that in addition to this field cable there would be great value in a light form of air line, erected on poles. The materials for such a line would be lighter than a cable and messages could be transmitted more easily.

All these branches, offices, cable and air line were developed in a very complete manner. For the offices, the invention of Cardew's vibrator provided an instrument which was extremely sensitive and capable of work through very defective lines.

For the cable work, a special form of steel cable with a copper core was designed and this was carried on drums fitted in a vehicle

which was at first a two-wheeled cart. The strength of the cable was such that the cable could be laid out automatically while the vehicle was moving at the canter, while an office set connected to the drum enabled communication to be maintained through the cable.

For the air line, a special form of wire was obtained, which was rust-proof and strong enough to stand rough handling and with good electrical conductivity. The poles and insulators and all parts were also selected to give the maximum efficiency with the minimum of bulk and weight. A special wagon called an air-line wagon was designed to carry the equipment.

In 1884 the original Telegraph Troop was amalgamated with the two companies employed under the General Post Office to form the Telegraph Battalion, R.E., which was organized in two divisions. The 1st Division included the companies for work in the field, each with the equipment which formerly belonged to the "C" Troop. The 2nd Division was organized to provide reservists and drafts for the Field units and also an organization for work on the Line of Communications, to connect the Field Armies with the general telegraph system of the country in which the operations were taking place.

Each Field Telegraph Company was organized in four sections with a headquarters, two of the sections being equipped with air line and two with cable; each section comprised two working detachments. One company was allotted to each Army Corps.

A telegraph detachment was employed in the Ashanti War of 1873 and the "C" Troop was on active service in the Zulu War of 1879, the Transvaal War of 1881 and the Egyptian campaign of 1882. Details are given in Volume II, Part II, Chapters II and III. In 1884–5, Telegraph units were employed on the Nile, at Suakin and in Bechuanaland, and from that time they formed part of all military expeditions (see Chapter V to VII of this volume).

Wireless Telegraphy

The system of wireless telegraphy invented by Marconi first came under the notice of the R.E. Committee in 1898, and from that date all experiments were carefully watched by Major G. A. Carr, R.E., representing the R.E. Committee. The first experiment on Salisbury Plain was over a distance of three-quarters of a mile only, but this was soon improved on, and the next year trials were taking

place between Poole and the Needles. In 1900 some trial sets were sent out to South Africa in charge of Captain J. N. C. Kennedy, R.E., but the system was not sufficiently developed to be of use on active service.

AERONAUTICS

In Volume II a description is given of the early history of military ballooning, the efforts of Captain G. E. Grover and others from 1862 to 1871 to get ballooning taken up in the British army, the start which was eventually made with the establishment in 1878 of the Balloon Equipment Store at Woolwich by Captain H. P. Lee and Captain J. L. B. Templer of the Middlesex Militia (later K.R.R.C.), the School of Ballooning at Chatham up to 1888, and the employment of balloons in the Bechuanaland and Eastern Sudan expeditions in 1885.

Two notable achievements of the early days at Chatham were the introduction by Captain Templer of goldbeater's-skin balloons and the carriage of hydrogen compressed in steel tubes. Goldbeater's-skin was lighter, strength for strength, and more impervious to hydrogen than any other balloon material, and the secret of preparing and joining the skins to form a full-sized balloon was perpetually guarded. The trial of steel tubes to carry hydrogen under compression in the field had been recommended in 1875 by the R.E. Committee, but the proposal was then pigeon-holed; the introduction of this equipment did away with the inefficient and cumbrous manufacture of hydrogen *in situ*, and in this the British Service was several years ahead of any other. A balloon wagon, to carry the winch and accessories and a balloon in its basket before it was filled, was improvised at an early stage, and later tube wagons for the carriage of the gas tubes and filling gear were sanctioned; until tube wagons were introduced in 1888–9 the tubes had to be carried in G.S. wagons or in trucks drawn by traction engines (or even on camels in the Sudan).

The manning and equipment of the balloon detachments employed in the Bechuanaland and Eastern Sudan expeditions, which were respectively commanded by Major H. Elsdale, with Lieutenant F. C. Trollope, Grenadier Guards, and Major Templer, with Lieutenant R. J. H. L. Mackenzie, and contained only 8 to 10 N.C.Os. and men, exhausted the resources of the infant organization at Chatham, and great difficulty was found in fitting out the Sudan detachment after the Bechuanaland party had left with the best of the equipment. Some useful observations were, however, made in

the Sudan by Lieutenant Mackenzie and the balloons had a great moral effect on the enemy. There was no fighting in Bechuanaland, but ascents were made, and in both expeditions the suitability for active service of the goldbeater's-skin balloons and the gas tubes was proved.

In 1888–9 Major C. M. Watson was the Officer in Charge of Ballooning, and thanks to his representations and the success of a balloon detachment which was sent to the Aldershot manœuvres in 1889 the formation of a regular Balloon Section was sanctioned in 1890, under the command of Lieutenant H. B. Jones. This joined the R.E. Troops and Companies in Stanhope Lines, Aldershot, in 1891, and in 1892 Major Templer's establishment was transferred there, a small factory being set up on the bank of the Basingstoke canal. This was officially designated the School of Ballooning until 1897, when it was recognized as the Balloon Factory.

The period from 1891 to the outbreak of the South African War was occupied in developing the training, equipment and transport. The Balloon Section was throughout handicapped by not having a mounted establishment (which had been recommended as essential by Major Watson), and horses and drivers had to be borrowed from other R.E. units at Aldershot : it was not until the South African War was in progress that a mounted section was sanctioned in peace establishments. Officers of other arms were attached for balloon courses, and two of these were posted to balloon sections in the South African War. In addition to captive ballooning, free runs were practised. They were necessary in order to enable the aeronautics to control and land a balloon if it broke away ; and until airships and aeroplanes arrived they were considered to have direct military value, to make reconnaissances or possibly bombing raids across an enemy salient in a favourable wind, or to provide air transport for passengers or dispatches out of a besieged place, as exemplified during the siege of Paris in 1870. As the balloons were made as small as possible, in the interests of handiness and mobility and in order to limit transport and gas requirements, they could not carry much ballast, which limited the length of free runs, and they were forbidden to leave the country and cross the sea. The longest free run was to a distance of 152 miles, and was made by Captain H. B. Jones, accompanied by Lieutenant H. C. Prichard, Northampton Regiment, in 1894.

Balloons proved very useful in the early stages of the South African War, up to the fall of Pretoria and the dispersal of the

Boer armies, after which they were unsuitable for the guerilla operations which ensued. Some account of their performances is given in Volume III. The balloon service was rapidly expanded; three sections were sent to South Africa and a detachment was exemporized in the field to operate with Sir Redvers Buller's Ladysmith relief force; a fourth section was sent to China to join the international force which occupied Peking to protect foreign interests menaced by the Boxer rebellion, and two more sections were formed on peace establishments at Aldershot. The 1st Balloon Section, commanded by Captain H. B. Jones, with Lieutenants A. H. W. Grubb and R. G. Earle, achieved notable results at Paardeberg, sketching the Boer position and directing the artillery on targets invisible from the ground, the result being the capture of Cronje and his army, and in the advance on Pretoria when balloon observation located the enemy positions and facilitated the capture of the enemy forces. The 2nd Balloon Section, commanded by Major G. M. Heath, with Captain W. A. Tilney, 17th Lancers, and 2nd Lieutenant C. Mellor, was in Ladysmith during the siege. For 27 days until the gas available with the section was exhausted, further supplies being unobtainable from the field gas factory at the base, the balloonists made constant reports on the Boer positions and movements and successfully directed the fire of artillery including the Naval "Long Toms." After the relief of Ladysmith the Section was converted into the 3rd Field Troop. The 3rd Balloon Section, commanded by Lieutenant (temporary Major) R. B. D. Blakeney, with Captain B. A. Warry, Essex Regiment, and 2nd Lieutenant A. H. Bell, was of material assistance at Fourteen Streams in forcing the Boers to evacuate their positions on the right bank of the Vaal river, by locating the Boer laager and directing artillery fire, including that of a 6-in. gun on a railway mounting; the 6-in. gun successfully dealt with the laager 7,000 yds. away, which was invisible from ground level. The extemporized balloon detachment, which was raised by Captain G. E. Phillips, was handicapped by its nature, but it did good work during the operations for the relief of Ladysmith. The 4th Balloon Section, commanded by Brevet Lieut.-Colonel J. R. L. Macdonald, with Captain A. H. B. Hume and 2nd Lieutenant T. E. Martin-Leake, arrived in China after the fighting was over. The equipment and some of the N.C.Os. were transferred to India, where they formed the basis of the Experimental Balloon Section Bengal Sappers and Miners, which was maintained until 1911.

Searchlight Sections

The use of searchlights in the field had been considered as early as 1886, when an equipment was prepared at Chatham for dispatch to Suakin, but no definite unit was formed until the war in South Africa, when a Searchlight Section to provide two lights was dispatched under the command of Captain D. H. Ridout, R.E. This was supplied with horse transport. The power was obtained from a steam-driven plant carried on a wagon, a second wagon carrying the projector and other stores.

In 1900 a second Searchlight Section was formed by the London Corps of Electrical Engineers. This was equipped with traction engines which provided the necessary power. It was commanded by Colonel Crompton, E.E.V., with Captain F. L. Lloyd, R.E., as Adjutant.

Changes after 1902

During the war in South Africa there was a continuous stream of suggestions for the improvement of the Engineer equipment, which came partly as the result of experience in the field and partly from independent inventors. Many of these centred round the use of barbed wire, which was first used on a large scale in this campaign. All such proposals were considered by the R.E. Committee who were kept busy after the war in carrying out experiments with new or improved equipment. There was also in hand a general revision of all War Establishments by the newly formed General Staff, who were insistent in calling for every possible reduction of transport for the Field units. A further change of procedure, which proved of some importance, resulted from the abolition of the appointment of the D.A.A.G. in the office of the A.A.G., R.E., in 1905. Up to this time the A.A.G. had been responsible for the equipment tables of all Field units, while the D.F.W., who had just replaced the I.G.F., was responsible for all fortress and station equipment. Most of this latter was required in connexion with the Submarine Mining and Electric Light Defences, which were under the Inspector of Submarine Defences, and this officer also advised the A.A.G. on Field Telegraph equipment. With the abolition of the D.A.A.G. it was decided that the D.F.W's. office should take over all equipment details, whether for field or fortress service, and these were allotted by the D.F.W. to the Inspector of Electric Lights. To provide for the extra work, this officer obtained an addition to his

staff of a Quartermaster, R.E., and two clerks. This arrangement worked very well and during the next few years the Equipment and Mobilization Tables and the Field Service Manuals were brought up to date and kept abreast of the changes in establishments made by the General Staff.

A summary of the changes made is of interest as describing the equipment with which the Engineer units entered the Great War.

Vehicles

By 1905 the number of different kinds of vehicles used by the R.E. had reached eighteen, of which thirteen were specially designed for use by the Engineers. The design of all these vehicles was now reconsidered in conjunction with the Royal Carriage Factory. The latter had been engaged for some time in standardizing the patterns of wheels, axles and all parts of vehicles. It was found possible to use standard patterns of wheels and axles for all R.E. vehicles, also to adopt pole draught and South African brakes on most of the vehicles, and as a corollary, it became possible to reduce the number of patterns of harness in use to two only. These changes had the further advantage that they simplified the stock of spares which had to be taken into the field by the Army Ordnance Department.

Of the changes made in the patterns of special vehicles the most important was the new form of tool-cart. In this the distinction between the limber and body was abolished and the new cart was a two-wheeled vehicle with pole draft and a box body in which tools and stores could be packed and which could be used to carry stores or materials during the progress of works; the body could also be used as a seat for men if a small party was required urgently. Two carts were usually limbered together to form a double tool-cart to be drawn by four horses. The same double cart was found suitable for the Field Troop, but to give increased mobility in this case, six horses were allotted and the load reduced.

The track of the pontoon and trestle wagons was reduced to 5 ft. 6 in. and various minor alterations were introduced, including rollers to assist in unloading the pontoons and fittings to carry spare baulks and chesses.

The cable cart was superseded by a four-wheeled cable wagon on the limber principle to carry 8 miles of field cable. A new vehicle was designed for the carriage of a collapsible boat equipment for

Field Troops, and another for wireless telegraphy. A special vehicle was designed on the limber principle for a field searchlight, to carry a projector and cable, and also a wagon for the power plant, but these were in the experimental stage.

Tools and Equipment

The patterns of the entrenching tools carried were all revised to include improvements in manufacture, these tools included picks and shovels, spades, felling axes, hand axes, billhooks, handsaws and crowbars. The shovels were of the R.E. type, the pickaxes included twenty-five per cent with a heavy 8-lb. head.

The sets of artificers' tools were reduced to the lowest possible amount. All tools not absolutely required were withdrawn and special sets were prepared for field service. All special tool-chests were omitted and tools were carried in Clarkson's chests which were available for pack transport, or in leather holdalls, carpenters' bags or sandbags. Field forges were carried, thus avoiding the use of the cumbrous forge wagon. Small grindstones were included.

The patterns of blocks and cordage were the subject of considerable experiment. The early blocks were of the Naval pattern with wooden body and sheaves and the use of tarred cordage was general. The growth of the Submarine Mining Service led to a demand for more efficient blocks and tackles and the introduction of metal blocks and wire rope falls. On the suggestion of Mr. Travis, the engineer in charge of the vessels of the Army Ordnance Department, the use of metal blocks was tried for field service and an extensive series of experiments was carried out in conjunction with the Army Ordnance Department. These showed that the patterns of service blocks were very defective, but by 1904 a new series of patterns was sealed. At the same time white Manilla cordage, which was more than double the strength of the older hemp cordage, was introduced and the whole of the ropes and lashings in use by the Bridging and Field units were reconsidered. It was also arranged that only new cordage should be taken into the field and that all cordage stored in mobilization equipment should be renewed yearly.

A pump for water supply with hose was carried on each tool-cart of the Field Companies and Field Troops, and a 600-gallon waterproof trough with the necessary pickets and cordage was included in the Field Park.

Though gun-cotton had been for some years the official explosive,

there had been considerable variety in the pattern and size of slabs. These were all reviewed and one pattern of slab (15 oz.) and one pattern of primer (1 oz.) were adopted for all services in the field. At the same time the primer and the opening in the slab were slightly coned, thus ensuring a tight fit.

All these alterations of pattern were carefully investigated by the R.E. Committee (see page 297), while the methods of packing and the arrangement of loads, also the alterations in vehicles and harness, were all tried at Aldershot under the supervision of Lieut.-Colonel J. L. Irvine, the Officer Commanding Troops and Companies, the actual packing, etc., being carried out by the 11th Field Company, R.E., commanded by Major C. C. Pery, R.E.

Bridging

During the war in South Africa considerable experience was gained with the service pontoon and excellent work was done by the specially enlisted men of the Bridging Company commanded by Major J. L. Irvine. It was found, as might have been expected, that as the pontoons got sodden by long immersion, their weight increased and their buoyancy decreased. To remedy these defects, the bridging Sub-committee of the R.E. Committee, under the Presidency of Major Louis Jackson, carried out a long series of trials with pontoons composed of rustless metal or with metal frames. All these failed, as it was found that if the metal skin was made thin enough to give increased buoyancy, it was very liable to be punctured, while the metal frames, if strong enough to stand the cross stresses to which they were subjected, became unduly heavy. It was, however, found possible to reduce the number of layers of canvas and so reduce the time required for manufacture, while the margin of buoyancy was increased. But during this time there was an almost continual increase in the weight of the guns which might accompany an army in the field, while the use of mechanical transport was likely to make a further call for stronger bridge equipment.

The abolition of the specially enlisted pontooniers and the conversion of the Bridging Companies into "Trains" did not affect the design of the equipment. The existing Bridging Companies were formed into two trains each with equipment for 200 yds. of medium bridge. Each train was organized in two half-trains of 100 yds. each.

The Bridging equipment carried with a Field Company was

increased by the addition of a trestle wagon, giving each company 15 yds. of medium bridge.

A light equipment of collapsible boats with superstructure was designed for the Field Troop. This was intended for use as rafts to carry over men, guns and equipment, the horses swimming.

There were also several forms of light Infantry footbridge, but these were not in charge of the R.E.

TELEGRAPHS

The Telegraph units at the time of the South African War had reached a high standard of efficiency, both as regards the patterns of the equipment and the training of individuals. The changes introduced in equipment after the South African War were mainly in details, except the improved cable wagon already referred to, but there were various changes in grouping due to the changes in Army organization introduced by Lord Haldane (see Chapter III). The principal of these was the introduction of a Divisional Signal Company to accompany each division. This consisted of three detachments each with a cable wagon carrying eight miles of cable. This unit had to maintain communication between Divisional Headquarters and the headquarters of Brigades.

The Army Telegraph units were organized into separate Air Line and Cable Companies. The Air Line Company had a headquarters and three sections, each section with two detachments and each with 20 miles of air line carried on four wagons and one cable wagon carrying 8 miles of cable. Each Cable Company had a headquarters and four sections, each section with two detachments, two cable wagons and two light spring wagons carrying spare cable and stores.

For peace command and training, the Army Telegraph Companies were formed into two groups with headquarters at Aldershot and Limerick.

The use of wireless telegraphy in the Army had received a setback by an agreement entered into between our Admiralty and Mr. Marconi for the sole use of the latter's patents, even to the exclusion of other Government departments. But experiments continued at Aldershot with other systems and gradually a unit was evolved with a special wagon carrying a motor and a collapsible aerial. Trials were also made with a bicycle attachment to produce the power required for small sets.

The whole organization of the Telegraph Service was again changed following the decision to amalgamate the Telegraph and Signal Service. This necessitated an enlargement of the Divisional Telegraph Companies and led to an extension of the use of telephones in the field and the provision of a light form of insulated cable. For work with the Cavalry, Cable Sections were attached to each Field Troop.

The next change of organization was that Telegraph Companies were formed for each Army or Army Corps Headquarters, while the Air Line and Cable Companies were broken up into self-contained sections each of two detachments. These sections became the working units. Two Wireless Telegraph Companies were formed to accompany Army Headquarters and were used mainly for communication with the Cavalry.

Aeronautics after South African War

After the South African War ballooning equipment and technique were further improved, the man-lifting kites invented by an American, Mr. S. E. Cody, were added to the equipment, and following upon the success of the Zeppelin airship in 1900 and the conquest of the air by the Wright brothers with their flying machine in December, 1903, experiments with airships and aeroplanes were taken up as the exiguous funds available allowed. A great impetus to the work was given by the appointment in 1903 of Brevet Lieut.-Colonel J. E. Capper as O.C. Balloon Sections (which later were designated balloon companies). A limbered balloon wagon was devised, which much improved the handling of balloons and was also suitable for use with kites; the same cable, basket car, telephones and other accessories were used for balloons and kites. The addition of the kites to the regular equipment in 1906, after two years of trial, including employment on manœuvres in 1905 when Colonel Capper made successful kite reconnaissances, enabled aerial observation to be provided in conditions from a calm up to winds of 50 miles an hour. Lieutenant R. V. Doherty-Holwell conducted the first army experiments with the kites under the supervision of Mr. Cody, who was made chief instructor in kiting, and the record altitude of over 3,000 ft. was attained by Lieutenant P. W. L. Broke-Smith in 1905.

After the advent of power-driven aircraft the use of captive balloons and kites was progressively confined to the direction of

artillery fire, which remained the rôle of static aircraft until aeroplane wireless was perfected. When kites were taken up, the kite balloons originated in Germany had not achieved reliability and kite balloons were a failure in the Russo-Japanese War in 1904-5. The British balloon and kite equipment required about one third of the personnel and half the transport needed for kite balloons and could provide aerial observation in much stronger winds, while the small balloons and flights of kites were much less vulnerable. The efficiency which kite balloons eventually attained led to their adoption in the 1914–18 war.

The feats of Santos Dumont in his little dirigible balloons in 1901 led to permission being given to Colonel Templer to construct a dirigible balloon or airship in the Balloon Factory. A cigar shaped balloon was made, but continued limitations of funds delayed completion of the airship.

In December, 1904, Colonel Capper, after attending the St. Louis exhibition on behalf of the War Office, paid a personal visit to the Wright brothers at Dayton, Ohio. They had then made two flights of 5 minutes' duration and were closing down for the winter, during which they intended to build a new machine for trial the following summer (with which they achieved a flight of 24 miles). Satisfied that the Wrights had discovered a great deal about the art of flying, Colonel Capper elicited from them an informal offer to come to England and work solely for the British Government for 4 years, imparting their knowledge to no one, except their own country if that needed it, for a sum of £20,000. (Actually the U.S. Government took no interest until 1908 when they ordered a machine.) Colonel Capper reported the result of his visit to the War Office on his return and recommended that the Wrights should be engaged on these or similar terms; but the proposal, which was strongly supported by Brigadier-General Ruck, who was the D.F.W. and a keen advocate for the development of the aeronautical service, was rejected. The British authorities had as yet no belief in the practicability of flying and subsequent negotiations for the purchase of a Wright machine were abandoned in 1906. The British service thus missed the chance of being the first in the field in developing military aviation.

In the winter of 1905–6 the Balloon Factory was transferred from the restricted site at Aldershot to Farnborough, where there was room for the necessary expansion and adjoining open country was available for the provision of an aviation ground. The balloon

companies were moved to barracks in North Camp and the administration of the Balloon School, into which they were absorbed, was combined with that of the Balloon Factory, under Colonel Capper. Airship operation commenced on the appearance in 1907 of Dirigible No. 1, popularly called "Nulli Secundus," whose completion had been finally delayed owing to the difficulty of getting any suitable engine until Colonel Capper secured one in Paris. The shape of her goldbeater's-skin balloon, which had been designed in 1902, was by now out of date and the construction was perforce elementary in other respects, but "Nulli Secundus," piloted by Colonel Capper and with Mr. Cody in charge of the engine, made a spectacular flight to London, encircling St. Paul's Cathedral, on 5th October, 1907. On the return journey the airship had to be landed in the Crystal Palace grounds as a strong head wind had sprung up, but she achieved the current endurance record for a non-rigid airship of 3½ hours. In 1909 "Nulli Secundus" was followed by Dirigible No. II, or "Baby," which was made very small to test the pisciform shape of the balloon. The enlargement of this airship as "Beta," together with a third experimental airship, "Gamma," was in hand when Colonel Capper ceased to have charge of the Factory on the separation of the Factory from the Military side. The defunct "Nulli Secundus" was classified as "Alpha" in the series. "Beta," which carried a crew of three and was equipped with a 35 h.p. Green engine (the first successful British aero engine), had many notable performances to her credit, including the first night flight, to London and back, in June, 1910, and intensive reconnaissance flying, covering the area between Hampshire and the Bristol Channel, during the Army manœuvres of 1910. In November, 1910, Mr. Haldane was taken for a flight in "Beta"; he claimed to be the first War Minister to fly in an airship. "Gamma," which also appeared in 1910, had a balloon of the rubberized fabric which was now in general use and was more suitable than goldbeater's-skin for airship envelopes, could carry a crew of seven, and was fitted with swivelling propellers, the first successful example of the device, which greatly facilitated ascents and landings. "Beta" and "Gamma" remained in use, between periods in dock for overhaul or modification, up to and after the formation of the Royal Flying Corps in 1912, and made many flights over the southern portion of England.

Anticipations of possessing two full-sized military airships of proved performance, a Clement Bayard and a Lebaudy, were not

realized. These airships were flown to England from France in October, 1910, under the sponsorship of the Parliamentary Air Committee and the *Daily Mail* and the *Morning Post*, respectively, and landed at Wormwood Scrubs and Farnborough, where sheds had been provided for them. The Clement Bayard was purchased by the War Office in conjunction with the Parliamentary Air Committee; but she had seen much service, her balloon required replacement, and she was unlikely to pass the tests demanded for an efficient military airship, so she was broken up. The Lebaudy had an accident upon arrival, the shed being a few feet too low for her as she had been built higher than had been specified. The landing party was ordered to go on by an enthusiastic spectator, believed to be a very senior officer in uniform, when the officer in charge had halted the airship at the entrance to the shed while he surveyed the situation and decided whether she could be squeezed in or must be deflated. Seven months later the Lebaudy, after repair under the supervision of her manufacturers, was out of control on her first test flight in the hands of her French crew, and was wrecked when attempting to land.

In 1907 and 1908 experiments were made with two aeroplanes of original design, which were built in the Balloon Factory under the supervision of their inventors, Lieutenant J. W. Dunne of the Wiltshire Regiment and Mr. Cody, who was already attached in connexion with his kites. Progress naturally had to be made by trial and error, and was hampered by the dearth of efficient aero engines, which were then in their infancy; the Dunne biplane had not got beyond short soaring flights, although Cody had flown distances of over a quarter of a mile, after making in May, 1908, the first recorded flight of 50 yds. in Great Britain, but in April, 1909, further aeroplane trials were prohibited as the expenditure incurred on the Dunne and Cody machines, £2,500, was considered to be too great. Both designs were successfully flown later under private auspices. Cody gained the first prize in the military aeroplane trials in 1912 and created several current aviation records in his time; he was killed in a flying accident in 1913. The Dunne aeroplane possessed remarkable inherent stability, and its ease of handling was shown by the fact that a one-armed man, Captain A. D. Garden, gained his flying certificate in a Dunne.

In 1910 the Duke of Westminster presented two aeroplanes, a Voisin biplane, which was retained in the Balloon Factory for research purposes, and a Blériot monoplane similar to the machine

in which Blériot crossed the Channel in 1909. Apart from the earlier experiments with the Dunne and Cody machines, the first Army flying was carried out by Lieutenant R. A. Cammell, R.E., in the Blériot in November, 1910, on Salisbury Plain. Engine failure caused him to make a forced landing when flying the machine to Farnborough for overhaul and it did not become available again. Lieutenant Cammell then purchased a Blériot of the latest design in France and flew it throughout the summer of 1911. Cammell was one of the three officers of the Air Battalion who qualified in all forms of aircraft—balloons, kites, airships and aeroplanes—and he was a very skilful and versatile aviator. His career was brought to an end when he was killed in September, 1911, while taking over an aeroplane of unusual design which had been presented to the Army by its maker. The first aeroplane purchased for the Army, a Henry Farman biplane, was flown at Farnborough from January, 1911, by Captain C. J. Burke, of the R. Irish Regiment, who together with Captain J. D. B. Fulton, R.A., was attached to the Balloon School in advance of the formation of the Air Battalion in April of that year. Flying training was then concentrated at Larkhill on Salisbury Plain, where the aeroplane company was stationed, but from the end of the year an aeroplane detachment was built up at Farnborough. Flights were made to many other places, including the Cambridge area, where preparations were made for the participation of six aeroplanes (and an airship) in the autumn manœuvres, which were cancelled owing to the drought, and to the civilian aerodromes at Hendon and Brooklands, beside journeys between Salisbury Plain and Farnborough. To supplement the Farman and Cammell's Blériot a batch of six Bristol biplanes was provided for training purposes, but otherwise the War Office policy at this stage was to purchase only single aeroplanes of promising new types as they appeared, for trial. The Bristols were thus followed by a Bréguet Tractor biplane (the first all-metal frame aeroplane), and Nieuport, Deperdussin and Bristol monoplanes. In March, 1912, the B.E., a tractor biplane made in the Aircraft Factory, was handed over to the Air Battalion; this was the prototype of the successful range of B.E. biplanes. Owing to delays in delivery of new machines and the accidents which were then not unusual, the number of effective aeroplanes with the Air Battalion seldom exceeded four or five.

In earlier years Colonel Capper and other officers had taken part in free ballooning competitive events, and now the Army flying

officers showed their mettle. Lieutenant Cammell in his Blériot and Lieutenant H. R. P. Reynolds in a privately owned Howard Wright biplane were well up in the *Daily Mail* Circuit of Britain race in July, 1911, when they had to retire owing to engine failure, having respectively got as far as Wakefield and Harrogate from the starting point at Hendon; only four competitors out of twenty-seven completed the circuit. In the competition for the Mortimer Singer Cup, which was to be presented to the Army pilot making the longest flight with a passenger during the year ending 31st March, 1912, Lieutenant Cammell in his Blériot covered a distance of 110 miles, of which 90 miles counted for the competition. This was a notable achievement at the time, but owing to his military duties Cammell had no opportunity of bettering it before he was killed flying in September, 1911, and the record stood until Lieutenant B. H. Barrington-Kennett, Grenadier Guards, flying the Army Nieuport monoplane, won the cup with a flight of 249½ miles in March, 1912, making the current world record for a flight with a passenger.

The Air Battalion was allowed no mechanical transport except one motor-car, but the Commandant, Major Sir Alexander Bannerman, procured sanction to the purchase of two powerful second-hand touring cars (the maximum number permitted) and their adaptation as aircraft tenders, with double rear wheels and wagonette bodies; these were the forerunners of the R.F.C. tenders. In continuation of earlier trials in free balloons, experiments in the evolution of aircraft wireless apparatus were carried out by Captain H. P. T. Lefroy, O.C. Wireless Experimental Section R.E., so far as the pressure of work on ground wireless sets for the Army permitted. In February, 1911, signals were transmitted from and received in the airship "Beta" up to a range of 30 miles, and in May, 1912, successful tests were made of a set installed in a "B.E." aeroplane; these experiments led to the subsequent achievements in this field.

No account of the work of the aeronautical branch of the Corps should close without a reference to the good services of the N.C.Os. and men, who handled and went up in all forms of aircraft, from balloons to aeroplanes, in their turn. A number of the N.C.Os. and men of the Air Battalion subsequently became airship or aeroplane pilots in the R.F.C.

From the end of 1911 preparations were in hand for the transfer of responsibilities to the Royal Flying Corps, which was inaugurated

in May, 1912, absorbing the bulk of the officers and other ranks of the Air Battalion.*

Searchlight Equipment

The use of electric lights in the field having been found successful during the South African War, a special company was formed at Aldershot in 1906, under the command of Captain R. Walker, R.E. The company was in four sections, the equipment for each section included a power wagon, carrying an internal combustion engine and motor, and a projector wagon on the limber principle, the projector being mounted on the body, while a coil of double cored cable was carried on a drum round the axle of the limber. All vehicles were horse drawn. This company was tried during manœuvres at Aldershot and a favourable report on its use was compiled by a special Committee under the Presidency of Colonel C. Penrose. It was criticized in two directions. Sir Evelyn Wood's Committee, which reported in 1906, advised that while electric lights would be useful in the field, they should not be formed into a special unit but single lights should be attached to each Field Company; on the other hand, the General Staff, while admitting lights might be of assistance in certain circumstances, considered the plant required would need too much transport to justify the inclusion of such a unit in the normal functions of a Field Army. Finally the Kitchener Committee of 1912 recommended that the unit should be broken up, but that lighting by night in the field could be provided by the use of flares or similar mechanical devices and recommended the addition of ten men to the strength of each Field Company to take charge of such equipment. This was approved.

*The officers of the Air Battalion were :—Commandant, Major Sir Alexander Bannerman, Bart., R.E.(*b*); Adjutant, Captain P. W. L. Broke-Smith, R.E. (*a*) (*b*); Experimental Officer, Captain A. D. Carden R.E.(*b*); Quartermaster, Lieutenant F. H. Kirby, v.c., R.E., *No. 1 (Airship & Balloon & Kite) Company*, Captain E. M. Maitland, Essex Regt. (O.C.) (*a*) (*b*); Lieutenant C. M. Waterlow R.E.(*a*); Lieutenant A. G. Fox, R.E.(*a*) (*b*); replaced by 2nd Lieutenant J. N. Fletcher, R.E.(*a*) (*b*); *No. 2 (Aeroplane) Company*, Captain J. D. B. Fulton, R.A. (O.C.) (*b*); Captain C. J. Burke, R. Irish Regt. (O.C. Farnborough detachment) (*b*); Lieutenant D. G. Conner, R.A. (*b*); Lieutenant B. H. Barrington-Kennett, Grenadier Guards (*b*); Lieutenant R. A. Cammell, R.E. (*a*) (*b*); (killed flying Sept. 1911 and replaced by Lieutenant Fox), Lieutenant G. B. Hynes, R.A. (*b*); Lieutenant H. R. P. Reynolds, R.E. (*b*); Other officers were attached from time to time.

(*a*) qualified as airship pilot. (*b*) qualified as aeroplane pilot.

Field Parks and Line of Communications

Up to the end of the war in South Africa, the organization of the Royal Engineers with the Field Army included a unit called the Field Park, one of which was to be provided for each Army Corps. This park contained any special stores which were too heavy to carry with the Field Company and was also a centre where materials could be collected or spare equipment accumulated. When the Army was reorganized into six large divisions, this unit was abolished and nothing substituted.

Included in each Field Park there had been special sections for printing, photography and lithographic work. Each had a special form of vehicle which acted as an office. On the abolition of the Field Parks, the Printing Section was retained as a separate unit to accompany Army Headquarters ; sets of equipment for photography and lithography were sealed for use if required, but their special wagons were withdrawn.

At the same time the question of the R.E. units to be provided for the Line of Communications came under consideration and finally one of the Fortress Companies (29th) was allotted for this duty. The centres where R.E. work would be required on a typical Line of Communications were at the base, at railhead and at two points in advance of railhead but behind the Field Army, where some organization similar to an enlarged Field Park would be required for work round Army Headquarters and to supply R.E. stores to the Field units. The company was therefore organized in four portions, each included the staffs for an office and for a store depot, while at the base and railhead the R.E. would, in addition, have to establish workshops and an organization for Works. An equipment to accompany the unit overseas was provided, consisting of sets of portable workshop machine tools, each with a power plant. These sets had been selected by the R.E. Committee at the end of the South African War and were kept stored in reserve at Woolwich. The transfer of these machines to mobilization equipment was intended to enable the peace personnel to become acquainted with the articles in their charge. The peace station selected for this unit was Chatham, so that the company could be employed in the workshops at the S.M.E.

This company was only intended as a nucleus for the R.E. organization on the Line of Communications and it was supplemented by two Fortress Companies, stationed in peace-time at

Portsmouth and Plymouth. Later these two companies were given an organization like a small Field Company, with two double tool-carts and horse transport. This was all the organization provided for Works, but the Telegraph Service had a more complete organization of two strong companies, formed from the 2nd Division Telegraphs, including a number of reserve employees from the Post Office. These units were intended to take over and work any telegraph lines in the area of operations which might be handed over by the local government.

There was also provided for the Line of Communications the nucleus of a railway organization, drawn from the R.E. companies at Longmoor, but this was only intended to assist the French railway authorities, who had accepted the responsibility for all rail movements in France.

Reserves

An important question in the organization of a Field Army is that of the reserve stores to be held in time of peace and of the amounts which should be taken into the field to supply the army. In time of peace the supplies held by the Army Ordnance Department, who are responsible for the supply of all equipment, were equivalent to three years' peace consumption, though there were special scales for such items as artillery and small arm ammunition. During the South African War these reserves were found quite inadequate to meet the requirements of a protracted war and a special Commission, presided over by Sir Francis Mowatt, was formed in 1900, to consider the whole question of these reserves. As time was pressing, this Committee recommended that for the R.E. units the reserve should be equal to the quantities carried in the field or 100 per cent. This was obviously only a rough and ready way of dealing with the question, as in the case of important consumable stores, such as telegraph cable or explosives, it would be obviously inadequate. On the other hand, a reserve of 100 per cent of vehicles or special bridging material would be excessive and would be open to the objection that there could be no adequate turnover in time of peace. For the ordinary consumable stores, such as paint, oil or canvas, the peace stock would be ample. The scales governing the preparation of this list of stores, as laid down by the General Staff, were that the stores were to be sufficient to provide for the requirements of a Field Army composed of six divisions and one Cavalry Division for a period of three months. This was on the assumption

that on the outbreak of war, orders were to be placed at once with manufacturers for further supplies. With these considerations in mind, the whole list of stores used by the R.E. was reviewed in concert with the Army Ordnance Department and a list of reserve stores to be maintained by the Army Ordnance Department was approved. These stores, which included such items as barbed wire and sand-bags, as well as Engineer tools and materials, were to be taken into the field and distributed by the A.O.D.

There was also a special list called "Engineer equipment for demolitions, water supply, entrenching and siege requirements." This list was prepared on the advice of the R.E. Committee and was an amplification of a list which had been in use since the Egyptian campaigns of 1882–6. It contained special water supply stores, pumps of various sizes, troughs, some 1¼-in. tube wells and 2 miles of 2½-in. light steel water main with couplings. There was also a special stock of explosives and firing apparatus suitable for mining work, and containers for under-water charges; also heavy lifting tackle, to lift weights up to 4 tons, 22½-ton jacks and various sizes of steel wire rope. This reserve was to be controlled by the R.E. and the articles to be taken into the field were to be selected by the Engineer-in-Chief of the force.

It may be added here that the reserves of Engineer stores provided proved amply sufficient for the early months of the European War. Later, as the size of the Field Army increased very rapidly and demands were made for campaigns in other areas, the supply of some articles, as sand-bags, barbed wire or telegraph stores, fell short of requirements; while as trench warfare developed, demands were made for new weapons and materials, which had not been anticipated. But responsibility for the delay in the supply of such articles should not be placed on the Royal Engineers.

Stores for Training

It was laid down, as a principle, that Engineer units of the Field Army should hold in peace-time the whole of the equipment and tools they would require on mobilization. Of this equipment, all vehicles and harness were used by units during the year for training, and also such equipment as bridging stores and entrenching tools. Consumable stores such as cordage and sand-bags, though held by the unit in peace, were not used for training, but a special allowance of such stores was issued for use in peace. The only exceptions to this rule were the explosives which were held by the Army Ordnance

in local magazines, but so packed that they could be issued at short notice. An annual allowance of gun-cotton and similar stores was made to each unit for expenditure during the year. In addition to the equipment taken into the field, there was a supply of tools and materials for Fieldworks, trestle and suspension bridging and of mining, which were held at stations in Engineer charge and were available for the instruction of any part of the Army. There were also local stores of camping material, for cooking, water supply, etc., which were held by the R.E. and used during the annual training. Similar sets of Fieldwork and camping stores were held in all fortresses and defended ports at home and abroad, so that all R.E. Fortress Companies could carry out the same annual training as the Field units. The lists of stores for training were brought up to date during the revision of equipment which followed the South African War and an addition was made of a money allotment to each station, which could be expended locally on materials suitable for the station.

Inspection of Equipment

An important factor in the arrangements for the supply of R.E. equipment was the officer called the Inspector of R.E. Stores, who had his headquarters at Woolwich Dockyard. This appointment dated from 1871, when the first large supply of Submarine Mining stores was delivered at Woolwich, and a detachment of Submarine Miners, under Lieutenant Scott, was sent to receive and inspect these stores and dispatch them to stations. This proved so useful that, in 1873, Lieutenant C. M. Watson was appointed by the War Office to take charge of this work, when one of his first jobs was the dispatch of telegraph and other R.E. stores for the Ashanti expedition of 1873, including the materials for a light railway. In 1889 this position was raised to that of an Inspector of the Army Ordnance Department. The work and duty of this officer increased largely with the growth of technical services and experience of the value of careful inspection. In 1894 an officer of the Coast Battalion was appointed as an Assistant Inspector, and in 1900 this officer was replaced by an R.E. Officer specially trained in Mechanical Engineering ; from this time, till 1914, the two officers in this appointment represented the Electrical and Mechanical branches of the R.E.

The work of this branch included the custody of a complete set of sealed patterns of all articles of R.E. equipment ; such patterns were sealed by the Army Ordnance Department after final approval

by the R.E. Committee, who also prepared a detailed specification to govern contract and manufacture. Contracts for supply to this specification were called for as necessary from a list of selected firms and as the goods were supplied they were inspected by the I.R.E.S. and passed to the Army Ordnance Department for issue. As experience was gained the methods of inspection improved and special apparatus was obtained for tests. This branch proved very successful during the Great War.

The Royal Engineer Committee

The early history of the Royal Engineer Committee has been traced, as described in Volume II, Part II, Chapter V, to a Royal Warrant of 1782. The records of its activities prior to 1864, however, are not extant and it is from that date, or perhaps from 1866 when the Committee was reconstituted on a more formal and official basis, that its more modern history should be dated.

Before 1862 no form of pontoon bridging equipment had been adopted as a standard pattern to accompany our Armies in the field, but in that year a special Committee was appointed to investigate and make recommendations upon the type and form most suitable for the British Army. About the same time an opposed river crossing exercise was held in India, near Delhi, and one of its objects had been to examine this problem or, at least, to determine the particular needs of the Army in respect of bridging equipment. The report on this aspect of the exercise is recorded in the *Extracts of Proceedings of the Royal Engineer Committee*; these records of the work of the Committee are continuous from that report up to the early part of the Second World War, with the exception of a short period during the war of 1914–18.

It is of interest to note that this first report was signed by "B. Blood, Captain, R.E.," and that officer will be recognized by all Sappers as the well-known and distinguished soldier who in later years became Father of the Corps in the revived post of Chief Royal Engineer—General Sir Bindon Blood.

The Special Committee to investigate pontoon bridging arranged for a small party of Engineer officers to visit the leading military nations of Europe and to examine the types of floating bridge equipment used in their armies. The result of these investigations was a recommendation for the adoption of the type that employed "saddle" loading of the floating supports in the form of boats or pontoons, in preference to "gunnel" loading. The former in

general gives a more flexible bridge and simpler means of providing ferry rafts, while the latter has some small advantage in the size and weight of the individual float; the Austrians had adopted the former type, whilst the French used the latter. It is of some interest to note that the founder of a firm of bridge engineers in Austria (later in Czechoslovakia), was Napoleon's Chief Bridging Engineer, and succeeding generations of his family maintained the firm's tradition of being the leading experts in Europe on heavy floating bridges. Incidentally the R.E. Board, the successor to the R.E. Committee, was in contact with this firm and the descendant of Napoleon's Bridge Engineer shortly before the Second World War.

On completing its report and making its recommendations this Committee did not dissolve but remained in being, probably under the ægis of the R.E. Committee. In 1865 a special Committee consisting of :—

Lieut.-General Sir R. Airey, Q.M.G.
Major-General Sir F. Abbott
Major-General W. Sandham, R.E.
Colonel J. W. Gordon, R.E.
Colonel J. L. A. Simmons, R.E.
Colonel J. S. Addison
Colonel J. Hawkins, R.E.

was formed to inquire into the organization of the R.E. Establishment at Chatham. They included in their report, dated 25th September, 1865, recommendations in regard to the R.E. Committee which at that time consisted of the Director of the R.E. Establishment, the Commandant at Shoeburyness, the Superintendent, Royal Carriage Department at Woolwich and the R.E. Officer Instructors at Chatham. As a result of their recommendations, the Committee was reconstituted in 1866 so as to consist entirely of Engineer Officers. This decision was conveyed to the Military Secretary in letter No. 7624/7, dated 5th March, 1866, which states that

"... The Marquis of Hartington concurs in the recommendation contained in that report that the Engineer Committee should be reconstructed, and in future consist of Engineer Officers only.

His Lordship also concurs in the arrangement now proposed for obtaining the opinion of the I.G.F. on the reports of the Committee previous to the submission of them to the Secretary of State and the F.-M. Commanding-in-Chief."

The functions of the R.E. Committee were at that same time defined as

> "... to consider questions of Military Engineering on which it is desirable that the Secretary of State for War should be specially informed, such as inventions and improvements in articles of Engineer Equipment, etc., and all the reports of the Engineer Committee must have reference to the equipment and efficiency of Engineers in the field."

In another letter to the Military Secretary, Horse Guards, dated 19th March, 1866, appeared:

> "... Members of the permanent Engineer Committee at Chatham shall be Colonels Simmons and Collinson, Captain Parsons and Lieut.-Colonel Lennox." Colonel J. L. A. Simmons C.B. being the first President of the Committee as reconstituted.

It was not long before difficulties arose and these mainly concerned the clash of responsibilities between the instructional duties and the Committee work.

In 1869, the difficulty was represented that the R.E. Committee, consisting solely of Officers of Engineers belonging to the Establishment at Chatham who had other duties which occupied their time, could not advise fully on new inventions and on trials and that it was most desirable that a permanent Secretary should be appointed (Minute No. 7624/20, dated 16th March, 1869). At this time, in supporting this recommendation, the Director of the R.E. Establishment wrote, on 9th March, 1869:

> "... The time of these Officers being already fully occupied, they find it inconvenient to give the leisure necessary for the consideration of the several inventions submitted. Consequently the investigations of the Committee are often hurried and imperfect."

A year later, in a letter dated 25th January, 1870, the Commandant of the S.M.E. again pointed out that he had had further experience of the inefficiency of the present system:

> "... the principle of which was that the Instructors of the S.M.E. are members of the R.E. Committee, and the Brigade Major, Secretary.

As these Officers are fully employed in their respective capacities, they cannot afford the time necessary for the proper consideration of the many subjects submitted for investigation, even when experiments and meetings take place at Chatham, and when it is necessary to conduct experiments at another place—such as lately at Portsmouth—the Brigade Major has to remain here for the performance of his legitimate duties, and the members cannot afford to absent themselves more than two or three days (some not at all), the consequence of which is that the experiments are often hurried and imperfect."

As a result, Mr. Cardwell, the Secretary of State for War, applied in February, 1870, to the Treasury for a sum of £300 per annum,

". . . to defray expenses incident to the Committee of Officers of Royal Engineers, charged with consideration of proposals respecting the application of electricity to military operations, and more especially in connection with mining and torpedoes."

This sum of £300 was to provide emoluments for :—

Secretary	£200 p.a.
Clerk	£16 p.a.
Draughtsman	£23 p.a.
Messenger	£12 p.a.
Travelling Expenses	£49 p.a.

These emoluments do not appear unduly generous, but it is probable that they were in addition to normal rates of pay.

In their letter dated 11th June, 1870, the Treasury approved this sum and the provision of a permanent Secretary for the Committee, and on 17th May, 1871, the Treasury was informed that provision had accordingly been made in Vote 1, Sub-head T, of Army Estimates 1871–2. Treasury approval was accorded in their letter dated 25th May, 1871. Captain R. Home was selected for this appointment and had taken up the post on 1st April, 1870.

This appointment of a full-time Secretary to the Committee marks a further step towards recognition of the importance of experimental and development work.

A further responsibility was added to the functions of the R.E. Committee about the same time. In 1870, the patterns and inspection of all War Department scientific instruments came under the supervision of the R.E. Committee. The Control Department, which was formed in 1869, included the Assistant Inspector of Works (Lieu-

tenant G. E. Grover, R.E.), who was charged with the duties of inspection of all scientific instruments ; the inspection was moved from London to Woolwich Arsenal at that time on the formation of the Department. Later in that year, however, Lieutenant Grover recommended some changes in the system and proposed that a R.E. Officer, under the direction of the R.E. Committee, should be appointed with the title of " Inspector of Scientific Instruments to the War Department," to inspect all supplies of drawing, mathematical, meteorological and survey instruments supplied for the service of the War Department.

The I.G.F., with the recommendation of the Inspector of Works, obtained the views of the Controller who agreed that a R.E. Officer should be appointed especially for this duty and that the inspection should be made at Woolwich ; this proposal was also concurred in by the S.G.O. and the D. of A. As a result, the Commandant, S.M.E., detailed Captain R. Home, R.E., the then Secretary of the R.E. Committee, for the duties of this inspection on 12th November, 1870. Early in 1871 it was approved that the articles should be sent from Woolwich to Chatham for inspection, but a year later the Controller complained that the system had broken down and it was changed back so that Mohammed had to go to the Mountain, and the officer had to proceed from Chatham to Woolwich to carry out inspection whenever required.

A modification to the composition of the R.E. Committee was proposed in 1872, when the I.G.F. proposed to reconstruct the R.E. Committee to comprise :—

(*a*) A President, *ex-officio*.
(*b*) One Lieut.-Colonel, R.E., to be paid £800 per annum by the W.D.
(*c*) One Lieut.-Colonel, R.E., to be paid £800 per annum by the Indian Government.
(*d*) A Secretary.

With the following associate members (unpaid) :—

(*a*) The three Chief Instructors, S.M.E., to be associated, each for the subject of his own special appointment.
(*b*) The Chemist to the W.D.
(*c*) The D.A.A.G., R.E., for matters relating to Engineer equipment.

This attempt to form a permanent nucleus for the Committee, independent of instructional or other duties, again stressed the point

that instructors could not devote sufficient time to the investigations and experiments and this was endorsed by the I.G.F. who minuted :

> " . . . I cannot help feeling that, while many subjects are unavoidably postponed, many others have been dealt with in too superficial a manner, and the inevitable result must be that some day the Committee will—from no fault of its own—lead the W.D. into some serious mistake."

This proposal was not accepted by Mr. Cardwell, then Secretary of State ,who preferred a different solution, and a letter was addressed to the Treasury by Mr. Campbell-Bannerman, on the 1st April, 1873, representing that Mr. Cardwell had for some time had under his consideration the working of the Royal Engineer Committee. He proposed that the duties performed by the Committee as a whole should in future be carried out by Committees appointed from time to time as necessity arose, but in order to maintain unity of the labours of these committees a Subaltern Officer should be appointed as Assistant Secretary and he should be charged with the preliminary inquiries and investigations of the subjects laid before the Committee, the conduct of experiments and the preparation of reports.

As a result of these recommendations, an Assistant Secretary to the R.E. Committee was appointed on the 10th May, 1873, at a salary of £150 per annum and three months later he was ordered to be quartered in London so that he might carry out his duties at the War Office. This appointment was, however, abolished in 1876.

This formation of Committees under the R.E. Committee really started the system that persisted ever since in its method of working, though most of them were referred to originally as Sub-Committees, except in special cases such as the " Torpedo Committee " that served from 1870 to 1876 to deal solely with Torpedo Defence, and relieved the R.E. Committee from detailed work on that subject.

It is interesting to note that the appointment of an Assistant Secretary was revived temporarily during 1881 and 1882 as the Secretary of the Committee, Captain G. Barker, was employed also as Secretary of the Channel Tunnel Committee.

In October, 1886, in referring to a proposed revision of membership, the Committee reported to the I.G.F. :

> " . . . The system of a separate Committee and separate Secretary for Submarine Mining work was duly tried, and was, after full

consideration, abolished in favour of the present system by which Submarine Mining questions nominally came before the whole Committee, but really are dealt with by only those members who have a special acquaintance with this subject."

The committee as revised, with the approval of the Secretary of State in April, 1887, remained the same for many years with the exceptions that the O.C.S.M. Battalion disappeared when the battalion was reorganized in 1892, and the addition of the Inspecting Officer, R.E., which was made in that same year.

Its composition was :—

President	The Commandant S.M.E.
Members	The W.D. Chemist (became Associate Member later when S.M. work was reduced). One Assistant Director of Works and Fortifications. The A.A.G., R.E. The Inspector of Submarine Defences. The O.C.S.M. Battalion, Chatham. The Instructors at the S.M.E., Chatham, in Field Fortifications, Construction, S.M. Mining, Surveying, Electricity.
Associate Members	The O.C. 2nd Division Telegraph Battalion (Permanent Telegraphs). The O.C. 1st Division Telegraph Battalion (Field Telegraphy). The O.C. Pontoon Troop (Pontoons). An Officer Indian Store Department (Indian Stores). The Assistant Inspector S.M.D.
Secretary	An Officer to be specially appointed.

Apart from the changes in 1892 mentioned above and the subsequent omission of all representation of Submarine Mining when the Corps relinquished its responsibilities for that subject, the headquarters of the Committee, with its permanent Secretary, were moved about 1905 to the War Office under the Inspector of Electric Light (F.W.4), who became *ex-officio* a member for electrical work and all engineer equipment. At the same time the Assistant Director

of Fortifications and Works (F.W.1) was appointed President in place of the Commandant S.M.E.

The Committee and its work had thus become a direct War Office controlled concern, and continued so up to the 1914–18 war, though in 1913 the position of President was assigned to the Chief Engineer, Aldershot. This was the general form of the Committee at the time of the outbreak of war in 1914. In fact apart from the changes involved by the war organization bringing in the Ministry of Munitions and its department of Munitions, Inventions and the Trench Warfare Committee, with both of which the wartime work of the Committee was for a time associated, the form and composition of the R.E. Committee remained the same after it reverted to War Office control at the end of the war and continued so until the Committee itself disappeared and was translated into an executive Board with its own experimental and development establishments. That phase is dealt with in Volume VII.

Here this record of the constitution of the R.E. Committee up to the 1914–18 war may fitly be closed by a list of the Secretaries, its only permanent officials on whom a large part of the success of the work depended.

Prior to the appointment of a permanent Secretary in 1870, two officers acted as Secretary *ex-officio*, being Brigade Majors to the R.E. Establishment :

Major R. Harrison, from 15th March, 1866.
Captain F. A. Marindin, from 15th September, 1869.

The permanent Secretaries were :—

Captain R. Home, 1st April, 1870.
Captain V. G. Clayton, 1st August, 1871.
Captain M. T. Sale, 1st August, 1876.
Major G. E. Grover, 1st February, 1881.
Lieutenant G. Barker, 25th February, 1881.
Captain G. W. Addison, 20th December, 1882.
Lieutenant L. B. Friend, 27th December, 1884.
Captain H. E. Rawson, 1st January, 1890.
Captain H. Druitt, 1894.
Major G. A. Carr, 1899.
Major G. Harrison, 1902.
Major E. G. Godfrey-Faussett, 1906.
Major R. H. Boys, 1910.
Major R. H. Lewis, 1913.

CHAPTER XIV

THE ROYAL ENGINEERS IN MISCELLANEOUS EMPLOYMENT

Employment on Staff of the Army—Staff College—R.E. Instructors and graduates—Commands on active service—Districts at home—Coast Defences—Field Army—General Officers i/c Administration—Fortresses abroad—Commands abroad—War Office—Military Education and Military Intelligence—Educational establishments—Army Ordnance Department—India—Admiralty—Board of Trade—Local Government Board—Post Office—Science and art—Other Government service—Survey—Employment abroad—Foreign Office—Colonial Office—List of Colonial Governors—Military Training — Civil work — Royal Geographical Society — Civil Engineers—Electrical Engineers—Mechanical Engineers—Structural Engineers.

No history of the Corps of Royal Engineers would be complete without some reference to their employment on duties other than those of their own Corps; such as service on the Staff. But, in addition to their military duties, the Corps has always been considered as a body of official engineers available for employment on any work required by the Government, whether at home, in the Colonies or in foreign countries. In addition, the Corps has always been in close touch with the various organizations connected with the general engineer work of the country and individuals have contributed to the growth of engineer knowledge and to the organization of engineer work.

Employment of the Staff

In the British Army the term "Staff" has been used in many different senses, but may be defined generally as employment on military duties other than the command and training of regular units. Thus, the term "Regimental Staff" is used to include the Adjutant and Quartermaster of a battalion or similar unit, but not the Officer Commanding; the term "Educational Staff" is used for the Professors or Instructors at the various educational establishments; while the term "Army Staff" is used for the officers who assist the General and other officers in command of districts or stations. Since the reforms which followed the Esher Committee in

1904, the Army Staff has been divided into two parts, the "General Staff," who deal with military operations and training, and the "Administrative Staff," who deal with drafting, movements, quartering, and the general arrangements for feeding, clothing and housing the troops.

Up to 1904 the General and other Officers Commanding stations and all officers above the rank of Lieut.-Colonel, even though employed on the duties of their own corps, were described as members of the Staff of the Army with such titles as "Major-General on the Staff," or "Colonel on the Staff."

To attract suitable officers to take up service on the Staff, the pay allotted to such appointments was higher than the regimental pay of an officer of similar rank, while special honour was attached to such appointments by the addition of the letter "s" against an officer's name in the Army List and by the rule that good service on the Staff carried considerable weight when selecting officers for higher promotion.

Prior to the abolition of the Board of Ordnance, very few appointments to the Army Staff were made from officers of the Ordnance Corps; this tradition or prejudice remained even after the abolition of the Board in 1855, and it was some years before officers of the Royal Engineers were employed on any staff work not connected with their special duties.

Staff College

For the training of officers of the Army in staff work, the senior department of the Royal Military College at Sandhurst was formed into the Staff College in December, 1857, and a special course of instruction was laid down lasting two years. This course seems to have been modelled on that in force at the Royal Military Academy and included Mathematics, Military History, Fortification and Artillery, Military Topography and Languages. It is perhaps not surprising to find that the first Instructors in the Military subjects were drawn almost exclusively from the Royal Engineers. The following are the names of officers so employed:—

Fortification and Artillery	Captain H. Schaw	1864–1878
	Lieut.-Colonel Lonsdale Hale	1878–1879
Military History	Captain C. C. Chesney ...	1864–1868
	Lieut.-Colonel Lonsdale Hale	1880–1883
Military Topography	Captain S. B. Farrell ...	1858–1878

It will be noticed that there was in those days no time limit to these appointments.

Of the above officers, Schaw was later head of the Fortification branch of the I.G.F's. office and retired as a Major-General in 1887 ; Chesney reached the rank of Colonel and died in 1876, Farrell was promoted Lieut.-Colonel in 1872 and died at Barbados in 1879, while Lonsdale Hale, who retired as a Colonel in 1883, earned a world-wide reputation as a lecturer and writer on Military questions. A short biographical notice of Chesney appears in Volume II, page 499.

For twenty-three years, from 1883 to 1906, no officer of Engineers was employed on the staff of the College, but in January, 1907, it was decided that an officer of the R.E. should always be included in this staff and Major G. M. Harper was the first officer so appointed ; he was followed by Major J. S. Fowler in 1911 and by Major D. S. MacInnes in 1914.

With the course of instruction following so closely the training of R.E. officers it was early decided that such officers should be eligible for Staff appointments without holding a Staff College certificate. It does not appear that many R.E. officers were employed on the Staff under this decision, but it seems to have operated for some years to prevent any R.E. officers from passing through the course at the Staff College. In the lists of officers who passed the final examination in 1860 there appears the name of Lieutenant R. Grant (afterwards I.G.F.), but this officer was only resident at the college for a few months early in 1859, when he left to take up the appointment of A.D.C. to the General Commanding in Canada. He was allowed to return to England in 1860, to pass the final examination. In the same year Lieutenant R. Home passed the examination after only twelve months at the college.

Except the above, no officers of R.E. appear to have been through the course prior to 1874, when Major J. C. Ardagh and Captain A. H. Hare passed.

There was a paragraph in the Regulations for the Staff College under which officers of any branch could submit themselves for the final examination without previous attendance at the College and under this ruling we find the name of Lieut.-Colonel C. E. Webber as having qualified in 1874, and Brevet Colonel R. Harrison and Major A. C. Hamilton in 1875, and in 1880, just before the regulation was withdrawn, occur the names of Major H. Helsham Jones, Brevet Major Thomas Fraser, Brevet Major C. M. Watson and Brevet Lieut.-Colonel R. H. Hart.

With the issue of Engineer pay in 1881, it was decided that such pay could not be drawn while undergoing the course and this necessarily limited the number of R.E. candidates. It was also decided that, in order to provide vacancies for officers of different Corps, the numbers of officers from any one Regiment or Corps must be limited and under this arrangement the number of R.E. who were admitted each year was limited to two or three. There were often more candidates from any one Corps than vacancies, with the curious result that officers who had passed high up in the list of candidates were unable to obtain admission.

Among other officers who failed under this rule, we find the names of Captain Ronald C. Maxwell and Captain G. K. Scott-Moncrieff, who passed the examination but failed to obtain admission because they were beaten on marks by three other officers of their own Corps.

This rule was partially remedied by a modification of the regulation, under which the Commander-in-Chief could nominate a certain number of officers each year; one of these was usually taken from the R.E.

From 1874 to 1914 about eighty R.E. officers passed the College out of about 1,300 officers who passed through the Corps in the same period.

In addition to the graduates of the Staff College, who had the letters *p.s.c.* after their names in the Army List, there was a special list of officers recorded as qualified for the Staff on account of active service in the field. After the South African War there were eight R.E. officers on this list, headed by the names of Lord Kitchener and Sir William Nicholson. These officers were distinguished by the letters "q.s." after their names.

In addition to those on the lists of *p.s.c.* or *q.s.*, a number of other officers of the R.E. served on the Staff in various capacities.

The names of most of the R.E. officers who held Staff appointments at home or in the Colonial garrisons between 1884 and 1914 are given in Volume III, Chapter VII. This list does not include any appointments in India.

Commands on Active Service

Prior to 1882 no officer of the British Corps of Royal Engineers seems to have been given a command of a mixed force on active service, with the exception of Brigadier-General A. d'Aubat, who commanded in an attack on Corsica in 1794 and was promoted Major-General the next year for his services.

Lieut.-Colonel Sandes in *The Military Engineer in India*, Volume I, records the name of Lieut.-Colonel Thomas Keating, Bombay Engineers, who, in 1774 and 1775, commanded an independent force of 2,000 British and 35,000 irregulars in the Maratha War of 1775.

But these were exceptions and in spite of the distinguished services of the Royal Engineer officers in the Peninsular and Crimean Wars, they were strictly limited to the command of their own Corps.

The first officer to break through this rule was Brigadier-General Sir John Cheape of the Bengal Engineers, who commanded a division in the Second Burma War of 1852.

Following him comes the honoured name of Lord Napier of Magdala, who, as Colonel Robert Napier of the Bengal Engineers, saw much fighting in the Indian Mutiny when he commanded various forces in the field. In January, 1860, he was appointed to the command of the 2nd Division of the Expeditionary Force for the China campaign of that year, and in 1867 he was selected for the command of the troops in the Abyssinian campaign, described in Volume II, Part I, Chapter XXII.

The first appointment of an officer of the British Royal Engineers to an independent command in the Field was that of Colonel Sir Charles Warren in Bechuanaland in 1884–5. This is described in Volume II, Part I, Chapter XXV.

In the Egyptian campaign of 1882–5, Major-General G. Graham was appointed to the command of the 2nd Brigade of the 1st Division. This brigade led the advance on Tel-el-Kebir and fought the battle of Kassassin. In 1884 Graham was appointed to command an expedition based on Suakin, on the Red Sea, to break up the power of an Arab force under Osman Digma, and in February, 1885, Graham was again appointed to command a force based on Suakin with the intention of pushing a railway from Suakin to Berber. Part of this force fought a battle at Tofrek, but shortly afterwards the project was abandoned and all British troops were withdrawn from the Sudan.

The command of Graham's old brigade of the Army in Egypt was taken over by Major-General W. O. Lennox from 1884 to 1887. The services of Sir H. H. Kitchener in the Dongola campaigns of 1885 and 1896 and in the reconquest of the Sudan, in 1898, need only be mentioned here. Also the work of Lord Kitchener in the South African War of 1899–1902, in which General Sir Charles Warren and Major-General Sir Herbert Chermside commanded divisions while Major-General Bindon Blood, Major-General Elliott

Wood, Colonel H. H. Settle and other officers of R.E. commanded detached forces or columns.

The only other important campaign outside India was in North China, in 1900–2, which is described in Chapter VII of this volume. In this (local) Major-General A. R. F. Dorward commanded the troops at Tientsin and later conducted several punitive expeditions into the neighbouring country.

Commands of Districts at Home

Under the system in force in 1885 the following R.E. officers held senior appointments :—

Major-General C. B. Ewart	Jersey	1883–1887
Major-General H. Wray	Jersey	1887–1892
Major-General Sir Howard C. Elphinstone, v.c.	Western District	1889–1890
Major-General Sir Richard Harrison	Western District	1890–1895
Major-General Sir Charles Warren	Thames District	1895–1898
Major-General Sir Thomas Fraser	Thames District	1898–1902
Major-General Sir Reginald C. Hart	Thames District	1902–1906
Major-General Sir Herbert C. Chermside	Curragh District	1899
Major-General E. P. Leach, v.c.	Belfast District	1900–1905
After the formation of Commands at home :—		
Lieut.-General Sir Edward P. Leach, v.c.	Scottish Command	1905–1909
Major-General H. M. Lawson	Northern Command	1914
Coast Defences		
Major-General H. H. Settle	Southern	1905–1908
Major-General D. A. Scott	Eastern	1906–1909
Major-General G. Barker	Eastern	1909–1911
Major-General R. C. Maxwell	Eastern	1911
Brigadier-General L. B. Friend	Scottish	1908–1912
Brigadier-General F. C. Heath-Caldwell	Scottish	1912
Colonel A. J. Kelly	Mersey	1905–1908
Colonel A. M. Stuart	Mersey	1908–1910
Colonel H. N. Dumbleton	Mersey	1910–1911

Colonel W. P. Brett	Mersey	1911–1913
Colonel R. F. Edwards	Mersey	1913
Colonel G. F. Leverson	Tyne	1904–1907
Colonel W. Russell	Tyne	1907–1910
Colonel H. V. Kent	Tyne	1911–1912
Colonel F. Baylay	Tyne	1912
Brigadier-General C. Hill	South Irish	1914

Commands in Field Army

Brigadier-General H. M. Lawson	Infantry Brigade, Dublin	1906–1907
Brigadier-General G. F. Gorringe	Infantry Brigade, Lichfield	1907–1911
Major-General H. M. Lawson	2nd Division, Aldershot	1910–1914
Brigadier-General A. G. Hunter-Weston	Infantry Brigade, Colchester	1914

General Officers in charge of Administration

Major-General H. M. Lawson	Aldershot	1907–1910
Brigadier-General R. C. Maxwell	Western Command	1906–1909
Major-General R. C. Maxwell	Southern Command	1909–1911
Major-General R. M. Ruck	Eastern Command	1908–1912
Major-General L. B. Friend	Irish Command	1912

Governor and C.-in-C. Fortresses, Abroad

Major-General Sir Thomas L. J. Gallwey	Bermuda	1882–1888
General Sir Lintorn Simmons	Malta	1884–1888
General Sir Lothian Nicholson	Gibraltar	1891–1893

Command of Troops, Abroad

Major-General Sir W. O. Lennox	Ceylon	1887–1888
Colonel Sir Charles Warren	Straits Settlements	1889–1893
Major-General Sir J. Bevan Edwards	China	1889–1890
Brigadier-General H. Chermside	Crete	1897–1899
Major-General Sir Reginald C. Hart	Cape Colony	1907–1912
Lieut.-General Sir Reginald C. Hart	South Africa	1912–1914
Colonel A. R. F. Dorward	Wei-hai-wei	1900

Brigadier-General Sir Arthur R. F. Dorward	Straits Settlements	1902–1905
Major-General J. R. L. Macdonald	Mauritius	1909–1912
Major-General J. A. Ferrier	Sierra Leone	1911
Major-General F. H. Kelly	South China	1913

In addition, Major-General Sir Arthur R. F. Dorward was Major-General in charge of Administration South Africa from 1905 to 1909, while Colonel G. M. Kirkpatrick was Inspector-General of the Forces in Australia from 1910 to 1913.

War Office

At the War Office, up to 1904, the Inspector-General of Fortification was the head of a branch which was responsible for the work connected with Defences and Barrack policy as described in previous chapters.

In addition R.E. officers were employed in connexion with the branches dealing with Military Intelligence and Military Education. Major-General W. O. Lennox was Director of Military Education from 1893 to 1895 and he was followed by Major-General Sir Charles Wilson from 1895 to 1898. Major-General J. C. Ardagh was Director of Military Intelligence from 1896 to 1901 and was followed by Major-General Sir William Nicholson, from 1901 to 1904. After 1904 the Director of Military Education became Director of Military Training, and the Director of Military Intelligence became the Director of Military Operations and Intelligence. This last branch always included a number of R.E. officers, among whom were J. J. Leverson, E. Agar, H. J. Foster, E. H. Hills, J. E. Edmonds, and G. M. W. Macdonogh, while Lieut.-Colonel H. M. Sinclair and Captain W. A. J. O'Meara did good work in the Intelligence Service in South Africa before the outbreak of the war in 1899. This branch of the War Office had a map-making section which was officered by the R.E. This section was considerably expanded on the reorganization of the War Office in 1905, under the charge of Colonels C. F. Close and W. C. Hedley.

The office of Quartermaster-General was filled by Major-General Sir Richard Harrison from 1897 to 1898, when he was transferred to the office of I.G.F.; and Major-General Sir William Nicholson was Quartermaster and third member of the Army Council from 1905 to 1908, in which year he became Chief of the General Staff till 1912.

Under the Quartermaster-General a new Directorate of Movement and Quartering was formed in 1904, of which the first Director was Brigadier-General H. M. Lawson, 1904–6, he was followed by Brigadier-General G. F. Gorringe from 1906 to 1909.

Educational Establishments

The command of the School of Military Engineering at Chatham was always one of the duties of the Corps and the Instructional staff were drawn almost exclusively from the R.E. (see Chapter X).

The appointment of Commandant of the Royal Military Academy at Woolwich was held in alternate appointments by officers of the Royal Artillery and Royal Engineers. The R.E. officers who have held this appointment during the period of this volume were :—

General Sir James F. M. Browne	1880–1887
Major-General R. Harrison	1889–1890
Lieut.-General E. O. Hewett	1895–1897
Colonel R. H. Jelf	1901–1904
Colonel A. G. Thomson	1908–1912

There were also many R.E. officers employed as Instructors in Fortification, Military Topography or in Science, both at Woolwich and Sandhurst.

Colonel E. O. Hewett was Commandant of the Royal Military College at Kingston, Canada, from 1875 to 1885, and other officers of the R.E. were employed as Instructors at this college.

Army Ordnance Department

Although the bulk of the appointments in the A.O.D. usually fall to officers of the Royal Artillery, a certain number of Engineer officers have always been employed. Mention has already been made of the Superintendent of Building works and the control of the railways at Woolwich Arsenal. The Ordnance Committee, which is an important body to advise on all details of ordnance, always included one senior R.E. officer of Colonel's rank. The appointment of Superintendent of the Royal Carriage Factory at Woolwich was held by Lieut.-Colonel T. English from 1887 to 1889 and by Lieut.-Colonel Sir George Sydenham Clarke from 1894 to 1901, and junior officers of the R.E. have been employed in this and other branches.

India

The names of R.E. officers employed on the Staff in India are given in *The Military Engineer in India*, Volume I, and cannot be repeated here. Mention may be made of Major-General Sir H. N. Prendergast, who commanded the forces in Burma in 1886, of Brigadier-General J. R. L. Macdonald, who commanded the troops in the Tibet campaign of 1903, and of the many services of Sir Bindon Blood, who filled a long series of appointments up to the rank of General. A larger proportion of appointments were given to R.E. officers than was the case in the Home Army prior to 1904, and we find R.E. officers holding the appointment of Adjutant-General and Quartermaster-General, as well as a share of the Brigade and higher Commands.

Other Government Departments

In Volume III of this history lists are given of R.E. officers employed under nearly every department of State, including the Admiralty, the Foreign Office, the Board of Trade, the Local Government Board, the Departments of Agriculture, Science and Arts, Prisons, Post Office and Board of Works; also in Ireland and the India Office in addition to service under H.M. the Queen, and other members of the Royal Family. It is impossible to give details of all the work under the many heads, a few only can be mentioned here.

Admiralty

At the Admiralty the appointment of Director of Works was held from 1884 to 1912 by officers of the R.E., under whom a very large scheme of expansion was carried out at all Naval Dockyards. The R.E. officers holding this appointment during this period were Colonel P. G. L. Smith, Major H. Pilkington and Colonel E. Raban. Other R.E. officers under them held the appointment of Superintending Engineer at different Dockyards, including Colonel S. H. Exham, who constructed the new yard at Rosyth.

Board of Trade

Under the Board of Trade many R.E. officers have been employed as Inspectors of Railways in Great Britain. This branch was originally formed by Major-General Sir J. M. Frederick Smith, and among the well-known R.E. officers who served in this branch are Major-General C. S. Hutchinson, Colonel Sir Francis A. Marindin,

Major Sir Horatio A. Yorke, Major G. W. Addison, Major P. G. Von Donop, Major E. Druitt, and Colonel Sir John Pringle. The value of an inspection by a body of officers who are quite unbiased and independent of any connexion with either the railway companies or contractors is so manifest that this system has continued to the present day.

Local Government Board

In the early days of Local Government the Corps was called on to provide a staff of Inspectors for determining the areas of newly formed boroughs, or local questions affecting water supply or sanitation. Major H. Tulloch of the Madras Engineers was the Chief Inspector of the Local Government Board 1888–97. On the Introduction of electric lighting, a similar staff to control the development of electrical undertakings was formed under Major R. Y. Armstrong and Major P. Cardew. As the general knowledge of engineering improved, and staffs of engineers were trained for the Government service, members of these staffs succeeded to the higher appointments.

Post Office

The work in the Post Office in connexion with telegraphs and telephones has always been closely associated with the Royal Engineers through the connexion with the 2nd Division Telegraph Battalion, as described in Chapter XII. In 1902, Major W. A. J. O'Meara was appointed Assistant Engineer-in-Chief, General Post Office, and succeeded to the appointment of Engineer-in-Chief in 1907. O'Meara had been employed as a junior officer with the 2nd Division and, among other work, had to arrange the layout of the land line for the first telephone line to France in 1891. He did good work as Engineer-in-Chief in improving the organization and efficiency of the service.

Science and Art

The work of the R.E. in connexion with the organization and development of the Science and Art Museums at South Kensington is described in Vol. II, Part III, Chapter VIII, culminating in the design and construction of the Albert Hall by Major-General H. Y. D. Scott. Various officers of the R.E. were employed on the staff of the Science and Art Department, notably Major-General Sir John F. D. Donelly, who was Secretary till 1892, Major-General E. R. Festing and Captain W. de W. Abney. It is interesting to note that, from the early days, a detachment of about twenty tradesmen, drawn from

the retired list of the R.E., has been maintained for work in the South Kensington Museum.

In Edinburgh, Major-General Sir Robert M. Smith was Director of Science and Art from 1885 to 1900, while in Ireland Lieut.-Colonel G. T. Plunkett held the same appointment in Dublin.

India Office

In the India Office, an officer of R.E. was employed in the purchase and dispatch of building stores for India.

Government Service

In the higher ranks of the Government Service, several R.E. officers have done excellent work, especially in Ireland, for which see Volume II, Part III, Chapter VI. This tradition was continued by Colonel Sir Herbert Jekyll, who was Secretary to the Lord Lieutenant, 1892–5, and by Lieut.-General Sir Richard H. Sankey, Chairman of the Board of Works, Dublin, 1884–96.

Among other R.E. who held important offices in Great Britain were Colonel Sir Colin C. Scott-Moncrieff, Under Secretary of State for Scotland, 1891–1902; Captain M. F. Ommaney, Under Secretary of State for the Colonies, 1900–6; Lieut.-Colonel Sir Matthew Nathan, Secretary of the General Post Office, 1910–11, and Chairman of the Board of Inland Revenue, 1911; and Colonel Sir Charles Warren, Commissioner of Metropolitan Police 1886–8. Lieut.-Colonel G. T. Chesney (1871–80), General Sir Alexander Taylor (1880–96), Colonel J. Pennycuick (1896–9) and Colonel Sir John Ottley (1899–1903) were the four Presidents of Cooper's Hill Civil Engineering College during its existence.

Survey

The most distinctive civil employment of the R.E. was, however, the Ordnance Survey, with its headquarters at Southampton and its tentacles in many fields of employment at home and abroad. The origin and work of this branch is described in Volume II, Part III, Chapter II, and in Volume III, Chapter VI, which also describes the growth of the surveys in the Dominions and Colonies.

One peculiarity of this branch is that while the work itself is mainly of a civilian nature, there is no branch of the Civil Service which has the necessary training and experience to carry on the work if the Military Staff were withdrawn.

During the Great War, important duties fell on the Survey branch, which will be described in Volumes VI and VII, and it was

fortunate that the Army possessed a body of officers trained to survey work who were able to carry out these new duties.

The names of the R.E. officers who have held the post of Director-General of the Survey since 1885 are given in Volume III, page 178.

Employment Abroad

The work of the R.E. in India, which employed about two-fifths of the strength of R.E. officers, is outside the scope of this volume; while the work in Egypt has been fully dealt with in *The Royal Engineers in Egypt and the Sudan*, and in Volume III, Chapter III. There remains, however, a large body of employment to which some reference must be made. Most of this is connected with the development of the Colonies, of which some details are given in Chapters V, VI and VII of this volume.

Work under Foreign Office

Up to about 1903 the control of all protectorates was vested in the Foreign Office, so that most of the early expeditions described in the above chapters were arranged by this office. After Mr. Joseph Chamberlain became Secretary of State for the Colonies, this office gradually took over the general control of all such protectorates and organized them as Colonies. There remained under the Foreign Office all work which affected other nations such as the appointment of Military Attachés and Consuls, International Exhibitions and International Commissions. The names of the officers employed in some of these capacities are given in Volume III, page 228, among whom special mention may be made of Colonel H. C. Chermside at Constantinople, 1889–96, and Crete, 1896–7, Colonel G. S. McD. Elliot with the Macedonian Gendarmerie, 1906–7, Colonel Sir Henry Trotter in Turkey, Syria and Roumania, 1882–1906, and Colonel C. M. Watson at the St. Louis Exhibition of 1904.

Work under the Colonial Office

Some of the work of the R.E. in Australia and New Zealand is described in Volume II, Part III, Chapter V and a list of employments in the Colonies is given in Volume III, page 230. But in all Colonies where there is a British garrison, R.E. officers have often been employed on various duties of a civil nature, in some cases such employment resulting in permanent engagement in the Colonial Service. In the Australian Colonies, after the withdrawal

of the British garrison, an officer of the R.E. was employed as military adviser in each Colony, mainly connected with Coast Defence. After the formation of the Colonial Defence Committee of 1885, the officers who were employed as Secretary of that Committee usually continued in Colonial employment.

The following officers have been appointed Colonial Governors, Lieutenant-Governors or Commissioners :—

Lieut.-General Sir William F. D. Jervois	New Zealand	1883–1889
Major H. E. McCallum	Lagos	1897–1899
	Newfoundland	1899–1901
	Natal	1901–1907
	Ceylon	1907–1913
Major M. Nathan	Gold Coast	1900–1903
	Hong Kong	1903–1907
	Natal	1907–1910
Colonel Sir G. Sydenham Clarke	Victoria	1901–1904
Lieut.-General Sir Herbert C. Chermside	Queensland	1902–1905
Major J. E. Clauson (Lieut.-Governor)	Malta	1910–1914
Major J. K. Chancellor	Mauritius	1911
Colonel Sir E. Percy C. Girouard	Northern Nigeria	1907–1909
	East Africa	1909–1912
Colonel A. R. F. Dorward (Commissioner)	Wei-hai-wei	1900
Colonel T. J. W. Prendergast (Commissioner)	Northern Gold Coast	1905–1909

During the South African War, Major W. A. J. O'Meara held the appointment of Burgomaster of Johannesburg from 1900 to 1902.

Military Training

Before closing the lists of military employments, mention must be made of the contributions of R.E. officers to the official and unofficial literature on military subjects. Some of the training manuals on engineering, such as fortification or topography, are usually prepared by R.E. officers, but there is a large mass of contributions to military journals or of lectures on military subjects of a general nature which must be credited to the R.E. The pages of the *Journal of the Royal*

United Service Institution contain many such contributions, and R.E. officers have frequently served on the Council of this Institution. The Gold Medal given biennially by this Institution for an essay on a military subject has been won three times by R.E. Officers. Among general subjects, Colonel Home's *A Précis of Modern Tactics* was for many years a text-book of this branch of military education, and mention must be made of *Infantry Fire Tactics* by Captain C. B. Mayne, and of the writings of Major E. Swinton under the pen name of " Ole-luk-oye."

CIVIL WORK

In the civil life of the nation R.E. officers have made many notable contributions, in such subjects as Banking and Finance, Manufacture (especially in weapons of war), Education, Literature and many forms of Commerce. In Parliament itself, officers of the Royal Engineers have served with distinction, both in the House of Lords and in the House of Commons. The development of local Government has also been helped materially by the services of R.E. officers on the retired list, on County, Borough and District Councils, while many corporate bodies controlling the voluntary hospitals, public schools or charitable institutions can testify to the value of the services of the R.E. Among the last must be included the Gordon Boys Home at Woking, founded largely by the exertions of R.E. officers in remembrance of their celebrated comrade, Major-General Charles Gordon.

Among special subjects, note may be made of the work of Sir William Abney, as a pioneer of dry plate photography, the work of E. H. Hills in connexion with the photography of the eclipses of the sun, and that of H. G. Lyons in the study of geology.

One of the modern developments in the life of the nation is the growth of organized societies for the study and promotion of some particular branch of science, and the share of the R.E. in such development deserves more detailed mention.

ROYAL GEOGRAPHICAL SOCIETY

From the initiation of the Ordnance Survey, and as a consequence of their employment in the early development of our Colonies and Dependencies, R.E. officers have been closely associated with the study of geography, and almost from the beginning of the formation of the Royal Geographical Society, in 1830, there appear the names of R.E. officers, first as members, then as serving on the Council,

while a number of R.E. officers have received special recognition from the Society. From 1895 to 1908 Major Leonard Darwin was one of the Honorary Secretaries and was followed by Sir D. A. Johnston, C. F. Close and H. G. Lyons.

The first R.E. President was Sir G. Taubmann-Goldie, 1905–8, followed by Leonard Darwin 1908–11.

Among early members of the Council are the names of Sir William Denison, Douglas Galton, Sir Henry Thuillier and H. Yule, while in more recent years the names include General R. Strachey, Sir Charles Warren, Sir Charles Wilson, Major-General A. C. Cooke, Sir Thomas H. Holdich, Sir Charles Watson, and many other officers who have already been mentioned for survey work at home and abroad. Among the list of recipients of the Royal Gold Medal are included Colonel Henry Yule, Lieut.-Colonel T. H. Holdich, Captain C. H. D. Ryder, and Major Hon. M. G. Talbot, while others have received special recognition in other forms.

Institution of Civil Engineers

Many R.E. officers have been elected Members and Associate Members of the Institution of Civil Engineers and, in the earlier days, a few have served on the Council. The following have been elected Honorary Members, the highest honour given by the Institution: Sir Charles Pasley, 1820, Sir John Burgoyne, 1839, Sir Lintorn Simmons, 1892; Sir Andrew Clarke, 1896; and Lord Kitchener, 1904.

Institution of Electrical Engineers

This Society is a direct descendant of the Society of Telegraph Engineers which was formed in 1871 on the initiative of Major (afterwards Sir Francis) Bolton* and Captain (afterwards Major-General) C. E. Webber, R.E. These officers obtained the support of Captain P. H. Colomb, R.N., Major R. H. Stotherd, R.E., and Captain E. D. Malcolm, R.E., and the Society was actually started

* Sir Francis Bolton originally enlisted in the Royal Artillery and was appointed an Ensign in the Gold Coast Artillery Corps in 1857, for good work on active service on the Gold Coast and, in 1860, was promoted to Captain in the 12th Foot; he received the brevet of Major in 1868, was promoted Lieut.-Colonel in 1877 and honorary Colonel in 1881. From 1883–6 he was in charge of the lighting for the South Kensington Exhibition and was knighted for his services in 1884. He died in 1887.

at a meeting attended by the above five officers with three leading civilian engineers, W. Whitehouse, Louis Loeffler and Robert Sabine. Captain C. E. Webber had just been placed in command of the two R.E. Companies, 22nd and 34th, who had been detailed for work with the General Post Office; the other four officers had been first brought together in the School of Military Engineering, where Major R. H. Stotherd was Superintendent of Special Schools (which included Telegraphy and Submarine Mining) and Captain E. D. Malcolm was the Assistant Instructor; Captain P. H. Colomb, R.N., and Major Frank Bolton, R.A., had been attached to the S.M.E. to carry out experiments in the system of lamp signalling which was eventually adopted by both services, and Bolton, who had invented the oxy-calcium light, was attached to the R.E. from 1867 to 1869 as Assistant Instructor in Army Signalling. Among the early members of the Council were Colonel E. D. Malcolm and Lieut.-Colonel R. H. Stotherd, while Major J. V. Bateman-Champain was President in 1879. From this time there was nearly always an R.E. Member on the Council, drawn from the leading electrical experts in the Corps, among whom may be named Major P. Cardew, Vice-President 1901, and Lieut.-Colonel W. A. J. O'Meara, Vice-President 1911.

Institution of Mechanical Engineers

Prior to the modern growth of mechanization in the Army the number of R.E. officers who joined the above Institution was restricted to the small number who trained in the special mechanical course, but prior to the Great War the Corps was represented by Captain H. Riall Sankey, who was a member of the Council in 1910. Major-General H. Hyde was elected a member in 1865, but there is no further record till 1887 when Lieut.-Colonel C. McG. Bate became a member, followed by G. H. Harrison in 1889 and R. P. Robinson-Embury in 1903.

Institution of Structural Engineers

The Institution of Structural Engineers developed from its original name of the Concrete Institute to study the principles and practice of the use of reinforced concrete. Among the names of the original founders were Lieut.-Colonel John Winn and Major H. S. Rogers. The latter served on the Council in 1913. This Institution was in its infancy on the outbreak of the Great War, but has since developed and taken an important position in the Engineering world.

CHAPTER XV

THE HOMES OF THE ROYAL ENGINEERS AND SOME DOMESTIC DETAILS UP TO AUGUST, 1914

General—Homes—Chatham—Brompton Barracks, Officers' Mess—St. Mary's Barracks—Chatham Barracks—Chattenden Barracks—Aldershot, Gibraltar Barracks—Longmoor—Ireland—Dublin—Cork Harbour—Curragh—Fermoy Park—Limerick—Finance of Officers' Mess—"A" Fund—Band Fund—Portraits in the H.Q. Mess—Mess Plate—War Memorials—Windows in Rochester Cathedral—Memorials of Individuals—Annual General Corps Meetings—Corps Committee—Technical and Literary Activities—Libraries—Chatham — London — Indian Libraries independent — Libraries taken over by R.E. Institute—Professional Papers—Four Series—Confidential Series—Foreign Translation Series—Publications and Technical Books—Roll of Officers—History of the Corps—Occasional Meetings.

FROM the time that the Corps of Royal Engineers was given an official position in the Army, there has gradually grown up a number of clubs, and other organizations, connected with what may be called the domestic life of the Corps. Some of these are mentioned in Volume II, Part II, Chapter IV, but no reference to such details is given in Volume III. Much work on such records was carried out by Lieut.-Colonel B. R. Ward, and published in the *R.E. Journal* prior to 1909, and since then further researches have been made by successive Secretaries of the R.E. Institution.

An attempt is being made in this and the following chapters to record the growth of these Societies and Clubs, and to carry this record up to August, 1914, the limit of this volume; leaving to a subsequent volume the recording of the important changes which followed the Great War 1914–18.

It is not thought necessary to commence such records earlier than the foundation of the School of Military Engineering at Chatham under Pasley in 1812, from which time the important dates in our Corps history are as follows :—

1812	Foundation of S.M.E.
1848	Formation of R.E. Officers' Mess in Brompton Barracks, which a little later was recognized as the Headquarters Mess of the Corps.

1854–8	Crimean War followed by Indian Mutiny and War in China ; large increase in numbers—Royal Sappers and Miners joined with Royal Engineers.
*1856	Removal of R.E. Depot from Woolwich to Chatham.
1862	Amalgamation of R.E. and Indian Engineers.
1886	Large increase to provide for additions to Submarine Mining service and to Field units.
1899–1902	South African War followed by a reorganization of the Army.
1904	Esher Committee, abolished Inspector-General of Fortifications.
1914	Opening of Great War.

The year 1848 was an important date in the history of the Corps as there was in progress a large increase, both in officers of the Royal Engineers and in other ranks of the Royal Sappers and Miners. It is worth noting also that a great impetus had been given to all scientific interests in this country by the development of railways, following the introduction of our standard gauge in 1856, and this was succeeded soon after by the introduction of the electric telegraph. Before these improvements in communications, Chatham had been so cut off from London that Pasley had worked almost independently of, and sometimes in opposition to, the heads at the War Office.

It is also noteworthy that all through the period of the long peace from 1815 to 1854, all members of the Corps, in spite of very slow promotion, maintained a high standard of professional ability and keenness. At first the leaders, such as Burgoyne and Pasley, may have been inspired by the recollection of the inadequacy of the Engineers during the Peninsular War, but that later generations developed such keenness is a striking testimony to the success of Pasley in inspiring all his pupils with his own burning zeal. The growth of the Survey and the decision in 1825 to put the whole work of barrack construction on the Royal Engineers were also factors which encouraged the study of professional details.

The Homes of the Royal Engineers

From the nature of their work it follows that the Corps is always split up between a number of stations at home and abroad. At

* Whitworth Porter in Vol. II, p. 182, refers to the Royal Warrant of 1850, abolishing Woolwich Depot, but the move was actually effected on 17th October, 1856.

each of such stations there was gradually organized a system of interior economy, which followed that of an Infantry Battalion, and included Messes for the Officers and N.C.Os., recreation rooms, canteens and similar accessories.

While the Royal Artillery and the Royal Engineers remained under the direct control of the Master-General of the Ordnance, there were at many of the smaller stations abroad, and at some home stations, joint establishments for the R.A. and R.E., and joint R.A. and R.E. Officers' Messes continued at many stations for some years after separate barracks had been allotted for the rank and file. The last of the joint messes was at the Auberge de Castille in Malta, which survived till the outbreak of the Great War in 1914. Many changes followed the growth of the Empire, which caused new foreign stations to be opened, while other stations were closed, as some of the Colonies were granted self-government, and the Imperial troops were withdrawn from Australia, New Zealand, Canada, and South Africa. When the H.E.I. Company Engineers were amalgamated with the R.E., in 1862, new centres were taken over or formed in India, but they remained under the control of the Indian Government and are dealt with in the *Military Engineer in India*.

In 1885 the principal centres of Engineer work at home were at Chatham, Aldershot, and Dublin; and there were subsidiary centres in the defended ports of Portsmouth, Plymouth, Dover, Pembroke Dock, Harwich and Cork Harbour; and at the training centres of Shorncliffe, Colchester, and the Curragh. There were also smaller centres at the commercial ports at home.

At the fortresses and coaling stations abroad, there were Engineer barracks at Gibraltar, Malta, Hong Kong, Singapore, Trincomalee, Sierra Leone, Mauritius, Halifax, Nova Scotia, Bermuda, Jamaica, Barbados, St. Lucia, Cape Town and St. Helena.

The centre of all this organization was in London, where the Deputy Adjutant-General, R.E., controlled the personnel and their interior economy under the general control of the Inspector-General of Fortifications, who was the official head of the Corps.

The centres of the civil work of the Corps were those for the Ordnance Survey at Southampton and in Dublin and for the 2nd Division Telegraphs which worked under the Post Office and had its central office at New Cross.

CHATHAM

The largest of the military centres was at Chatham, which contained the depot for the dismounted branches of the R.E. and also the School of Military Engineering described in Chapter IX. This centre was in Brompton Barracks, which had been built in 1803 for the Royal Artillery, but when Pasley was appointed in 1812 to start the school of instruction, which developed into the S.M.E., the school staff and the officers and other ranks under instruction were accommodated in these barracks. As they grew in numbers they gradually ousted their hosts until they took over nearly the whole barracks. A battery of Field Artillery, however, remained in occupation of the North Square until 1824, when they were withdrawn to make room for a Field Company, R.E.

The Officers' Mess in the north-west corner of the barracks was opened in 1807, when the dining members included six to eight R.A. and three or four R.E. Officers. In 1848, when there were forty-one R.E. Officers and twenty-three H.E.I.C. Engineers against ten R.A. Officers, Colonel Sir Frederick Smith, then Director of the R.E. Establishment, suggested to the Master-General of the Ordnance that the mess should be taken over for the Royal Engineers and should be under the order of the Director. This was approved with effect from 1st September, 1848; a division of the mess property was arranged and the R.A. formed a smaller mess in the north-east corner of the barracks.

In 1856 the Depot of the Royal Sappers and Miners was moved from Woolwich to Chatham. With the additions made to the Corps at the time of the Crimean War the accommodation in the mess was insufficient and was increased by the construction of the centre portion of the present messroom, which was opened in 1861, the old messroom becoming the Ante-room. The south annexe was constructed at the same time and contained a band room in the centre of the serving rooms. The messroom had at first a gallery at the east end where the Ladies of the Corps were admitted on Guest Nights. About the same time the billiard rooms were rebuilt, funds for the purpose being raised by debentures.

The present entrance hall was erected in 1883–4 to the design of Captain A. G. Clayton, the Assistant Instructor in Construction. It was built by Sapper labour under Lieutenant J. A. Ferrier, the officer in charge of Workshops. The north annex was added by Captain H. W. Renny-Tailyour, the Assistant Instructor for

Workshops, in 1887–8, and other alterations were made, the three rooms in the southern annexe were thrown into the messroom and the gallery was removed. Up to about 1890 the duty of Secretary of the Officers' Mess was allotted to one of the Regimental Officers at the station, but as the mess expanded, it was necessary to provide for more supervision and a permanent Secretary was appointed, normally a retired officer of some other Corps.

The establishments in the barracks for the rank and file expanded in a similar manner; by 1885 there was a large Sergeants' Mess and a fine Recreation Establishment (see Volume II, page 198).

When H.M.S. *Hood* was made the centre for the Submarine Mining Companies—4th and 33rd—in 1873, a small branch Officers' Mess was formed on board. In 1883 the Submarine Mining Companies were moved into St. Mary's Barracks and organized as a battalion. The Officers' Mess in this barracks became independent of the Headquarter Mess from 1885, except that the officers at St. Mary's could make use of the Headquarter Mess and share in entertainments, paying a small monthly subscription for the privilege. When the Submarine Mining Battalion was broken up in 1892 the Mess became again a detachment from the Headquarter Mess.

As the R.E. grew in numbers they overflowed into Chatham Barracks (later called Kitchener Barracks), and after the South African War one of the two Infantry battalions was withdrawn and their barracks allotted to the R.E. Service Battalion. An Officers' Mess was taken over in these barracks.

When the 8th Railway Company was sent to Chatham after the Egyptian campaigns, it was stationed in Chattenden Barracks, where an Officers' Mess and other regimental organizations were provided for this unit.

ALDERSHOT

The R.E. centre at Aldershot began after the Crimean War, when the "A" troop, which had been formed for R.E. transport in the Crimea, was sent to that station. The centre for the R.E. units was in huts in the South Camp, but when the barracks at Aldershot were built in 1888 and following years, a barracks, subsequently named Gibraltar Barracks, was allotted to the R.E. in the Stanhope Lines. This centre, in addition to the Field units allotted to the troops at Aldershot, contained the depot for the Bridging units and the depot and training school for the drivers of all R.E. mounted units. It also became an experimental centre for the trial of bridging and

telegraph equipment, and the equipment of Field Companies and Field Troops.

When the R.E. Railway Companies were concentrated at Longmoor, a centre for R.E. activity developed at that station.

When the R.E. Telegraph units were combined with the Army Signalling organization in 1913, the centre of the new service was in Gibraltar Barracks, replacing the old centre of the Bridging unit which had been broken up in 1904.

IRELAND

The R.E. centre in Ireland was in Dublin, where the Royal Engineers were the successors of the separate Corps of Engineers of Ireland, which was absorbed into the R.E. in 1801, on the union of the two countries. The troops in Ireland after 1801, were under a Commander-in-Chief, who was *ex officio* a member of the Irish Privy Council, and on his staff there was a Colonel who was called Chief Engineer. This officer supervised the work of the Commanding Royal Engineers of the four districts into which Ireland was divided. His office was first in Dublin Castle and later in the Headquarter office, in Phœnix Park. The R.E. units in Ireland were in Fort Camden, at the entrance to Cork Harbour, and at the Curragh Camp, which was first a hutted camp dating from the end of the Crimean War, but was rebuilt under the barrack scheme of 1888. When Army Divisions were formed in 1906, the two Field Companies of the 5th Division were stationed at the Curragh. In 1905 a new centre for the 6th Division was started at Fermoy in Southern Ireland, where it was intended to provide barracks for two Field Companies, but building had not commenced on the outbreak of War in 1914. In 1906 a group of R.E. Telegraph units was sent to Limerick where an existing Artillery barracks was appropriated for the group.

The centre of the Irish Survey in 1885 was in Phœnix Park, where a barracks had been built for the company.

The 2nd Division Telegraph Battalion, transferred to Ireland in 1909, had its headquarters in Aldborough House, Dublin.

FINANCE OF OFFICERS' MESS—"A" FUND

Under *Queen's Regulations*, all officers of the R.E. were called on, when joining the Corps, to contribute an entrance fee of thirty days' pay to the Headquarter Mess and a further amount of one day's pay a year, this latter in place of a contribution on promotion, which was

paid in other Corps. The daily contributions were credited to a special fund called " A " Fund and the entrance fees were included in the current accounts up to 1894, when they were also credited to " A " Fund. This fund was used for the purchase and maintenance of Mess property and the repair of Mess premises when not carried out at Government expense. When R.E. Messes were formed at other stations, they could claim from Chatham on 1st April each year a refund of the annual subscriptions for each officer at the station.

R.E. Band Fund

The formation of the R.E. Band is described in Volume II, Part II, Chapter IV.

It originated in the Brass Band belonging to the Depot of the Royal Sappers and Miners at Woolwich, but in 1871 our well-known Bandmaster, Mr. J. R. Sawerthal, was appointed and under him the String Band was formed. Sawerthal was an excellent musician and teacher and under him the R.E. soon took a leading position among all Military Bands. Mr. Sawerthal was succeeded in 1890 by Mr. J. Sommer, who was of German extraction, though his father had been a Bandmaster in our Army. The normal rank for the Bandmaster is that of Warrant Officer, but in 1899 Mr. Sommer was given a Commission and in 1901 he was given the M.V.O.; for some years he was one of the Examiners at Kneller Hall. On Mr. Sommer's retirement, in 1905, some difficulty was found in selecting a successor and eventually, as a result of applying to the Royal Academy of Music, Mr. Neville Flux was appointed, although he had no previous experience of Army Bands. The selection proved successful, and in 1919 Mr. Flux was given a Commission as Lieutenant, with the title of Director of Music; he was promoted Captain in 1927, the first Bandmaster of the Corps to reach that rank. Mr. Flux composed a great variety of music and was elected F.R.A.M. in 1910.

The Band was stationed in Brompton Barracks where it formed either a Brass Band for parades or outdoor concerts, or a String Band for indoor concerts, including music at the weekly Guest Nights at the Officers' Mess. It gave concerts in London and other stations and was also in demand for many important state functions, the most important during the period of this volume being the State Ball at Buckingham Palace in 1897, the year of Queen Victoria's Diamond Jubilee.

The official establishment of the Band provided in Army Estimates was twenty-three, the same as for a battalion of Infantry, but the actual strength was about fifty, the cost of the additional numbers being met from an annual subscription by all officers and by payments for non-official performances. Individual bandsmen were also permitted to take private engagements; the receipts from these helped to increase the emoluments of the performers.

The uniform of the Band consisted of a red tunic with bandsmen's stripes in gold lace and, up to 1897, a gold stripe on the trousers; a red stripe was substituted in that year. The full dress head-dress was the bearskin.

Recruiting for the band was effected by enlisting boys of 14 who passed into the ranks as musicians on reaching the age of 18. These boys, many of them sons of members of the Corps, received their early musical training entirely in the band, instruction being carried out by the more expert bandsmen. Selected musicians were sent from time to time for more advanced instruction at Kneller Hall.

The business of the Band Fund was in the hands of the Adjutant S.M.E. and a small local Committee.

A feature of the Band programmes was the concerts given in London, when for many years the Queen's Hall used to be filled twice a year by a throng of R.E. officers and their friends. Concerts were also given during Royal Engineer Week at Aldershot, and this was later extended to other stations.

Portraits in Headquarter Mess

From the formation of the R.E. Headquarter Mess, an interesting series of records of distinguished officers has been accumulated in the Mess in the form of oil paintings, busts and engravings. Some of these were presented to the Corps by relatives or friends, but the majority were purchased by subscriptions collected from officers and others through the agency of the *R.E. Journal*: Ward in his book on the Headquarter Mess, which carries the story to 1909, gives a list of thirty-one oil paintings and eight busts.

The oil paintings include full-length reproductions of paintings of Her Majesty Queen Victoria and the Prince Consort—copies of the well-known paintings by Winterhalter. These are believed to date from 1851, when a number of R.E. officers was employed in connexion with the Great Exhibition of that year.

Other Royal portraits are those of H.R.H. the Duke of Cambridge,

the Colonel-in-Chief of the Corps from 1861 to 1904; of H.M. King Edward VII, who succeeded the Duke as Colonel-in-Chief from 1904; and of H.M. King George V, Colonel-in-Chief from 1911.

The remaining portraits and busts include: Lieut.-General Sir William Skinner (1700 to 1780); Colonel Sir George Elliott (first Lord Heathfield), the hero of the famous siege of Gibraltar, and his Chief Engineer, General Sir William Green; the Field-Marshals of the Corps, Sir John Burgoyne, Lord Napier of Magdala, Sir Lintorn Simmons, and Lord Kitchener—most of the officers who held the position of Inspector-General of Fortifications after Sir John Burgoyne; Sir Richard Fletcher and the two brothers Sir John and Sir Harry Jones, representing the Peninsular and Crimean Wars; Sir Charles Pasley and Sir Henry Harness, representing the School of Military Engineering; Sir Arthur Cotton (bust), Sir Henry Durand, Sir J. Bateman-Champain, Sir James Browne, representing civil and military work in India; Sir William Denison, formerly governor of Van Diemen's Land (now Tasmania); Sir Gerald Graham and Sir John Ardagh of Egyptian fame; Sir Henry Yule and Colonel Charles Chesney, representing the writers of the Corps; with last, but not least, Brevet Lieut.-Colonel Charles George Gordon in his yellow Chinese coat. The whole is certainly a distinguished gallery and fairly representative of the various activities of the Corps. Further portraits have since been added from time to time.

Mess Plate

In addition to portraits, the Mess possesses a quantity of plate presented by individuals or affiliated Corps. The most striking pieces are those which commemorate the various campaigns, which were presented to the Mess by the R.E. officers who took part in each.

Ward's book, which should be referred to for details, enumerates records of campaigns in the Crimea, Indian Mutiny, Abyssinia, Ashanti 1873, Zulu War 1878, Afghanistan 1878, Egypt 1882, Burma 1885, Chitral 1895, North West Frontier 1897, South African War 1899, China 1900, and the Tibet expedition 1903.

In addition, there are many other mementos, including the Chinese throne sent home by Gordon in 1860 and a royal stool from King Prempeh's House at Kumasi sent home in 1896.

There are also many fine sporting trophies presented by different officers.

Among the smaller pieces of plate are silver statuettes of Sir John Burgoyne and Lord Kitchener, a cup presented by Prince Arthur (Duke of Connaught) in 1868, and a silver pickaxe and stand, presented by Major W. Merriman in 1875, and used to call the members to attention when Grace was said in the Mess.

R.E. War Memorials

In addition to the memorial plate, a custom gradually grew up of commemorating any important military operation by some tangible memorial connected with the names of the officers and other ranks who laid down their lives in the course of the fighting. Some of these were originated by the Corps as a whole, others were started by friends and were later handed to the Corps for maintenance. Of these memorials only the more important can be mentioned in this record.

The first to note is the Arch at the entrance to Brompton Barracks erected to commemorate the Crimean War, which bears the names of all the officers and men of the Royal Engineers, and the Royal Sappers and Miners, who fell in that campaign.

After the Egyptian campaigns a series of memorials was associated with the name of General Gordon. The principal of these was the Gordon Memorial Home at Woking, for the sons of ex-Sappers, managed by a Committee on which many of the senior officers of the Corps have served. The tangible memorial was the statue, designed by Onslow Ford, of Gordon on a camel, carrying the small stick always associated with his name; this was erected in front of the R.E. Institute.

The South African War was commemorated by an Arch with a single opening in front of the grounds of the Institute and facing the Crimean Arch.

In 1884 Rochester Cathedral was adopted by the Corps for a series of memorials, which took the form of stained glass windows at the west end, in memory of various campaigns up to 1881, and in 1888 the windows in the South-west transept were presented in memory of the R.E. officers who fell in the Peninsula and at Waterloo, and a series in memory of the Egyptian and Sudan campaigns of 1882-6. See Volume II, *History of the Corps of Royal Engineers*, page 198.

In 1895 a memorial to the officers and men who died in the Crimean War was erected by the Corps in the cemetery at Cathcart's Hill,

outside Sebastopol, on a site selected by Sir John Ardagh. The cost was defrayed by a subscription from officers of the Corps, with a small grant from the R.E. Memorial Maintenance Fund.

Individual Memorials

In addition to the general memorials there have been a number of memorials to individual officers.

The first of these was the Fowke Medal, which was founded by the Corps in 1866, in memory of Captain Francis Fowke, who died in London in December, 1865. Fowke joined the Corps in 1842 and soon developed a taste for inventions and for architecture. He designed several public buildings in South Kensington, including the Natural History Museum and the general design of the Albert Hall. The Memorial took the form of a silver medal, to be given in each year to a junior officer who had been specially distinguished during his course in the School of Construction at the S.M.E., and a bronze medal for the N.C.O. who was considered the best of those who went through the course for Military Foremen of Works during the year. A memoir of Captain Fowke is included in Volume II, *History of the Corps*, page 494.

The Durand Medal originated in subscription from R.E. and H.E.I. Company's officers in memory of Major-General Sir Henry Durand, K.C.S.I., C.B., of the Royal Bengal Engineers, who, after a very distinguished career in military and civil work in India, was accidentally killed on 1st January, 1871, while holding the post of Lieutenant-Governor of the Punjab. In 1879 the Committee of the R.E. Institute took over the management of the fund, and it was decided that the memorial should be a bronze medal, to be presented annually to a Native Officer, N.C.O., or Sapper, of the three Indian Corps (in turn) who, in the opinion of the Commandant of his Corps, has distinguished himself as a Soldier and a Sapper by good and efficient service; the Commander-in-Chief in India to make the final award. A memoir on Sir Henry Durand is included in *History of the Corps of Royal Engineers*, Volume II, page 489.

The next memorial, to Captain A. E. Haynes, originated in 1898. Captain Haynes as a junior officer was selected by Colonel Charles Warren to accompany him on the Palmer Search Expedition in 1882 and in the Bechuanaland Expedition of 1884–5. He was Assistant Instructor in Survey at the S.M.E. from 1889 to 1894; and in 1896, while taking the 43rd Company to Mauritius, he with his

company joined the Matabeleland Expedition, when Haynes was killed in a successful attack on the enemy's stronghold. A subscription in which many R.E. officers joined, was raised by his family and friends to erect a memorial in Rochester Cathedral. A balance of the fund was offered to the Corps and was used to provide bronze medals to a Sapper in each party of recruits going through the Field Work course at the S.M.E. An account of the Matabeleland Expedition will be found on page 105 of this volume.

A memorial to Colonel R. Y. Armstrong, C.B., F.R.S., was founded by the Corps in 1899. Colonel Armstrong joined the Corps in 1858 and retired in 1892; he died in 1894. He contributed a great deal to the development of the Signalling and Submarine Mining Services and was, in succession, Instructor in Telegraphy at Chatham, 1875 to 1883, and Inspector of Submarine Defences at the War Office, 1884 to 1891. A memoir of his services is given at page 395 of this volume. The memorial took the form of a silver medal for the cadet in each batch at the R.M. Academy, who showed the greatest proficiency in Electricity, and a watch, or other present, to the best N.C.O. in the course for Military Mechanist Electricians.

Three other prizes were founded by private donations up to August, 1914.

In 1902 a prize in memory of Colonel Thomas George Montgomerie, F.R.S., was given by members of his family. Colonel Montgomerie joined the Bengal Sappers and Miners in 1849, and retired in 1876. During this period he was employed on the Indian Survey, including the original survey of Kashmir and parts of Tibet. He died in 1898.

In 1905 a donation was made by Miss J. C. Collinson to found a prize in memory of her father, Major-General T. B. Collinson, C.B. He had a long career in the Corps from 1838 to 1873, including the New Zealand War of 1847. He retired in 1873.

In 1909 a legacy was left by Mrs. Darling Barker to found a prize in memory of her son, Lieutenant Rainey-Anderson, who joined the Corps in 1892 and died of wounds in 1901 during the South African War.

The first two of these prizes were for junior officers at the S.M.E., the last was for the Cadet, commissioned in the R.E. from the R.M. Academy, who showed the greatest proficiency in two languages.

The details of these prizes have varied from time to time, following changes in military organization, and additional prizes have been added, including the following :—

Lewis Prize, in memory of Colonel J. F. Lewis, awarded to young officers for proficiency in Field Engineering, started in 1919, but ceased in 1933 owing to lack of Funds.

Stokes-Roberts Prize, started in 1922, in Memory of Brigadier E. R. B. Stokes-Roberts, awarded to N.C.Os. undergoing a construction course at the S.M.E. In 1948 it was decided to combine this fund with the Fowke Trust.

Arthur ffolliott Garrett Prize, started in 1923, in memory of Major A. ff. Garrett, R.E., and awarded to regular officers of the Corps not above the substantive rank of Major for articles in the *R.E. Journal*.

Alan Izat Prize, founded in 1941, in memory of Captain A. Izat, R.E., and awarded to the second highest cadet commissioned into the Corps from the R.M.A. Owing to the closure of the R.M.A. Woolwich during the 1939–45 War the first award was made in 1948 to the first batch passing out of the reorganized R.M.A. Sandhurst.

Institution of R.E. Prize was started in 1948 and awarded to the top cadet from each batch at the R.M.A. Sandhurst, commissioned into the Corps.

The Annual General Meeting of the Corps

In the course of the growth of the Corps, various societies or clubs have been formed, but before considering the details of these it seems desirable to refer to what is still known as the Annual General Meeting of the Corps held in London, to which all Corps Committees submit reports of their activities during the previous year ending 31st December, and at which the accounts for the year are discussed and approved. One of the functions of this Meeting is the approval of any new societies, their Rules and Bye-laws and the amendment of all such regulations.

The Inspector-General of Fortifications, as the recognized head of the Corps, had, up to 1904, an overriding authority to approve all reports submitted to the Meeting, at which he himself presided, and, as some of the matters discussed trenched on questions of Military organization, it was ruled that, in the absence of the I.G.F. for any reason, the senior R.E. officer on the active list would preside. This rule was put into force when the post of I.G.F. was abolished in 1904 and continued in effect till after the Great War of 1914–18.

Except for the Chairman and Secretary of each Fund or Society, attendance is voluntary and is open to any officer on the active or retired lists of the Corps. The draft of any proposal or amendment

suggested has to be approved beforehand, but considerable freedom of discussion is allowed ; any officer present can join in the discussion on any subject, but only subscribing members can vote on matters affecting their Society. A shorthand note of the Proceedings is taken and published in the *Supplement to the R.E. Journal* and is also circulated to all officers with the accounts for the following year.

The date of the first Corps Meeting is not known, but it is on record that the R.E. Libraries were reorganized at Corps Meetings held on the 1st February each year in 1845, 1846 and 1847, and in 1847 a Central Library Committee was appointed. The *Professional Papers*, which date from 1836, were approved by the I.G.F., without any special meeting of the Corps, and were controlled by an annual meeting of subscribers held at Woolwich ; but in 1846 the Editor was directed to submit a report to the Corps Meeting to be held on 1st February, 1847, and from this date the control of the *Professional Papers* passed to the Corps.

In the catalogue of the London Library, first issued in 1866, there is a preface detailing some of the Chronicles of the London Corps Libraries and giving many details of the actions of the Annual Meetings to further the growth of the Libraries.

The oldest Society of the Corps is the Officers' Widows Fund, founded in 1783 (see page 361). From 1785 the proceedings of this Society were regulated by a Deed of Settlement. Among other rules in this Deed, an Annual Meeting of members had to be held on 1st February in each year to discuss the annual accounts made up to the previous 31st December. It seems likely that this meeting gradually developed into the Annual Corps Meeting.

It is suggested that the organization of the Corps Meetings, as well as the foundation of the Royal Engineers Institute some years later (see page 347), may be associated with the name of Sir John Burgoyne, who commenced his long term of office as Inspector General of Fortifications in 1845 and held the appointment till 1868. He presided at the Meeting in 1845. Before joining the War Office he had been for thirteen years the head of a new Board of Public Works in Ireland. During this period he founded, and was for some years the President of the Irish Institution of Civil Engineers. This experience must have helped him in carrying through the founding of the Royal Engineers Institute at Chatham, and in persuading the Government to provide the necessary funds.

While the general procedure of the Annual Meeting continued almost unchanged to the end of the period covered by this volume,

it developed in many directions. When the Royal Engineers Institute came into being (page 347) the permanent Secretary became in practice the Secretary of the Corps Meeting and was responsible for the annual report of the proceedings.

Up to 1870 the reports of the Meetings of the Widows Fund were printed and circulated separately from the reports of the Corps Meeting, but in this year one report only was printed, which included the Widows Fund and the newly formed Charitable Fund. A complete set of copies of the Annual Reports from this date was kept by the Secretary R.E. Institute.

Corps Committee

In 1904, when the appointment of Inspector General of Fortifications was abolished, his duties were divided among several officers, and the Royal Engineers were deprived of any official or social head. In 1907, on the motion of Sir Richard Harrison, a Corps Committee was formed with the approval of His Majesty, the Colonel-in-Chief. It was composed of a Colonel Commandant as President, with the Inspector R.E., D.F.W., and A.A.G.R.E., as members. Its duties were to carry on the demi-official work which was formerly done by the I.G.F. as head of the Corps. Sir Richard Harrison accepted the position of President and was still holding this appointment on the outbreak of war in 1914.

As an example of the work of this Committee, its approval was requested to the formation of the R.E. Old Comrades Association in 1911 (see page 368).

Technical and Literary Activities

Royal Engineers Libraries

One of the first acts of Pasley at Chatham was the formation of a professional Library. This was inaugurated at a general meeting of R.E. officers stationed at Chatham, on 3rd November, 1813, under the presidency of Colonel Robert D'Arcy, who was probably the senior officer of the R.E. at the station. The expense was entirely defrayed by a small monthly subscription of members present at the meeting; there was no entrance fee. During the next few years, similar libraries were established at other stations and, on the suggestion of Pasley, company libraries, financed by voluntary subscription, were formed in several units. The Library at Chatham, managed by a Committee of officers at that station, continued to

flourish, and the library at Dublin, started in 1825, was alive in 1845, but the other early libraries had died out.

In 1845, at the Annual Corps Meeting held at the War Office on 1st February, Lieut.-Colonel R. C. Alderson, then Assistant Inspector-General of Fortifications, reopened the question of the Libraries and suggested the formation of a Central Library, either in London or Chatham, which should be accessible to the Corps generally. This was referred to a small Committee consisting of Lieut.-Colonel Alderson, Captain W. Denison and Captain G. Wynne. At the next Annual Meeting on 2nd February, 1846, this Committee was enlarged by the addition of Brigade Major H. Sandham and Captain M. Williams, with instructions to circulate their proposals to all officers of the Corps. At the next Annual Meeting, on 1st February, 1847, it was reported that 211 officers, a majority of the Corps, had agreed to the proposal and it was decided that the R.E. Corps Libraries should come into operation as soon as possible. The Committee was confirmed in its appointment, with the substitution of Captain H. D. Harness in place of Denison, and Lieutenant Douglas Galton was appointed Secretary, a post which he held for fourteen years.

Alderson applied at once to the Board of Ordnance, through the I.G.F., for Government recognition and assistance in the use of W.D. postage and transport for carrying books to out-stations and in the provision of suitable presses, at Government expense, at all stations where a library was established. These requests were approved by the Master-General of the Ordnance and have continued in effect through all the changes in organization at the War Office.

The Committee then proceeded to form libraries at selected stations, as funds permitted, and by 1862 had established libraries at sixteen home stations and nineteen abroad. This seems to have been about the peak as regards numbers of stations, but these were subject to constant variation as British garrisons were withdrawn from Australia, and other Colonies, or stations, like Corfu, were closed down.

Membership was voluntary ; the original annual subscription was £1 a year with an entrance fee of £1, but in 1857 the entrance fee was suspended, on the grounds that most of the capital expenditure was completed and the abolition of the entrance fee would benefit the junior officers.

In 1852 the Chatham Library, which still had its own Committee, claimed its independence. This was recognized and the Chatham

Library (later called the S.M.E. Library) regained its right to manage its own affairs. The financial question was solved by the Corps Library Committee collecting all subscriptions and refunding to Chatham the subscriptions of the officers present at the S.M.E. on the first of April in each year. In 1854 a sum of £21 per annum was allotted to the Dublin Library to be spent by the local Committee. When Aldershot (*sic*) was started an annual sum of £21 was set aside for that station.

The London Library was made a central library, and was housed in the office of the Inspector-General of Fortifications, first in Pall Mall, and from 1871 in the Horse Guards; one of the clerks in the I.G.F's. office undertook the work of Librarian. A catalogue of the books in the libraries (omitting Chatham) was issued in 1866. Later, as the London Library increased in size, a catalogue was issued of that library alone and was later reissued in a different form.

The Library Committee was gradually expanded to make it more representative of the Corps, and in 1869 it was made responsible for the annual publication of the reports of all Corps Funds and the record of the Annual Corps Meeting. In 1873 it was composed of a President, two *ex-officio* members (the D.A.G., R.E. and the Commandant S.M.E.) with nine elected members, and in that year it was combined with the Committee for the *Professional Papers* (see page 342) though separate accounts continued to be kept for the two Funds.

When it was decided to amalgamate the separate Corps of Indian Engineers with the R.E., access to the libraries by Royal Engineer officers ordered for service in India was considered and, after some discussion with an existing library in Madras, it was decided to leave the Indian Libraries quite independent of the English organization. Officers of the R.E. ordered to India ceased to subscribe to the Libraries on embarkation for India, and, a little later, officers returning from India on leave were allowed to subscribe and obtain books during their residence in this country, without being required to pay back subscriptions. An annual statement of the financial position of the Madras Library was presented at each Annual Corps Meeting up to 1882.

In 1876 and 1877, on the formation of the Royal Engineers Institute, the R.E. Libraries and *Professional Papers* were transferred to the charge of the Committee of the Institute, and the Secretary became Secretary of the R.E. Libraries. But the working and management continued on the same lines as before. The

Secretary was also Secretary of the S.M.E. Library, but the local Committee of management was retained.

By this time the books in the Central Library in London had been increased by many gifts from officers, while there was a systematic exchange of publications with other engineering societies. Also arrangements had been made with the War Office for supply of copies of all Orders and *Corps Memoranda*, and of papers and pamphlets issued by the Military Intelligence Department; the Indian Government also supplied copies of their publications.

When the new War Office was opened in December, 1906, the general question of the future of the London Library was considered and on the initiative of Brigadier-General R. M. Ruck, the D.F.W., and Colonel G. Barker, the Inspector of R.E., two rooms over the entrance to the Horse Guards, Whitehall, were allotted to the Corps for the use of the Library. This change was much appreciated, a permanent Librarian was appointed, and the rooms were fitted with presses and furnished, so that meetings of committees could be held there, while individual officers, wishing to obtain information or to refer to books in the Library, found a warm confortable room in which to work. All the Editors of the volumes of the *History of the Corps of Royal Engineers*, published since 1906, made considerable use of this room. Through the war of 1914–18, the room was used for a branch of the Censorship, but the issue of books continued and use by the Corps was resumed in 1919, and the room continued in use till 1939, when the London Library was moved to Chatham and the S.M.E. Library was incorporated with the main Library.

In 1942 separate subscriptions for the Library ceased and the Library became an integral part of the Institution of R.E.

The first permanent Librarian was Mr. S. G. Thornton, who had been in charge of the Library while a clerk in the I.G.F's. office. He retired in October, 1923, at the age of 84, after fifty-four years service to the Library.

Professional Papers of the Corps of Royal Engineers

The *Professional Papers* were started by Lieutenant W. T. Denison in 1837 and continued to 1918. There were four distinct series of volumes.

A memoir of Denison is included in Volume II of the Corps *History* (page 466), from which it will be seen that he joined the Corps in 1826 and in 1833 was the first Superintendent of Survey at the

S.M.E. In 1835 he was lent to the Admiralty as the officer in charge of the Engineering Works at Woolwich Dockyard, under Captain Brandreth, R.E., the Director of Admiralty Works. He remained in Admiralty employment for nine years, first at Woolwich and later at Portsmouth, and it was while at Woolwich he projected and became the first Editor of the *Professional Papers*, the first eight volumes being edited by him.

Woolwich in 1837 contained the depot of the Royal Sappers and Miners, which was commanded by an officer of Royal Engineers with the title of Brigade Major. There were other R.E. Officers for duty at the depot; also a C.R.E. and officers under him in charge of the ordinary Engineering Works. Denison first explained his plan for a series of Professional Papers to a meeting of R.E. Officers held at the Royal Engineer Office, Woolwich, when resolutions were passed outlining rules for the conduct of the papers and asking Denison to take charge of the proposed publication. These resolutions were signed by the Brigade Major, C. G. Ellicombe, and were submitted by him for approval of the Inspector-General of Fortifications, Major-General Sir Frederick Mulcaster. When approval was obtained Denison entered on his duties at once. There was no Committee and everything was left to him.

The first series of *Professional Papers* were issued in volumes of quarto size, the cost being defrayed by subscriptions not exceeding ten shillings a year. The first volume, issued in 1837, contained 165 pages. It consisted of twenty papers, varying in length from three to thirty pages. There were twenty full page illustrations, besides others in the text. It was bound in green cloth.

The contributors to the first volume included Colonel C. W. Pasley, Lieut.-Colonel W. Reid, Captains C. C. Alexander, H. J. Savage, and R. C. Alderson with Lieutenants T. C. Luxmore, E. Frome, and W. T. Denison, all R.E. There was also a series of articles on drawing instruments by S. B. Howlett, Chief Draughtsman, Ordnance. In the Introduction the Editor asked all officers to contribute their experience, however trifling, and pointed out that if they would do so, there would be ample material for a series of volumes.

Denison had edited the first eight volumes, when he was given the appointment of Governor of Van Diemen's Land and received the honour of Knighthood. His duties as Editor were taken over temporarily by Captain H. James, who had just succeeded Denison as Director of Admiralty Works at Portsmouth. At a meeting of

subscribers, held at Woolwich on 23rd September, 1846, the officers present subscribed for a piece of plate " to be presented to Captain Sir William Denison, R.E., as a token of grateful remembrance for his services in originating the *Professional Papers*."

James edited the ninth volume in 1846 and in a preface he explains that he had been asked by the meeting of officers, held at Woolwich in September 1846, to complete this volume which had been prepared by Denison. The meeting had asked Captain J. Williams to succeed James, but this meeting was a meeting of subscribers only and could not bind the Corps as a whole, so Williams was instructed to consider the future of these papers and to submit proposals to the next Annual Corps Meeting to be held in London on the 1st February, 1847. This was the meeting at which the scheme for R.E. Libraries was revived. The meeting appointed Colonel G. G. Lewis and Captain Williams joint editors and asked them to submit detailed proposals to an adjourned meeting on 23rd February 1847.

Their proposals were that " Papers should thence forward be issued in two forms, (1) *Corps Papers* of interest only to R.E., (2) *Professional Papers* of general interest, the first to be issued as pamphlets of quarto size in six or seven sheets, totalling ninety-six, or 112 pages each six months, and *Professional Papers*, compiled as before in separate volumes, about two volumes every three years.

The *Corps Papers* were to be paid for by subscribers through their accounts at Messrs. Cox and Co., the *Professional Papers* to be in the hands of a publisher. It is interesting to note that at this date the circulation of the old *Professional Papers*, which had been welcomed in many professional circles outside the Army, included as subscribers 250 R.E. officers and 112 officers of the H.E.I. Company (in addition to fifty copies purchased by the Government of India), forty-eight subscribers among R.A. officers and many from other Corps. In addition, copies were sent by the Publishers to almost every Military library in the capitals of Europe and America.

Under the above decisions of the Corps Meeting, the tenth volume of the series appeared in large octavo form, as the Publishers would not continue to use the quarto size on the ground of expense. The Editors published during the next three years, three numbers of *Corps Papers* which formed one volume, but the supply of articles was insufficient for the double issue and at the Corps Meeting in February, 1851, it was decided to drop the *Corps Papers* and the quarto form and to continue the *Professional Papers* as a New Series in large octavo.

Major-General Lewis and Captain J. Williams continued as joint editors to 1854, when Captain J. B. Bainbridge succeeded them till 1861, by which time ten volumes of the New Series had appeared; then Captain C. S. M. Hutchinson, who had been an Instructor in Fortification at the R. M. Academy, carried on the work for fifteen years to 1876, editing Volumes XI to XXIII. By 1876 Hutchinson was an Inspector of Railways, under the Board of Trade, and had the rank of Major-General, but continued this voluntary work for the Corps. A Committee to control the *Professional Papers* had been formed on a similar scale to the Library Committee, probably about 1861, with the I.G.F. as President.

On the formation of the R.E. Institute, when the Library and Papers Committees were merged in the Committee of the Institute, there was a widely expressed wish for a change of size, and, after considerable discussions, it was decided to start a third series of *Professional Papers* as an *Occasional Paper Series*, to be published quarterly in pamphlet form, each pamphlet containing four papers, but so printed and paged that they could be bound up at the end of each year to form a volume of ordinary octavo size. The issues in 1877 were so arranged to form Volume I of this series.

Meanwhile three separate papers had been issued in 1876, but not paged; these were bound into a separate volume called Appendix to Volume I.

In subsequent years some of the papers were issued separately, but each was marked with its volume and number and they were repaged and bound into a volume at the end of each year. Thirty volumes of the *Occasional Paper Series* were issued up to 1904.

In this year a change was made in the form of the *R.E. Journal* into a monthly technical magazine which absorbed all the shorter military articles and left much less for the *Professional Papers*, but the latter continued to be issued under the name of the Fourth Series, of which three volumes were completed covering 1905–7, 1908–11 and 1912–15. Six more papers were published to 1918 but not bound. All the above series were issued under the general title of *Professional Papers of the Corps of Royal Engineers*. A printed Index to all *Professional Papers* from the original issue was prepared by Hutchinson in 1872 and was reprinted in 1892; a copy completed to date in typescript is kept in the office of the R.E. Institute.

In 1874 a separate series of *Professional Papers* was issued on the initiative of Lieut.-Colonel W. O. Lennox, V.C., who was then

Instructor in Fortification at the S.M.E. These were translations of Prussian articles on the Franco-German War. There were five papers in all which have been bound into a volume. They were called the *Confidential Series* and this title has been used in later years to cover papers dealing with military details which could not be given to the general public. Such papers were printed separately without being bound into volumes.

There was also a series called the *Foreign Translations Series*.

Publications and Technical Books

In 1812, when the S.M.E. was started, the supply of technical books was very meagre and Pasley began his labours by writing three volumes of instructions: the first on some novel methods of teaching, the second mainly on Fortification, and the third on Practical Architecture written in 1825 when the responsibility for Barrack Construction was placed on the Corps. From this time R.E. officers contributed materially to the literature of engineering work, especially by the Series of *Professional Papers*, described in the previous section.

In 1866 Major H. Wray was appointed Instructor in Construction at the S.M.E. and held this appointment till 1874. In 1872 he published his lectures in book form under the title of *Instruction in Construction*, which was subsequently revised, reprinted, and used as the text-book of the school up to 1893. Many books and pamphlets were published by his successors. In 1879 Major H. C. Seddon (I. in C. 1879–85) published *Notes on the Building Trades and Building Construction*. Major E. C. S. Moore (I. in C. 1890–3) published a text-book entitled *Sanitary Engineering Notes* and also *Notes on Gas*. The former was enlarged by Colonel Moore and republished in 1898, when it was recognized as the standard work on the subject. Major G. K. Scott-Moncrieff (I. in C. 1893–8) contributed *The Water Supply of Barracks and Cantonments* and *Principles of Structural Design*. Major J. Winn (I. in C. 1898–1904) wrote *Notes on Steel Concrete*, the first book published in English on this subject.

In 1873 *Surveying*, by General E. Frome, was revised and enlarged by Captain C. Warren; Frome had been Superintendent of Survey at the S.M.E. from 1835 to 1839. There were two later text-books in this school, *Notes on Astronomy* by Lieut.-Colonel A. C. Macdonnell, 1902, and *Text-book of Topographical Surveying*, by Major

C. F. Close, 1905, a comprehensive work embodying all branches of Survey.

Three volumes of *Notes on Building Construction* were published anonymously for the use of the Science and Art schools in connexion with South Kensington, and a fourth volume on *Theory of Construction* was published in 1891. These were written by Major Percy Smith who had followed Wray as Instructor in Construction at the S.M.E. 1874–9.

Since 1882 the publication of technical text-books has been undertaken by the R.E. Institute, including many of those detailed above, and also Sir George Galton's *Army Sanitation* published in 1887.

In 1894 Major Scott-Moncrieff brought out his *R.E. Field Service Pocket Book*, of which a second edition was edited by Captain R. F. Edwards in 1902. Other books published by the Institute were Colonel H. Tovey's *Notes on Military Law*, *Permanent Fortification for English Engineers* by Major J. F. Lewis, and, perhaps the most valuable from the historical point of view, the *Roll of Officers of the Corps of Royal Engineers from* 1660 *to* 1898. This was compiled by Captain R. F. Edwards from MS. Rolls prepared by Captain T. W. J. Connolly, late Quartermaster R.E. Connolly, who retired in 1865, spent his leisure collecting data about the history of the Corps and on his death, in 1885, his papers were purchased by the Corps and have since been a fruitful source of information for many details of Corps history. His Roll was supplemented and completed by Edwards up to 1898 by references to the British Museum, Record Office, War Office, and other sources, public and private. An attempt was made to issue periodical additions but the labour involved in keeping copies up to date was immense. One copy completed in MS. and typescript is maintained to the present day in the office of the Secretary of the R.E. Institute.

In addition to the above, a number of official text-books on many subjects has been prepared and periodically revised by R.E. officers. Some, such as those on *Field Fortification* or *Military Topography*, are used by the whole Army, others such as those on *Surveying*, *Electric Lighting*, *Submarine Mining*, or *Telegraphy* were used in the various schools.

The first two volumes of *History of the Corps of Royal Engineers* (Volumes I and II), by Major-General Whitworth Porter, which took the history to 1886, were published in 1889. A third volume (Volume III) by Colonel Sir Charles Watson, which deals with some of the history up to 1914, was published in 1915.

A Sectional *History of the Submarine Mining Services* was written by Major W. Baker Brown, carrying the story up to 1906 (by which time the Mining had been transferred to the Royal Navy) and was published in 1910. Sectional histories on the work of the Royal Engineers in Egypt and in India by Lieut.-Colonel Sandes, R.E., have been published since 1914, but are mentioned here as they cover a good deal of the story in the general volumes.

R.E. Occasional Meetings

Another organization of a technical character was designed to provide opportunities for R.E. officers to meet and discuss papers on engineering subjects. The only record is an entry in the report of the Annual Corps Meeting for 1872, from which it appears that there was a separate Committee presided over by the Inspector-General of Fortifications, and that this Committee arranged for the reading followed by discussion of some suitable paper. The meetings were held in the War Office and about three to five meetings were held each year. Lieut.-Colonel C. S. Hutchinson, who was the Editor of the *Professional Papers*, was the Secretary of the Occasional Meetings Committee. In 1872 the Committee was amalgamated with the *Professional Papers* Committee, and the next year this was joined with the Library Committee.

When the R.E. Institute was formed, the arrangement of lectures was one of the duties undertaken by the Institute Committee.

CHAPTER XVI

THE ROYAL ENGINEERS INSTITUTE (LATER INSTITUTION OF R.E.) AND DUTIES OF COMMITTEE

General—R.E. Journal—R.E. Institute—The Institute Building—Committee of Management—Captain Vetch appointed Secretary—Duties of Secretary—Gold Medal Prize Essay—Model room—Names of Secretaries—Memorial Maintenance Fund—Incorporation under a Royal Charter refused—Premises for the Institution in London—Use of Theatre of R.U.S.I.—London Library allotted two rooms in the Horse Guards—Change of title to Institution of R.E.—Grant of Charter—Membership of Institution—Publications—R.E. Libraries—R.E. Museum—Entertainment Fund—Concerts in London—Annual Reception—Dinner Club—Luncheon Club.

THE year 1870 was noteworthy in Corps History for many reasons; it was a year of a revival of interest in military questions, stimulated by the Franco-Prussian War. There were also several changes in progress in the Corps of R.E. following the decision to absorb the separate Corps of Indian Engineers into the home Army; the number of R.E. officers in 1868 was 385, the absorption of the Indian Corps would add 336 and a further ninety-six officers were added from 1869 to 1874 to provide for increased demands for India, making an ultimate total of 817. At the War Office changes were in progress, the R.E. Branch was moving from Pall Mall to the Horse Guards in Whitehall, and the title of Inspector-General of Fortifications, which had been dropped in 1862, was being revived for Major-General Sir Frederick Chapman who took up the appointment on 1st July, 1870.

THE ROYAL ENGINEERS JOURNAL

At the Corps Meeting in May, 1870, Major R. Harrison proposed and Captain R. Home seconded "That a Corps periodical should be started." This met with general approval but no formal vote was taken. The first copy of the *Journal*, however, appeared in August of that year, Captain Home being the first Editor, but the next year Home handed over the duty to Major V. G. Clayton, who was

then serving at Chatham as Secretary, R.E. Committee, and who undertook the work and carried it on for the next five years, in addition to his other duties.

The *Journal* was printed in foolscap form, which it retained till 1905, and included a nominal roll of the Corps; it was issued monthly. From January, 1873, the nominal roll was printed separately and called the *Supplement to the R.E. Journal.*

The expenses of printing and distribution were met by a subscription from the officers who received a copy.

In 1876, on the formation of the R.E. Institute and the appointment of a permanent Secretary, the latter took over the duties of Editor of the *Journal*, and under his control the *Journal* continued to increase and flourish. The main feature was the Corps News, including copies of all *Gazettes* and *Army Orders* affecting the Corps, all *Corps Memoranda*, lists of officers ordered to and from foreign service, and of news from stations at home and abroad. Each issue usually included one or more articles of a technical nature and there gradually grew up a series of reviews of foreign military journals and of important publications. One feature was the biographical memoirs of deceased officers, though this was not carried out systematically. The reports of the Annual Corps Meetings were published in full. Considerable space was allotted to sport and games.

In January, 1905, the size of the *Journal* was reduced to Royal 8vo and its contents limited to professional matters and memoirs; the old *Supplement* was called the *R.E. Monthly List* and a new *Supplement* was issued monthly containing Regimental and Social news. From 1920 to 1939 the R.E. List was published quarterly and during and subsequent to the 1939–45 war it was published half-yearly.

Royal Engineer Institute

The increase in numbers and duties had put some strain on the officers who carried on the voluntary work described above, and there was also a growing wish for further opportunities of studying technical questions. These took the form of a suggested Royal Engineer Institute, following the lines of the Royal Artillery Institute at Woolwich, which housed a technical Library and a Museum, and was a centre for Artillery work. At the same time, the School of Military Engineering at Chatham was asking for additional accommodation for the increased number of officers and

men under training, and for the release of barrack accommodation in Brompton Barracks used as class-rooms and offices. About this time the expansion of Chatham Dockyard compelled the Fieldworks instruction branch to move from St. Mary's Creek to ground adjoining Brompton Barracks, and there were proposals under consideration to extend the instruction in some branches to other arms of the service, which would necessitate additional space for instruction.

In 1869 a Royal Commission on Military Education was sitting under the presidency of Lord Northbrook, and the above considerations being laid before the Commission, approval was given in 1871 for the provision at Chatham of a building which would combine the accommodation for an Institute with the provision of class-rooms, a lecture theatre and certain offices. A Committee composed of Lieut.-General Sir Lintorn Simmons, Major-General Sir Henry Harness, both former Commandants, and Colonel T. L. J. Gallwey, the then Commandant, was formed to draw up conditions as to floor space required and to propose a site; when these were approved the design of the building was prepared in the War Office by Lieutenant M. F. Ommanney under the supervision of the I.G.F. Lieutenant Ommanney had joined the R.E. in 1864 and retired in 1878 to take up work under the Colonial Office; a short memoir of his life and service is given on page 403 of this volume.

The estimate for the new building was £21,000 and this was included in the Votes for 1871 and 1872. Tenders were called for by Colonel J. W. Lovell, then C.R.E. Chatham, and accepted in November, 1871; the foundation stone was laid on 28th May, 1872, by Field-Marshal H.R.H. the Duke of Cambridge, C.-in-C.; the building was completed 31st December, 1873.

An account of the initiation and construction of the building was written in March, 1874, by Major W. D. Marsh and published in the volume of *Professional Papers* for 1874. The site of the Institute and apparently all the area on the east side of the road to St. Mary's Barracks was occupied by hut barracks, probably dating from Crimean days. The building faces west and is centred on the centre line of Brompton Barracks; the original site level was four feet below the barrack parade, but this was brought up by filling so that the bottom of the steps to the Institute Portico is on a level with the pavement of Brompton Barracks. The building is Italian in style and a feature of the design was the use of terra-cotta instead of stone for ornamental work.

The building is composed of a centre block with front and rear

ranges, each of two floors, there is a half basement under the front range.

The centre block contains the lecture theatre, which extends through two floors, the distribution of rooms was so arranged that the officers' halls of study were on the first floor, with entrance from the front, while the rooms for N.C.Os. and men were on the ground floor, and could be entered from the sides.

Rooms for the schools of Construction, Survey, Telegraphy and Chemistry were embodied in the design, the latter including a laboratory with printing and lithographic rooms in the half basement and a well-equipped photographic studio on the first floor. Rooms were allotted for a museum, a model room, a technical library, and offices for the Secretary and his staff and also for the Secretary, R.E. Committee.

The walling of the building is of grey stock brick with the façade, as far as the first floor, of white Suffolk bricks. The cornices, balusters of roof, window dressings, and string courses are of terra-cotta, and every fifth course is of terra-cotta nailhead bricks; yellow malms are used above the first floor, giving a contrast with the Suffolk bricks and terra-cotta; all other portions are faced with yellow malms; the chimney stacks are of Portland Stone. The spandrils and key stones of the three doorways of the portico are in lightly ornamented terra-cotta, to designs by Ommanney. These designs were exhibited at the Vienna Exhibition of 1873 by the contractors for the terra-cotta—Messrs. Doulton of Lambeth. The use of terra-cotta gave a small reduction of cost as compared with stone and also allowed of finer detail in the decoration; it is also unaffected by frost.

On the completion of the building, the original Committee was reassembled to report on the Institute and on the manner in which it should be organized and worked. Their report was approved by the Commander-in-Chief and the Secretary of State for War, and a précis of this report was presented to the Annual Corps Meeting on 22nd May, 1875. After detailing the accommodation provided, stress was laid on the importance of preventing all possible interference with the scheme of the S.M.E. and with this object "the Institution (*sic*) should be placed for discipline under the Commandant of that School and that he must have absolute control of the theatre, the schools and all the establishments housed within it."

With the précis was a proposal that the management of the Institute should be in the hands of a Committee consisting of nine

ex-officio and fifteen elected members. These proposals were accepted at the Corps Meeting of 1875, which elected the fifteen members and the Institute came into being from that date.

The Committee was constituted as follows :—

H.R.H. The Duke of Cambridge was Patron and President.

The Members were :—

*III	Lieut.-General Sir Frederick E. Chapman, K.C.B., I.G.F.
III	Colonel T. L. J. Gallwey, Commandant S.M.E.
IV	Colonel J. F. M. Browne, C.B., D.A.G., R.E.
II	Brevet Colonel C. C. Chesney, C.R.E. Home District.
	Brevet Colonel C. B. Ewart, C.B., Dep. Dir. Works, War Office.
IV	Brevet Colonel C. B. P. N. H. Nugent, C.B., Dep. Dir. Works, War Office.
	Colonel A. C. Cooke, C.B., C.R.E., Aldershot.
	Lieut.-Colonel R. H. Stotherd, War Office.
	Lieut.-Colonel H. Schaw, Professor, Staff College.
II	Major J. U. Bateman-Champain, Indo-European Telegraph Dept., Tehran.
III	Major R. Grant, D.A.A.G., R.E., War Office.
	Major P. G. L. Smith, Instr. in Construction, S.M.E.
III	Major C. W. Wilson, A.Q.M.G., War Office.
	Captain V. G. Clayton, Sec. R.E. Committee, Chatham.
	Captain W. Salmond, Chatham.
	Major W. Merriman, Colchester.
	Captain G. E. Grover, Camberley.
	Captain E. M. Lloyd, Professor, R.M.A. Woolwich.
IV	Captain W. de W. Abney, Asst. Inst., S.M.E.
	Lieutenant A. B. McHardy, London.
	Lieutenant E. Wood, London.
IV	Lieutenant M. F. Ommanney, War Office.
	Lieutenant R. H. Jelf, Adj. R.E. Train, Aldershot.
IV	Lieutenant H. Jekyll, Post Office Telegraphs.

The Institution Building at Chatham was erected at Government expense, and it is maintained out of War Office funds. Thus, not only was the Corps saved considerable expense, but the official

* Biographical notices of many of these officers are included in the Corps Histories—those marked II in Vol. II, those marked III in Vol. III and those marked IV in the present volume.

recognition of the various Corps activities and the incorporation of the officers of the Corps as a recognized Society helped the Corps in many ways. Not the least of these was the authority to employ an officer of the Corps on the active list as a whole-time Secretary. The appointment of the Secretary rested with the Corps at their Annual Meeting, subject to the approval of the I.G.F.; if more than one candidate presented himself the selection was to be by ballot.

The first Secretary so appointed was Major W. H. Collins, who took over from Captain V. G. Clayton in August, 1875, but he resigned the following year and was succeeded by Captain R. H. Vetch in July, 1876. It was Vetch who laid the foundations on which the work of the Secretary gradually grew until it included many of the Corps activities. He had a taste for writing and in his later years, after holding important positions at the War Office and elsewhere, did much work on the biographies of distinguished officers of the Corps. His work as Secretary was so successful that he retained his post till January, 1884.

The Secretary at once took charge of the *Journal* and in 1877 the joint Committee, which from 1873 had been in charge of the Libraries and the *Professional Papers*, was absorbed into the Committee of the Institute and Vetch became the Secretary of the Libraries and Editor of the *Professional Papers*, and was also responsible for the Annual Statement of Accounts presented to the Corps Meeting, and the preparation of the shorthand report of that Meeting. Among other details which were added to his duties was the charge of the various Memorial Funds and of any special fund raised to purchase portraits of distinguished officers. Vetch took a personal interest in the provision of memorial windows in Rochester Cathedral in memory of R.E. officers and men who died on active service and most of the memorials were installed during his tenure of office. He also took charge of the Photographic and Lithographic Funds for the S.M.E., and was Secretary of the S.M.E. Library. Another duty, which gradually increased to very large dimensions, was the supply of information to officers away from Headquarters, such as advice on books or instruments, and in some cases their purchase and dispatch to foreign stations, and this grew so fast that in 1879 the Secretary received, acted on and replied to more than 4,500 communications.

The separate subscription from officers for the Libraries was maintained, mainly because of the special provisions for officers in

India, but the S.M.E. Library retained its independence and had its own Committee. It was later moved from the Institute building to rooms in Brompton Barracks next to the Officers' Mess.

The subscriptions for the *Professional Papers* and for the *Journal* were merged in the general subscriptions for the Institute which at first were—Entrance Subscription, all ranks, £1 ; Annual Subscriptions for Lieut.-Colonels and senior officers £2, and then by a reducing scale to £1 for 2nd Lieutenants. It was decided that retired officers could be members of the Institute, also officers of the Reserve and Auxiliary Forces. Other officers including Surveyors (of Works) could be elected as Associate Members, and a list of Honorary Members, selected from leading members of the engineering professions, was started with the name of Sir Frederick Abel, F.R.S., the eminent chemist who had been long associated with the Corps in connexion with the development of explosives.

The original rules for the Institute provided for the appointment of a Treasurer, but in practice this duty devolved on the Secretary. The work was lightened by the Corps Agents, Messrs. Cox & Co., who arranged to collect officers' subscriptions through their accounts and credited the proceeds to the various Corps Funds. The Secretary had the work of paying all bills and outgoings. The invested moneys belonging to the various funds were invested in the names of Trustees, usually two or three senior officers of the Corps.

The Committee of the Institute was also responsible for arranging a few lectures each year in the Lecture Theatre, but this function was soon taken over by the Commandant S.M.E. Another duty was the collection of objects for a Museum which was to be in three classes: (I) Geology and Meteorology, (II) Chemistry and Electricity and (III) Artillery, to which was added objects of special Corps interest. Other work of the Institute Committee was to be the support of classes in foreign languages and landscape drawing and they also undertook the publication of text-books, as described above under Publications.

In 1875, on the suggestion of Colonel W. O. Lennox, it was decided to present a Gold Medal annually for a Prize Essay. The first medal for 1875 was won by Captain Thomas Fraser against four other competitors and he repeated his victory the following year when only two essays were sent in. In 1877 the medal was won by Lieut.-Colonel R. Harrison against four other competitors, but in 1878 and 1879 the medal was not issued. In 1880 the medal was won by Lieutenant R. da Costa Porter against two others.

The award was then discontinued, as the support from the Corps was considered insufficient.

In 1881 an "S" was added to the name Engineer for all Corps Associations, so the Institute became the Royal Engineers Institute.

In 1882 the Committee took over the Model Room in Brompton Barracks, formerly a chapel, which was furnished with objects of technical interest, including sets of all tradesmen's tools in the *Vocabulary*, a model of the recently designed pontoon on its wagon, models of the operations during the New Zealand War, and a model of the Rock of Gibraltar made at the time of the Siege, 1779-83. Further details of the R.E. Museum are given later.

When Major R. H. Vetch left his appointment as Secretary in January 1884, the whole outline of the business of the Institute had settled down into a form which continued till after the Great War of 1914–18. The succession of Secretaries was as follows :—

Captain R. H. Vetch	1875–1884
Captain F. J. Day	1884–1889
Captain W. A. Gale	1889–1894
Captain C. B. Mayne	1894–1897
Captain R. F. Edwards	1897–1902
Captain A. T. Moore	1902–1907
Major W. A. Harrison	1907–1910

In 1910, owing to the shortage of R.E. Officers, the permission to employ an officer on the active list was withdrawn, but a Government grant was approved instead to cover the salary of the Secretary and Staff, which could be given to an officer on the reserve or retired lists. Major Harrison, who was Secretary, elected to retire and transfer to the reserve and was continued in his appointment as Secretary which he held to August 1914, when he was called out with the Reserve of Officers. The work of Secretary was then carried on temporarily by various officers till 1919 when Colonel F. E. G. Skey was appointed by selection from the retired list. This was the beginning of a new chapter in the story of the Institute.

A few more events prior to 1914 may be recorded.

In 1883 several of the Memorial Funds for the provision of portraits or other records of distinguished officers were drawing to an end, generally with a small balance remaining unspent. At first such balances were given to the Charitable Fund, but it was pointed out that small expenses were certain to be incurred for the maintenance of Memorials and it was decided in 1882 to form a Memorial

Maintenance Fund, to which were also transferred the capital sums required for the annual provision of the Durand and Fowke medals. As only one body of trustees was required for this fund, this saved considerable trouble when a change of trustees was necessary.

At the Corps Meeting of 1886 a proposal was adopted " That the Committee of the R.E. Institute in conjunction with the Trustees of the R.E. Widows Society are authorized to take the necessary steps for the incorporation of the Corps under a Royal Charter, with a view to the appointment of Trustees with a Common Seal, to hold the various Corps Funds now or hereafter to be established." The petition was duly made to the Privy Council, but was refused by the law officers of the Crown, who suggested that the Corps should register under the Charitable Trustees Incorporation Act. This did not cover all the requirements of the Corps, so an effort was made to get a better ruling, but the law officers stuck to their opinion and the proposal dropped until it was revived in 1922 as described later.

In 1888 a discussion which lasted for the next three years was instituted at the Annual Corps Meeting on the subject of the provision of premises in London for the Royal Engineers Institute. When the building at Chatham was first suggested, it was intended to reproduce for the R.E. what the R.A. had in their building at Woolwich, as Colonel Vetch stated in 1904, but he goes on to say that " when the Institute buildings were completed, they were practically seized by the S.M.E."

There seems no doubt that the inclusion of class-rooms for the school was always part of the scheme approved by the War Office and was, in fact, the justification for the provision of so large a building. But it was also the fact that the absolute control by the Commandant S.M.E. was not contemplated in the original scheme, though it is difficult to imagine how it could have been avoided. Also Chatham is not a convenient centre for officers of the Corps who are not quartered at that station.

The difficulty of providing facilities for discussion on technical questions by the Corps as a body seems to have been apparent to the Committee of the Institute and from the beginning the entrance fees of members were invested in the names of Trustees to form a nest-egg of capital towards the cost of some provision in London or elsewhere. In 1887 the Committee of the Institute detailed a subcommittee under Major-General E. R. Festing with Lieut.-Colonel G. E. Grover, Captain W. de W. Abney and Major C. F. C. Beresford

to consider the question of the provision of premises in London, and on their report a resolution was carried at the Annual Corps Meeting in 1888 :—

" That the first efforts of the Royal Engineers Institute be now devoted towards obtaining suitable premises in London, in which . . . the publications of the Institute may be discussed and in which meetings may be held . . . and, with this in view, that a Committee be appointed to make arrangements with the Council of the Royal United Service Institution."

Though not mentioned in the resolution, it was understood that the new building would house the R.E. Corps Library, then kept in the Hourse Guards, which at this date numbered about 30,000 volumes. The two bodies, the R.U.S.I. and the R.E.I. then approached the Commander-in-Chief and the Secretary of State for War and obtained general approval.

The R.U.S.I. was then housed in somewhat inadequate buildings on the site of the present War Office, but was asking the government to provide better accommodation at public expense. The scheme which resulted in handing over the Banqueting Hall in Whitehall was under discussion and a scheme for including a separate room or rooms for the R.E. Library was discussed. But the annual expenditure for caretaker, lighting and heating was considerable and beyond the financial resources of the R.E.I., so this proposal dropped, but the R.U.S.I. said that they would always be willing to lend their lecture theatre to the R.E. for meetings and discussions. This met one part of the R.E. requirements and when the new building of the R.U.S.I. was completed the theatre was frequently used by the R.E.

The R.E. Corps Library remained in the Horse Guards and on the move of the War Office to their new building in December, 1906, two large rooms in the Horse Guards were handed over to the R.E. This provided very good accommodation for the Library and met most of the requirements of the R.E. for a centre in London.

Although this volume deals mainly with events prior to 1914 it is convenient to include here a few details in connexion with the Institute subsequent to that date.

In 1922 the title of R.E. Institute was changed to the Institution of Royal Engineers and at the same time the question of incorporating the Institution under a Royal Charter was again raised and on this occasion was approved by the Law Officers of the Crown and the Privy Council, and a Charter was granted in 1923.

The Membership of the Institution at that time was approximately 1,750 and it remained at this figure till the outbreak of the war in 1939. During the war Membership rose to about 2,000 and after that there was a steady increase, till in 1950 Membership reached the total of just under 3,000.

Besides the periodical publications, consisting of *The R.E. Journal*, *The Supplement* and *The R.E. List*, *Professional Papers* on technical subjects have been issued from time to time. In addition the Institution has published the following books :—

(*a*) *The History of the Corps of Royal Engineers*, of which Volumes I and II, written by Major-General Whitworth Porter, appeared in 1889. Volume III by Colonel Sir Charles Watson, in 1914, and in addition to this present Volume IV, Volumes V to IX are also in hand, taking the history up to 1948.

(*b*) *The Work of the Royal Engineers in the European War* 1914–18 in nine volumes, edited by Lieut.-Colonel G. H. Addison, C.M.G., D.S.O., which appeared between 1921 and 1927.

(*c*) *The Military Engineer in India* in two volumes by Lieut.-Colonel E. W. C. Sandes, D.S.O., M.C., published in 1932 and 1934.

(*d*) *The Royal Engineers in Egypt and the Sudan* by Lieut.-Colonel E. W. C. Sandes, in 1937.

(*e*) *The Indian Sappers and Miners* by Lieut.-Colonel E. W. C. Sandes, in 1948.

R. E. Libraries

As already stated, the Institution took over the Corps Libraries in 1877 and at that time, in addition to the H.Q. Library at the Horse Guards, there were thirty-one branch libraries at various stations at home and abroad. The branch libraries were gradually reduced, partly owing to the reduction in the number of stations abroad and partly due to the increase in size of the H.Q. Library at home. Also as a result of two World Wars, the branch libraries overseas had not been kept up properly and by the end of World War II practically all work was concentrated in the H.Q. Library, which had been moved to Chatham from the Horse Guards in 1939.

Up till 1942 there had been a separate subscription for Membership of the Libraries, but it was then decided to do away with the subscription and the Institution subscription henceforth covered the use of the Libraries.

R.E. Museum

An R.E. Museum was first approved in 1875 and a small number of exhibits were collected and added to at various times, but no great interest was taken in the venture and having no Curator the exhibits were not properly cared for and it suffered much from lack of proper accommodation.

It was not till 1908 that a Committee was set up under the presidency of General Sir Richard Harrison, and ably assisted by Major W. A. Harrison, the Secretary of the R.E. Institute at that time.

This Committee recommended that the Model Room in Brompton Barracks should be handed over to the Institute and be converted into a proper Museum and that another building should be used as a concert and dancing hall, for which purpose the Model Room had been used for some time.

These proposals were accepted by the Army Council and the Institute then spent £2,000 on converting the Model Room into a proper Museum, to a design prepared by Colonel E. H. Hemming. This work was completed at the end of 1911 and Major Harrison and Mr. R. P. Whiffen, who was appointed Curator, laid out the exhibits in various sections representing the different campaigns and parts of the world where the Corps has been engaged. For instance, there are sections dealing with the Peninsular War, the Crimean War, Indian Mutiny, Chinese Wars, Campaigns in Egypt, Abyssinia and South Africa, as well as, of course, the two World Wars.

Special thanks must be given to Major Harrison for presenting a large number of exhibits and for his energy in collecting items from many different sources and so producing a Museum worthy of the traditions of the Corps.

The earliest exhibit is a book printed at Verona in 1472, entitled *Ars Militaris* by Robertus Volturus (the second book printed and illustrated with woodcuts). There are numerous other books and documents, including a diary and plan of the Siege of Barcelona in 1706, the diary of Mrs. Green during the great Siege of Gibraltar and the original S.M.E. text-books written by Sir Charles Pasley, of whom there is a portrait in the Museum. There is a collection of silhouette models and also of clothing, illustrating the uniform of the Corps. Trophies, arranged by campaigns, form the bulk of the exhibits. There is a very fine collection of medals, practically complete, of all campaigns in which Sappers have taken part since the

institution of War Medals ; and there are also cases containing the swords and medals of many distinguished R.E. Officers and these include the batons of two Field-Marshals. Of special interest are the original field sketch of Waterloo, used by the Duke of Wellington at the battle, and the model of Gibraltar made at the time of the Siege, 1779–83. The Gordon collection, containing a large number of personal relics and documents, is unique.

After the 1914–18 war two small rooms were added, in one of which are shown most of the exhibits dealing with that war, while the other is now used to show uniforms and pictures of uniforms.

After the 1939–45 war two more larger rooms were added. One of these is used for the exhibits of that war and the other has been used to show models of bridging equipment used throughout the history of the Corps. Large models of the Mulberry Harbour used in connexion with the Normandy landings are shown in the centre of the main hall.

Royal Engineers Entertainment Fund

In 1892 some officers stationed in London thought they would like to have the opportunity of hearing the R.E. Band more frequently and obtained permission from the I.G.F. to form a small Committee to arrange for band concerts in London. The senior member of this Committee was Colonel H. Locock, but the moving spirit was Captain W. C. Hussey, then A.D.C. to the I.G.F., who made all arrangements for the concerts, issued tickets and kept the accounts. The concerts were well supported by the Corps and, by May, 1895, seven concerts had been held with the rather unexpected result of a small profit on each, which amounted to nearly £200. The Committee then laid the whole question before the Corps Meeting of June, 1895, and after discussion, it was decided to form the Royal Engineers Entertainment Fund, with a Committee composed of two officers from the War Office and representatives of the officers stationed at London, Chatham and Aldershot, with the A.D.C. to the I.G.F. as Secretary. The duties of the Committee were defined : " shall undertake the management of the Band Concerts in London and of such other entertainments as shall be approved by H.R.H. the Colonel of the Corps." In pursuance of this, two concerts were arranged in May and December each year, usually in Queen's Hall, about 1,200 to 1,400 tickets being sold for each concert. A small profit was usually made and in 1897 a grant of £100 was given

towards the expense of the Aldershot Band. But a proposal to make an annual grant was rejected in the following years. No concerts were held during 1900 and 1902.

When the Headquarters of the Corps was reorganized, in 1904, the Inspector of R.E. became *ex-officio* President of the Entertainment Committee.

Royal Engineers Annual Reception

At the same time as the Entertainment Committee was formed, a proposal was made to hold an Evening Reception, but this was negatived by Sir Robert Grant, who was then the Inspector-General of Fortifications, on the ground that he himself intended to give an evening reception to the Corps. These receptions were held by him and by his successor, Sir Richard Harrison, up to the outbreak of the South African War. In 1903 the proposal was revived and the Entertainment Committee arranged for an Evening Reception each year. At first this was held on the evening of the Corps Dinner, but this was not a success and it was then held on the evening before. Various halls were tried and later dancing was included, the number attending reaching a total of 300 to 360 each year.

In 1930 the Colonels Commandant R.E. stated that they wished to invite the Officers of the Corps and their families to a party in the place of the Annual Reception. They have continued to hold this "At Home" annually since then with the exception of the war years.

Royal Engineers Dinner Club

For many years the Corps, following a custom which is very general in the Army, had held a Regimental Dinner each year, at which officers on the Active and Retired lists could attend, and which was presided over by our Colonel-in-Chief, the Duke of Cambridge, and in his absence by the senior Colonel Commandant. In 1904 a Dinner Club was started with an entrance fee which varied with rank and with an annual subscription of 7s. 6d. a year. The management of the Dinner was vested in the Entertainment Committee, but the accounts of the Club were kept separate.

The object of the Club was to interest the officers in the Annual Dinner and to provide a small fund from which payments for the hire of a hall could be made. The Dinner was usually held in the

evening of the day of the Annual Corps Meeting. The number attending the dinner up to 1914 was between 120 and 148, but after the 1939–45 war the numbers rose to 300.

Royal Engineers Luncheon Club

The Luncheon Club was originally started by some officers at Aldershot, who formed a Committee for the provision of an R.E. Tent at the race meetings at Ascot and Aldershot, and at some cricket matches at Lord's, including R.A. *v.* R.E., and Eton *v.* Harrow.

In 1907 a proposal was made by Brigadier-General P. Buston that the Club should be recognized by the Corps and placed under the charge of the Entertainment Committee. This proposal was rejected on the ground that profits on concerts could not be used to cheapen the expense of attending race meetings, but in 1911 the accounts of the Luncheon Club were included among those submitted to the Annual Corps Meeting and the Club was thus recognized as representative of the Corps, but in 1936 the Club was closed owing to lack of support.

CHAPTER XVII

WIDOWS FUND AND MISCELLANEOUS

Widows Fund—Charitable Fund—Works and Societies of other ranks—*The Sapper*—R.E. Old Comrades Association—Games Fund—Cricket—Association Football—Rugby Football—Yacht Club—R.A. *v.* R.E. Boat Races on the Medway—Henley Regatta—Golf Club—R.E. Colours—Rackets and Billiards—Miscellaneous officers' clubs—Games of other ranks—Tug of War—Cutter Rowing—Rifle Shooting.

Royal Engineers Officers' Widows Fund

Of the various funds which came under review at the Annual Corps Meetings, the most important, and also by far the oldest, was that known up to 1922 as the Royal Engineers Widows Fund. This was a combination of a benevolent fund and an insurance for married officers, the object of the Fund being to make it unnecessary to raise a special subscription for any widow of an officer of Royal Engineers who might be left in necessitous circumstances.

The Fund was started by a small group of officers in 1783 and in 1785 the rules of the Fund were crystallized into a Deed of Settlement which every subscriber had to accept. Under this Deed the management of the Fund was vested in five Trustees of whom one was the head of the Corps (Chief Engineer, Inspector-General or Director), the other members being the Agents of the Corps and three of the senior officers. The basis of the Society was the payment of an annual subscription by officers, starting within six months of their first joining the Corps, and if married, continued until death, when their widows would receive an annual payment or pension, which was the same for all ranks and all ages. To help the junior officers, the rates of subscription varied with rank; the Deed laid down a scale of subscription in two parts, a rating which varied with rank and also whether married or unmarried, and a poundage based on threepence in the pound of the regimental pay. But it was necessary to modify the rule to meet the various changes in the rank and pay of officers, such as the introduction of Major as a regimental rank and the introduction of Engineer pay. It was

ruled that the expression "standing pay" referred to regimental pay and that the rank of an officer was his last regimental rank; thus a General Officer who had not become a Colonel Commandant, paid subscriptions as a Colonel and later when the position of Colonel Commandant became honorary and when the rank of Colonel became an Army rank, all senior officers paid subscriptions for a Lieut.-Colonel.

The amount of the pension for each widow was £30 per annum, but in the original Deed a hope was expressed that the fund would be gradually increased by annual investments of surplus income, so as to enable a considerably larger pension to be given in future years.

An arrangement was made that officers who did not join when first commissioned could join later, but this involved the payment of back subscriptions with compound interest at 5 per cent and required the approval of two-thirds of the members present at an Annual Meeting. This procedure was discouraged and in practice a large majority of the officers joined the Society when first commissioned. In one case of an officer who had been a subscriber, but had left the Society, permission to rejoin later was refused by the Meeting.

Under the Deed the Trustees had to submit an Annual Statement of Accounts to a Meeting of Members to be held on the 1st February in each year, and every tenth year the Trustees were to investigate the financial position and report to the Meeting. When the Annual Meeting was absorbed into the Annual Corps Meeting, and for the convenience of members was held later in the year, the Trustees used to call a Meeting on the 1st February each year, and then adjourn to the date selected for the Corps Meeting.

The first increase in the pension occurred in 1812, when the amount was raised to £40, the number of widows drawing pensions being then nineteen. By 1827 the pension had been raised by successive increments to £60, when the widows were about thirty in number. The Trustees do not appear to have made any special attempt at a valuation of future liabilities, but from 1812 details of deaths of members and widows were recorded. In 1832 the pension was reduced to £50. By 1864 there was a large surplus of income and at the Corps Meeting of that year, but without previous investigation, the Trustees were recommended to make a further increase of £60.

In 1870 there was a fall of surplus income and the Trustees became anxious about their financial position. In 1871 General Sir Lintorn Simmons and Lieut.-Colonel G. A. Leach were appointed a Committee to investigate the affairs of the Society and on their

report, which was presented to the Corps Meeting of 1872, the amount of the annual pension was reduced to £55 a year.

This is the first mention of Lieut.-Colonel Leach in connexion with the Widows Fund, but from this date for the next thirty years he took a prominent part in the affairs of the Society, usually answered for the Trustees at the Annual Corps Meeting, and eventually became chairman. A biographical memoir appears on page 408 of this volume.

In 1879 the amount of the invested funds had been considerably increased and after further discussion a Committee composed of Colonel A. C. Cooke, Colonel G. Graham, Colonel R. H. Vetch, and Lieut.-Colonel G. A. Leach was appointed to make a further investigation. This Committee urged that variations in the amount of the pension should, if possible, be avoided in future and recommended that the pension and bonus should be kept at £55. It was also recommended that similar investigations should be carried out every ten years.

In 1880 a small change was made by the extension of the scheme of pensions to include orphan families. The pension is only granted up to the age of 21 for a girl and 18 for a boy, only one pension being drawn for each family.

In 1889 the Decennial Committee was assembled with the same members as before but with the addition of Major-General R. Grant. They issued and circulated to members a complete report with tables of calculations in a form which was inspired by Lieut.-Colonel Leach and which was followed for subsequent Committees. They recommended the retention of the £55 pension and bonus and it may be noted that from 1875 the annual payment was referred to in two parts, a pension of £30 a year and a bonus of the balance. This was a return to the original scheme under which the £30 pension was a minimum which could not be reduced, made to every widow, and the bonus was an extra payment which could be reduced or withheld by the Trustees to meet any emergency.

The members of the next Decennial Committee in 1900, which by an oversight assembled a year late, were Lieut.-Colonel Sir George Leach, Major-General W. Salmond, Colonel R. H. Vetch, Colonel R. H. Jelf and Major P. Cardew. They recommended the retention of the £25 bonus. At the Annual Corps Meeting of 1907 Sir George Leach, who had been working for the fund for thirty years and had reached the age of 82, resigned his position as Trustee and Colonel R. H. Vetch was appointed in his place.

The members of the next Decennial Committee which assembled in 1909 were Colonel R. H. Vetch, Colonel Sir Charles Watson, Colonel N. M. Lake, Colonel S. D. Cleeve, and Colonel J. L. Irvine. They recommended the bonus being raised to £30, making a total of £60 per year. In each case the report of the Decennial Committee included tables with estimates of the probable state of the Society for the next ten years. These were based on a method of calculation originally suggested by Sir George Leach and included an estimate of the maximum number of widows and orphans which would eventually be reached.

Writing after an interval of some years, the actual experience of the Society shows that the figures which emerged varied considerably from the estimates made by the Decennial Committees, the variations in all cases being in favour of the Society, so that, in fact, the Society was always in a better financial position than was thought at the time. Several factors which have since proved of importance were omitted or underestimated, while the future numbers of widows and orphans were consistently overestimated.

One detail which later considerably affected the finance of the Fund was the incidence of Income-Tax. At first this was very small and was considered as affecting slightly the income from investments, but by 1914 the rate of tax had risen to 1s. 10d. in the pound or about one-eleventh of the income from investments. By this date a special provision had been made for the reduction of the tax in the case of charitable institutions, but in order to obtain this benefit it was necessary to register the Society under some of the special Acts and the Trustees were afraid this might bring our Society, with its somewhat exceptional regulations, under the control of some Government department. The outbreak of war in 1914, which affected our Society in many ways, made it impracticable to proceed with such registration, which was not carried out until 1922.

Another point which attracted notice was the possible incidence of active service. Up to about 1890 the ordinary insurance societies inserted a clause in their insurance policies that if the individual insured went on active service, the benefit of insurance would be suspended or a special heavy premium would be demanded. But by degrees, these societies realized that the risks of active service were not as great as was anticipated. Our own Society always included this risk among others.

The actual war casualties among married officers, members of our society, since Waterloo and prior to 1914 have been :

In the Crimean War	1854–5	8 casualties
In Ashanti	1874	1 casualty
In Zululand	1879	2 casualties
In Egypt	1882–1914	1 casualty
In Matabeleland	1896	1 casualty
In South Africa	1899–1902	4 casualties
In Somaliland	1902	1 casualty

In all the various campaigns in India and on the Indian Frontier and in other campaigns not mentioned above, there were no casualties among married members.

The total casualties on active service was thus eighteen in a period of just one hundred years, for a total of members from 250 to over 1,000.

The financial affairs of the Fund were, throughout its whole course, in the hands of the Agents for the Corps, Messrs. Cox & Co. One of the senior members of this firm was one of the Trustees, and he appointed one of his subordinates in the Bank to represent him. This gentleman kept the accounts of the Fund, collected subscriptions through officers' accounts and made the payments to the widows. A small annual payment, which did not exceed £200, was given as a personal bonus to the official concerned.

The audit of the funds was carried out up to 1922, by two of the senior members of the Society and, in addition to officers already referred to, the names should be recorded of the following officers, who rendered valuable service from 1885 onwards : R. N. Dawson-Scott, R. Owen Jones, W. O. Lennox, Gordon Pritchard, and A. C. Hamilton (afterwards Lord Belhaven and Stenton).

In 1913 the Trustees were Colonel R. H. Vetch, Major J. Stewart, Major J. F. H. Carmichael, Major-General G. K. Scott-Moncrieff (*ex-officio*), and the Agents of the Corps.

At the end of 1913, the last complete financial year before the outbreak of the war of 1914, the number of members of the Widows Fund was 1,181 of which 782 were married and 399 unmarried ; the number of widows was 220 with two orphan families. The amount paid in pensions was £13,187, the amount received from subscriptions was £9,632 and from interest on investments £9,379. The value of the stocks held by the Trustees was £308,697, of which £6,520 had been invested during the year. The surplus income, less £120 for expenses, had been £6,699.

Royal Engineers Charitable Fund

At the Annual Meeting of the Corps in 1866, a proposal was made by Colonel Keane, D.A.G., to establish an orphanage for the daughters of non-commissioned officers and men at Chatham. This led to a consideration of the general question of charitable assistance for the other ranks of the Corps. This proposal was elaborated by Colonel Lennox and considered by a special Committee with the Inspector-General of Engineers as President. There were at this time a number of Military charities in existence, such as the Soldiers' Daughters Home and the Cambridge Asylum for Soldiers' Widows, to which many individual R.E. officers sent annual subscriptions or donations.

The Committee collected the names of such subscribers and pointed out that if the aggregates in each case were given in the name of the Corps, the R.E. candidates for vacancies would benefit, while a general appeal to the whole Corps was likely to realize a considerably larger sum. This report, together with an outline of a scheme for the establishment of a Royal Engineer Charitable Society, was approved at the Annual Meeting in 1868 and a Committee, under the Presidency of Major-General Sir J. L. A. Simmons, was appointed to carry out the work. Lieut.-Colonel G. A. Leach was appointed Honorary Secretary and Treasurer. A circular letter was sent to all stations at home and abroad and the Fund came into operation on 1st January, 1869. The subscriptions asked for were £2 from each Field Officer or higher rank, £1 10s. from each Captain and £1 from each Subaltern, including the Indian Branch, and each troop or company was invited to contribute £5 a year to give the non-commissioned officers and men an interest in the Charity.

The purposes of the Fund were drawn on a very wide scale; to assist widows and children of deceased non-commissioned officers and men or of cripples or incurables; to help non-commissioned officers and men of good character to obtain employment; to assist the expenses of the move of families on change of station; and to subscribe, in the name of the Corps, to take advantage of existing institutions.

The rules provided for the Annual election of a Managing Committee composed of three *ex-officio* and six other members, but these numbers were subsequently increased. Some part of the income each year was invested in the names of Trustees to form a nest-egg.

The history of the Fund has been one of unbroken success, the

original rules are still in use with very little alteration and the annual reports show the number of cases helped has grown each year. A great deal of this success has been due to the work of the honorary officers in London and local Committees which were formed at each station. The first Honorary Secretary, Lieut.-Colonel G. A. Leach, gave a lot of time to the work of the Fund, personally investigating all cases which came before the Central Committee, and he was assisted by a retired N.C.O. as Clerk who helped to keep in touch with the rank and file. Lieut.-Colonel Leach continued to act till 1888, when he was succeeded as Secretary by Lieut.-Colonel E. C. Sim, but retained the duties of Chairman of the Committee and Honorary Treasurer till his death. Lieut.-Colonel Sim held the post of Secretary till 1895, when he was succeeded by Lieut.-General Sir Gordon D. Pritchard, who held it till his death in 1911. From 1911 to 1914 the Secretary was Lieut.-Colonel B. R. Ward, who was succeeded in 1914 by Brigadier-General F. G. Bond.

In 1913 the total receipts were £1,958, including £1,655 from annual subscriptions and £142 from investments. The expenditure was £1,638.

In 1943 the name of the Fund was changed to the R.E. Benevolent Fund and by 1949 the expenditure had risen to £24,000. In 1950 it was decided to divide the Fund into two Trust Funds, one for officers and their dependants and one for other ranks and their dependants. All the existing capital was retained for the latter Fund.

Work and Societies formed by Other Ranks

Up to 1886, the organization of other ranks of the Corps was on a regimental basis, but gradually a Corps organization grew up which included Engineer Clerks and Foremen of Works, but the numbers of these were still small until the large increase of the Corps in 1886, which included many new groups of Mechanists and increases in all the existing branches of the Supernumerary Staff. As these grew, so did the desire for some forms of organization to provide for the interchange of technical knowledge and for personal meeting.

The Sapper

The idea of a monthly periodical for the rank and file originated with three Corporals, Piggott, Avis, and Beaumont, in the early part of 1895. This was taken up by Engineer Clerk Sergeant S. W.

Hirst who, with the three Corporals, prepared in manuscript the first copy of the periodical. This was laid before the Assistant Commandant, Colonel W. G. Morris, who, with the approval of the Commandant, drew up a code of rules for a monthly paper to be called the *Sapper*, which obtained the approval of the War Office.

A Committee was formed at Chatham, which was divided into two branches, a Committee of Control of Officers stationed at the S.M.E., with the Commandant as President, and a Working Committee of Warrant and Non-Commissioned officers including an Editor, a publishing Secretary, a Treasurer and an Auditor. The first copy was published on 1st August, 1895, with an edition of 3,000 copies, all of which were sold within a week. The first few numbers were printed at the S.M.E. Printing School, but from January, 1896, the printing was done by a publisher at Chatham. All the notes and sketches were contributed by the Warrant Officers, N.C.Os. and Sappers of the Corps. Engineer Clerk Sergeant S. W. Hirst was the Editor for August and September, 1895, and resumed the duty in March, 1900, when he was a Superintending Clerk. Engineer Clerk Q.M. S. F. Bone was Editor from October, 1895, to February, 1900.

Royal Engineers Old Comrades' Association

In 1906 a few serving and retired Warrant Officers and Senior N.C.Os. formed themselves into an Association for the purpose of holding an annual reunion dinner in London for all ranks of the Corps who were then serving or had previously served in those offices. These reunions were so successful that, in 1911, a Committee was constituted to explore the possibility of extending them to all retired members of the Corps; the Committee consisted of: Colonel B. R. Ward, President, Lieut.-Colonel A. T. Moore, Mr. W. Eyles (late R.E.), Mr. W. W. Popperwell (late R.E.), formerly Hon. Secretary, R.E. Dinner Club, E.C.Q.M.S. J. McB. Robbins, R.E. Honorary Secretary.

The proposals of this Committee, after being agreed by the Corps Committee, the A.A.G., R.E., and the Committee of the R.E. Charitable Fund, led to the formation of an Old Comrades' Association for the Corps. The inaugural meeting of the Association was held in the R.U.S.I. Theatre, Whitehall, on 12th October, 1912, with General Sir Harry Prendergast in the Chair. Sir Harry was elected President of the Association.

The Association was controlled by a Headquarters Committee Meeting in London and there were a number of local branches. At first the objects of the Association were purely social, but in 1914 it was suggested by the A.A.G., R.E. that the Corps " Labour Bureau " which was administered by the Officer i/c R.E. Records should be transferred to the Association. This was done and the name of the Bureau was changed to the " R.E. Civil Employment Registry." With the outbreak of the war of 1914–18, the work of the Association expanded in many ways and its story will be continued in a later volume of Corps history.

It may be added that on the death of Sir Harry Prendergast in 1913, Lord Kitchener of Khartoum became President of the Association.

Royal Engineers Games Fund

The Royal Engineers have always been interested in games, but owing to the fact that the members of the Corps are split up between a number of stations the first clubs were formed on a station basis. As Chatham developed as the principal centre of Corps life, the various clubs there began to be looked on as representative of the Corps and the principal matches played were called Corps Matches. This was especially the case with matches played against the Royal Artillery.

Records of R.E. Cricket exist from 1862, but it was not till December, 1874, that a proposal was circulated to the Corps that the Cricket Club at Chatham should be made the " Royal Engineers Cricket Club," open to all officers of the Corps, with a scale of subscriptions for Residents and Non-Residents, Players and Non-Players. The reason given for bringing forward this proposal was that the Chatham Club, in addition to local matches, were playing a number of non-local clubs whose teams had to be entertained at Chatham ; the cost of such entertainment falling heavily on the officers of the Chatham teams. This proposal was brought formally before the Corps Meeting in May, 1875, and was approved with the inclusion in the scheme of the Chatham Football Club. Rules for the election of a Committee were approved, to include special representations of the Chatham Clubs. It is interesting to note that the first Committee was composed of Colonel Nugent, C.B. (President), Major F. A. Marindin, Lieut.-Colonel R. Harrison, Major W. Merriman, Lieutenant S. Waller, Lieutenant F. I. Edwards (Hon.

Secretary), with Major J. P. Maquay, Lieutenant H. W. Renny-Tailyour and Lieutenant the Hon. M. G. Talbot representing Chatham. The number of original subscribers was 295 with a yearly income of £170, but in the following year the Rules were changed and the Committee thenceforward only dealt with the subscriptions of non-playing members at 10s. a year.

In 1878, to avoid the trouble of annual election, it was decided that the Chatham representatives should be the President of the Chatham Cricket Club, the Captain of the Eleven, and the Captain of the Football team.

In 1879 the title of the Fund was changed to the Royal Engineers Games Fund, and took over the Racquet and Billiards Fund, which had been formed at Chatham to meet the expenses of the annual matches with the R.A. In 1882 the Rules were amended by adding " any project for promoting sport " and the Brigade Major S.M.E. was substituted as an *ex-officio* member of the Committee in place of the President of the Chatham Cricket Club.

In 1885 it was decided to add Yachting and Boating among the sports supported by the Games Fund, and the President of the R.E. Yacht Club was added as an *ex-officio* Member.

With these changes the Rules now read: " The R.E. Games Fund is established for the purpose of assisting in the expenses of Corps Matches, including Cricket, Football, Racquets, Billiards, Yachting and Boating, and to assist, when funds will admit, any project for promoting sports . . . The funds are managed by a Committee composed of ten members, six of whom are *ex-officio* members, viz., the A.A.G., R.E., the Brigade Major S.M.E., the Captain of the R.E. Eleven, the Captain of the R.E. Football Team, the President of the Committee of the R.E. Yacht Club, and the Aide-de-Camp to the Inspector General of Fortifications. The remaining four members are elected by the Annual General Corps Meeting; two retire annually by rotation . . . Officers become members by subscribing ten shillings or more annually."

In this form the Fund has continued to flourish, and as the number of officers on the Active and Retired lists increased, the amount received from subscriptions rose in 1914 to a total of £567 a year.

Although the Committee was always limited by the rule that they were helping the expenses of Corps Matches, and would not, therefore, give regular contributions to local clubs, they always took a liberal view of their responsibility for promoting sport and made grants toward initial expenses, such as the formation of

cricket and football grounds at Aldershot, the enclosure and pavilion for the Cricket Club at Chatham, the initial expenses of the R.E. Golf Club at St. Mary's Barracks, and the new raft and yachts for the R.E. Yacht Club. They also made grants towards the cost of stické or squash courts, as well as boats and yachts at several stations such as Bermuda, Halifax, Gibraltar, Malta, Bombay, Kirkee, and Rawalpindi; and, when lawn tennis became popular, towards courts at Sheerness, Gosport, and Cape Town. The R.E. Beagles and the R.E. Hockey Club at Chatham also received grants, and when the Army Racquets Championship was started, competitors were helped by a grant for expenses. Help was also given to the R.E. crew for Henley.

CRICKET

It is not possible in this volume of Corps history to follow the details of all the various Corps Matches with the names of individual players, but a few notes are given here on some of the early Chatham Clubs. It is especially interesting to note that, in many cases, the expert at any one game is also an expert at several others, and also that the expert at games is also an expert at work as well as at play.

The History of R.E. Cricket from 1862 *to* 1924 was written in 1925 by Captain R. S. Rait Kerr, R.E., and published by the Institution of Royal Engineers. The first records in this book date from 1862 and the following year a Committee was formed, with Captain C. E. Harvey as President. Colonel H. D. Harness was then the Director of the R.E. Establishment and Harvey was his Adjutant. With this official support the Committee got permission to lay down a pitch on the Great Lines, the glacis of the old defences which enclosed Chatham and Old Brompton. In 1868 officers at out stations were admitted as honorary members on payment of yearly subscriptions and their help was welcomed in important matches, which were called Corps Matches. Corps Matches included those against the Royal Artillery, Harlequins, Quidnuncs, I Zingari, M.C.C., Royal Military Academy and others. The rates of subscriptions varied from time to time, those who were also members of the R.E. Yacht Club paying a reduced subscription, but in 1910 an S.M.E. Games Fund was formed, which financed all Corps activities at Chatham.

When the first cricket pitch was formed on the Lines, in 1863, an area 40 yds. by 60 yds. was enclosed by posts and chains, sufficient

to keep out cattle but not sheep, but these posts and chains had to be removed at short notice when the Lines was used for Drill. In those days, movements in close order formed a large part of training and it was probably for this reason that the pitch was placed in the north-east corner of the Lines, close to a path used daily by the workmen from New Brompton going to and from their work in the Dockyard. There was only one boundary, to the east, a fence bounding the town of New Brompton*; on the other three sides there was open grass and every hit had to be run out. In 1885 the club obtained permission from the War Office to fence in the ground. There was a little local opposition from the "Dockies," who had been keen spectators, but this was overcome by the tact of Jim Fellowes who arranged for seats to be provided in the enclosure which were free to all. The cost of the fencing, about £200, was raised by a special subscription from the Corps. From 1890 the Football Clubs were allowed to use the ground on payment, and ten years later the R.E. Hockey Club was allowed a similar privilege.

When the pitch was first enclosed, a tent was used as a pavilion, but in 1880 permission was given to build a permanent pavilion at a cost of £500. This did not prove large enough and a bigger pavilion was constructed in 1913.

Rait Kerr in his book gives tables of many details, including a list of 193 R.E. who played in matches against the R.A. between 1864 and 1924. Among these the name of Renny-Tailyour stands out pre-eminent. Not only was he the finest R.E. cricketer of his generation, but possibly the finest all-round athlete of his period. In the twenty-seven years of his cricket career he scored a total of 12,671 runs in 307 completed innings, an average of 41 runs. In his early days he was a good bowler and in 1873 he took 62 wickets in Corps Matches at a cost of 12.9 runs apiece, but in his later years he was worried by a knee which frequently slipped and much interfered with his fielding and bowling. He was a fine field, a born Captain and a first-class judge of the game. He had the unique experience of representing Scotland at Football under both Association and Rugby rules.

Another player who deserves to be mentioned was J. Fellowes, whose record as a player extends for thirty-six years, from 1858 to 1895. He was pre-eminent as a bowler, but was also a useful last wicket bat. In 1874, perhaps his best year, he took 111 wickets for 8.7 runs per wicket.

* Now called Gillingham.

Association Football

A history of the early days of R.E. Football was written in 1928 by Major-General Sir Richard M. Ruck, in the *R.E. Journal* of December, 1928. In this he points out that the late 'sixties and the early 'seventies were remarkable for a notable increase in the popularity of games. At football each of the public schools had its own codes and customs, but towards the end of the sixties, some of the old boys from Westminster, Eton and Harrow founded the Football Association, to include all football clubs playing the Harrow game with the round ball, and evolved a code of rules based on those of Westminster School.

In 1869 Colonel T. L. Gallwey was the Commandant of the School of Military Engineering at Chatham, and on his staff was Major F. Marindin, his Brigade Major, and Captains Merriman and Fellowes, all interested in games. So it is not surprising that the Royal Engineers joined the Football Association in 1869 and soon formed a team which held its own with the best of the southern clubs. In the North of England the local clubs played a game somewhat similar to the Association code, the chief difference being the absence of offside in the Sheffield rules.

The Association Challenge Cup was started in 1871–2, and during the first four seasons the R.E. were prominent in the competition, winning the Cup in 1874–5, and being in the final in 1871–2 and 1873–4. They were also in the final in 1877–8.

The names of the first team in 1871–2 were Major Marindin (Captain), Captain Merriman, Lieutenants Addison, Mitchell, Creswell, Renny-Tailyour, Rich, Goodwyn, Muirhead, Cotter and Bogle. The order of play was seven forwards, three in the centre and two on each wing, two half-backs, one back and a goal-keeper, and with this arrangement they developed a system of team play which set an example that was quickly followed by other clubs.

In his article General Ruck gives a summary of the matches played in the first four years from 1871–2 to 1874–5; the figures are very remarkable and worth record. The total number of matches played was 86, of these, 74 were won, 3 were lost and 9 drawn. The goal records was 244 for and 21 against.

Towards the end of the 'seventies the Northern Clubs developed teams of professionals and, joining the Football Association, made a bid for the cup, which was won for the first time by Blackburn Rovers and a few years later by Preston North End. The R.E.

continued to compete for some years longer, but, like most of the other amateur clubs, were gradually outclassed by the regularly trained professionals. At many military stations there were local clubs which kept up the fine traditions of R.E. football, but their doings cannot be classed as representative of the Corps.

It may be added that before the advent of professionals, football grounds were generally unenclosed and the R.E. at Chatham played on the Great Lines, a ground being marked out for each match. Other local clubs also used a ground on the Lines and in 1883–4 three matches in the first round for the Association Cup were in play simultaneously on the Lines, the local teams being the R.E. and the Chatham and Rochester Clubs. Later the team had the use of the enclosed cricket ground.

Rugby Football

While the R.E. were winning honours at the Soccer game, a number of clubs were still playing the game under Rugby rules, and at the R.M. Academy, Woolwich, and the R.M. College, Sandhurst, the official game was Rugby, so that many of the cadets who joined the R.E. had some expert knowledge of this form of the game. For some years there used to be a match under these rules against the R.M.A., at which some of the regular Soccer players showed considerable proficiency.

The formation of a regular team of Rugby players began in 1886. In that year there was a large increase of the Corps, officers being appointed from Coopers Hill and other sources. Some of these were experts at the Rugby game, notably A. Walpole, who had played in International matches for Ireland, and E. Kirby, who played for Blackheath. The team thus got together played many of the best clubs in the South of England, and for some years played a team of the R.A., but it did not, at this stage, rank as a club representing the Corps.

Royal Engineers Yacht Club

The oldest of the Royal Engineers' Games Clubs is the Yacht Club, which was formally established in 1846. A very good history of the Club was written in 1932 by Captain W. G. Fryer, R.E., and published in the *R.E. Journal* of September, 1932. In this record Fryer suggests that the Club began soon after Waterloo.

This is very probable as the S.M.E. was founded in 1812 and it was decided in 1815 that the officers for the H.E.I. Company Engineers, after their preliminary training at Addiscombe, should go through a course at Chatham before proceeding to India. An important part of their course was instruction in bridging, carried out in St. Mary's Creek, which, in those days, cut across the marshes between Upnor and Gillingham, until in 1866 the Creek was absorbed by the extension of Chatham Dockyard. It would seem natural that a group of junior officers, placed on the bank of what was then a quiet river, should turn to rowing and sailing as one form of recreation. The original title of the Club was the Engineer Boat Club, but in 1855 this was changed to the Royal and H.E.I. Company's Engineers' Yacht Club and changed again the next year to Royal Engineers' Yacht Club. The first yacht of which the name is known was the *Whim*, bought in 1842 and described by Fryer as a fat, slow, little 3-tonner. After a long life for a yacht she capsized in Pinup Reach in 1867 and one of the occupants, Lieutenant J. J. Robertson, was drowned. There was also an accident in 1855 when the *Diver*, of 2½ tons, capsized in Rainham Creek on a duck-shooting expedition and three officers of H.E.I. Company's Engineers and one of the Bengal Cavalry were drowned. These were the only fatal accidents up to 1931.

In 1865 the Club was enrolled among the Royal Yacht Club of the United Kingdom with permission to fly the blue ensign. The R.E.Y.C. burgee, based on the arms of the Ordnance, also appears about this time. The earliest recorded Club Rules date from 1855; in these appear the fines for grounding, which added so much to the funds of the Club in later years. By 1863 the Club was holding both sailing and rowing races each season, and the names of Lieutenants Blood, English and Bucknill appear in the records. Bucknill, who, during the next twenty years, took a prominent part in the development of the Submarine Mining Service, was one of the leaders in both rowing and sailing. In 1864 he was one of a four—North, Ommaney, Bucknill, Harrison, and Lee (cox)—which won at Sheerness, Wateringbury, and Rochester regattas, and a crew of Burton, Rathbone, Bucknill, and Kirkwood took the *Talisman*, 10 tons, to Boulogne, the first recorded foreign cruise of the R.E.Y.C. Bucknill has left a record of the yachts owned by the Club, when he joined in 1864. They were the *Talisman*, the *Mona*, a narrow 5-tonner, the *Whim*, and the *Mary*, a nice little 4-tonner. Rowing was done in wherries or half-out-riggers from a raft and boathouse

at the lower end of St. Mary's Creek and the Yachts were moored near the boathouse.

The cruise of the *Talisman* to Boulogne seemed to have inspired the Club to seek new cruising grounds, for which a larger yacht was required, so in 1864 the *Violet*, a schooner of 12 tons, was purchased, the cost being met by debentures. She had a good turn of speed with a wind on the beam, but from her rig was at a disadvantage when beating to windward; but she held her own in the many amateur regattas of the Thames and Medway Estuaries.

Fryer gives a list of all the R.E. yachts, but special mention must be made of the *Dotterel*, a cutter of 9 tons, which was bought in 1878 as a novice's yacht and served the Club well for twenty years.

One of the first recorded cruises of the *Violet*, with a crew of Chadwick, Curling, English, Fanshawe, Gill, Macdonald, was to Flushing, reached in sixteen hours. In 1868 Lieutenant J. J. Curling was Musketry Instructor at Gravesend, where he kept a fine yacht, the *Lavrock* of 72 tons. He retired in 1873 and sailed his yacht to Newfoundland where he took up missionary work.

When the rowing boats left St. Mary's Creek, in 1866, a new raft was provided, built of Government timber provided by the Fortification School, and moored off the Marine Steps in Chatham Reach. It was merely a plain deck and was too short to carry an eight. A shed was built at Upnor to protect the boats during the winter.

Rowing had been in a flourishing condition ever since the 'fifties; in 1868 a professional coach was engaged and the R.A. were challenged to a four-oared race. In 1870 the R.A. were challenged to row an eight-oared race, and both the R.A. and R.E. crews entered for the "Thames" at Henley Royal Regatta, the first appearance of the R.E.Y.C. at Henley. In 1875 crews were entered for regattas at Molesey, Putney, Barnes and Kingston, and in 1878 J. T. Bucknill entered for the Diamond and Wingfield Sculls at Henley with fair success.

By 1883 a crisis had been reached in the history of the Club. The three yachts, the *Violet*, *Dotterel*, and the *Swallow*, a part decked sloop of 5 tons, were old and outclassed in the racing world, interest in yachting had waned, and rowing was so much in the ascendant that there was a strong movement to separate the Club into two parts for yachting and rowing. The raft was about to sink, as it depended solely on the buoyancy of the timbers which were waterlogged.

At this crisis Major and Brevet Colonel Sir Charles Warren became president and was ably seconded by Lieutenant J. R. L. Macdonald, the Secretary, who did much to encourage the interest of the newly joined officers in cruising. The sport had always been treated with a lenient eye by the authorities, and if a yacht, through stress of weather or other reason, had to put into a foreign port, no questions were asked. At the end of 1883 Lieutenant H. V. Kent took over the duties of Secretary. He was an expert at both sailing and swimming and during his tenure of office a new yacht—the *Buccaneer*—was purchased to replace the *Violet*, a new raft was built and the fleet of boats was overhauled to include a pair of Canadian canoes. Another innovation was the appointment of Flag Officers for the Club, and these posts were kindly accepted by the following :—

Commodore	H.R.H. the Duke of Connaught.
Vice-Commodore	Lieut.-Colonel G. A. Leach.
Rear-Commodore	Major T. English.

The name of Lieut.-Colonel Leach will be well known to all R.E. officers for his work in connexion with the R.E. Charitable Fund and the R.E. Officers' Widows Fund. He was a keen yachtsman and in 1910 was president of the Yacht Racing association. Major English, who owned a fine yacht, was at the time holding the appointment of Inspector of Iron Structures at the War Office.

The *Buccaneer* was a very successful purchase, of 19 tons with two sleeping cabins, rigged as a yawl and only five years old. In her first year, 1884, she entered for the annual amateur race, from Port Victoria to Ostend, in charge of P. Cardew and won first prize ; this success she bettered the next year when a crew with J. du T. Bogle as Skipper, won the annual race, this time from Dover to Ostend, and the following week also won the return race from Ostend to Southsea, still under Bogle, but with a slightly altered crew. The first prizes were money prizes and in 1885 the Club won £53 and also a statuette of " a dancing faun " presented by the Burgomaster of Ostend, which was given to the Chatham Mess. In 1887, the year of Queen Victoria's Jubilee, there was great activity in yachting circles and in July the *Buccaneer*, after a race at Port Victoria (then the headquarters of the Corinthian Yacht Club), on Friday, 1st July, joined in a race to Portsmouth, but did not succeed in saving her time on the larger yachts. On the 17th she left again for Portsmouth, where she had been entered by Major P. Haslett

for a race round the Isle of Wight, sponsored by the Portsmouth Corinthian Yacht Club. This took place on the 21st when the *Buccaneer* saved her time on all competitors and won the first prize of £50 which was presented to the Club.

The new raft, purchased in 1884, was also a success. Flotation was provided by pontoons, and in the centre there was a narrow dressing-room which was much appreciated. The raft was built by Messrs. Aveling and Porter, at a cost of £288. At this time it was customary to hold what were called Trial Fours in spring each year, over a course in Chatham Reach. These were to train beginners, each crew being in charge of an older member. The rowing year reached its climax in the Annual Regatta in August or September, which included a "Seniors and Juniors" race and obtained good entries for other events. It was held above the bridge where a piece of Government ground, Fort Clarence, was used by spectators and the R.E. officers were at home to their friends. The raft with boats on board was towed upstream a few days before.

A new departure, which owed its initiation to Sir Charles Warren, was the inclusion of "yachting and boating" in the activities supported by the Games Fund. A grant of £70 from this Fund was made in 1884 and, from 1885, an annual grant of varying amount was made to the Yacht Club.

Following these changes the Club had a quiet existence until 1896 when the R.E.Y.C. celebrated its Jubilee. Captain Gaynor was the Secretary and the services of Major-General Sir Charles Warren were secured as President of a special Committee. An appeal for funds from the Corps realized £606 and the *Brizo*, a 7-ton cutter, was bought for £200 to replace the *Dotterel*.

The main changes in the next years were the development of sailing punts and dinghies, which gave good sport, but the Club was adversely affected by the absence of officers at the South African War and in 1904 two events occurred which affected the Club and are described in the previous chapters of this Volume. The first was the transfer of Submarine Mining to the Navy and the consequent closing of the school at Gillingham, which had been able to help the Yacht Club in many ways, and the second was the request from the Admiralty to hand over the whole of the Royal Engineer Barracks and Establishments at Chatham for use by the R.N.

This would have involved the transfer of the S.M.E. to Cooper's Hill.

At this time the raft was in great need of repair, and the amount

of debentures owing was £300. As the yachts could not be taken up the Thames, they were sold; the *Buccaneer* realizing £120, only to be broken up the next year.

In 1906, when the R.E. had been definitely confirmed in possession of Brompton Barracks, there was a revival of activity on the water; the raft and rowing boats had not been sold, and the R.E. Regatta in 1906 was a great success. An appeal for funds realized £443 and with this the *Fulmar*, a cutter of 14 tons, was purchased and proved a worthy successor to *Buccaneer*. There was also a revival in the small racing classes, and in 1913 Colonel J. T. Bucknill presented *Thalassa*, a fast 7-metre sloop, to the Club. She was a fine vessel with a Bermudan mainsail, but her best racing for the R.E. was done after the Great War and is thus outside the scope of this volume.

It may be noted here that, after the death of the Vice-Commodore, Sir G. Leach, in 1913, Lieut.-Colonel T. English became Vice-Commodore, and Lieut.-Colonel J. T. Bucknill the Rear-Commodore.

The R.E. and R.A. boat races, which had been dropped in 1871, were resumed in 1900 as a four-oared race on the Medway. In 1906 and 1907 they were rowed as an event in Henley Regatta and a last race was rowed at Henley in 1911; in these eight years each Corps won four events.

This period was noteworthy for the energetic guidance of C. E. P. Sankey, under whose leadership very good eights were entered at Henley in the "Thames." The 1911 crew put up the second fastest time in the race while losing to the winners. Sankey, P. K. Boulnois and A. F. Grasett were elected members of Leander Club.

One feature of the R.E. Yacht Club is that branches exist all over the world; the Club burgee has been flown at such stations as Malta, Gibraltar, Bombay, Hong Kong, Halifax, Bermuda and Singapore, and in all such places R.E. yachts and R.E. oarsmen enter for the local races and regattas.

R.E. Golf Club

The R.E. Golf Club was started in 1886 by the Submarine Mining Officers in St. Mary's Barracks; a nine-hole golf course was laid out partly on land in front of the Barracks, where the old fortifications had been cleared by convict labour to obtain material for filling in connexion with the Dock extension, and partly over ground used by classes under instruction in Fieldworks. The course was very rough and the greens small, but the game was in its infancy in

England. Interest soon spread to the other barracks in Chatham and by 1887 the Club was firmly established and a year or two later was able to get a grant from the Games Fund and to get the advice of a professional in improving the course. In 1888 a team of ten from the Chatham Club played a friendly match with Oxford University who had just formed a club. When, in 1896, a large part of the ground was taken over by the Admiralty for Naval barracks, the Club was without a course and gradually became simply an association of golf players from whom a team could be obtained to play an annual match against the R.A.; usually at Sandwich.

Of the original players, the name of Dumbleton, who was a master at all games, stood pre-eminent, but the R.E. have produced many fine players, of whom R. M. Ruck, W. C. Hedley, E. M. Blair, R. S. Walker, A. H. Dumaresq, R. Walker, T. A. H. Bigge and G. O. Bigge were noteworthy.

R.E. Colours

The first photographic group of R.E. cricketers as published in Rait Kerr's book, showed most members of the team dressed in white knickerbockers with stockings of equal horizontal stripes of red and blue. About 1870 the cricketers adopted a blazer with one broad and one narrow red stripe separated by two narrow blue stripes, so that the red predominated. But the boating members wore a blazer of equal broad red and blue stripes up to 1883. At that time colours were only worn for games and the cult of the "old school tie" was very limited. In 1883, on the suggestion of Whistler-Smith (afterwards Smith-Rewse), a new blazer was adopted by all clubs. This had red and blue in equal quantities, broad and narrow stripes alternating. Similar blazers were adopted for the Auxiliary forces with a thin yellow stripe added for Militia and a while stripe for Volunteer units.

In 1933 a plain navy blue blazer with R.E. Hunt Buttons was introduced for general use.

Rackets and Billiards

In the 1870's, when team games were being organized, the two games in this section were provided for in Government buildings in many barracks and messes; and at a period when competition was developing against the R.A. in different ways, it was only to be

expected that matches at billiards and rackets should be organized.

The first records appear in 1873, and it became usual to play the billiards matches in the evening of the day on which the rackets were played. Each rackets match consisted of a singles and a doubles, and the annual events were arranged alternately at Chatham and Woolwich. The sequence was broken in 1877–8 and again from 1886 to 1889, on each occasion by the inability of the R.A. to raise a team. After 1878 new regulations were made by the two Corps, under which each Corps was to present a challenge cup to be played for by three games each year—two singles and a doubles at rackets and three single games of 300 each at billiards—the winners of the match to hold the cup for the year, the losers to challenge for the possession of the cup the following year. Except for some interruption during the South African War, these matches were continued up to 1914.

In the Army rackets championship competition the Doubles was won by the R.E. in 1895, and the Singles was won by S. H. Shepherd in 1903 and subsequently in 1906 and 1921, the latter when he was a Major-General.

Among other rackets players may be noted G. A. Tower, L. B. Friend, C. Penrose, W. C. Hedley, I. E. O'H. Hamilton, E. M. Blair and C. St. B. Sladen.

Among billiard players were Dumbleton, whose matches against Anstruther of the Gunners were features of the early '80s, T. Glancy, A. R. Dorward and H. B. Jones.

Miscellaneous Officers' Clubs

As new forms of games and sports developed, they were always taken up by some group or other of R.E. officers, but normally on a station basis, and thus not representative of the Corps. Up to 1914, the only games at which there was some attempt to obtain a representation of the Corps as a whole are those described above. After the period of the South African War, there was a marked development of new forms of sport, which received a greater impetus after the war of 1914–18. These new forms will therefore be best dealt with in a later volume, which will describe the life of the Corps from August, 1914, onwards. Of the officers' clubs mention may be made of Beagling, started at Chatham in 1906; Coaching, at Aldershot; Hockey, at Chatham in 1912, with an annual match against the R.A.; Lawn Tennis, which became universally popular

from the beginning of the '80's, but did not produce anything in the nature of a Regimental team till many years later; Polo, at its best in India, but with occasional teams at Gibraltar and Malta; and Shooting, in its many forms, mostly in India where the hunting of tigers and big game was a recognized form of sport. Reference must also be made to Hunting and the many forms of sport associated with the horse, more especially at stations like Aldershot or the Curragh where mounted units of the Corps were stationed.

Games of Other Ranks

Occasionally players from the "Other Ranks" appeared in R.E. teams at cricket and football and at most stations the Regimental team drew from all ranks. At cricket Corporal Bayfield played in the Corps and S.M.E. elevens from 1890 to 1894, including the matches against the R.A., until, in 1895, it was agreed that the teams for R.A. *v.* R.E. match should be officers only. At football in the '80's several of the N.C.Os. and members of the R.E. Band belonged to the Chatham Club and were sometimes included in the R.E. team. A few years later an R.E. Depot Battalion team distinguished itself in the Army Association Cup competition between 1902 and 1907, appearing in five consecutive finals, of which it won three, and in 1908 won the Amateur Cup. R.E. Aldershot had a team which won the Aldershot Charity Cup in 1905 and 1910, the open and junior Tournament Cups and the Charity Cup in 1912.

In earlier days the R.E. other ranks had earned distinction at two forms of sport which deserve special mention. In all athletic meetings one of the usual competitions was a Tug of War—eight a side—and in the Annual Naval and Military Tournament, first held at the Agricultural Hall, Islington, and later at Olympia in Kensington, one of the competitions was a Tug of War open to the Army and Navy, in which several R.E. teams used to enter. The best of these was generally the team from the Bridging Battalion at Aldershot. This unit had a special short-term enlistment and served at Aldershot only, except on active service. They were able to maintain a physical standard which was higher than that for the rest of the Corps and thus were able to select and train a very powerful team which always took a prominent place in this competition. In 1899 the Bridging Battalion won ten championships in London (open to Navy and Army) and three at Aldershot and defeated all opponents in the last fifty-four pulls in which they were engaged.

The other form of competition in which the Sappers were pre-eminent was cutter racing. In the various regattas which took place round the coast, a race was usually included for twelve-oared service cutters, and when the R.E. were put in charge of the mining defences of our ports they began to put in crews for this event, their principal opponents being the Royal Navy and crews from the hands in the Naval Dockyards. The training for the crew covered a period of three months each summer and was usually supervised by one of the senior W.Os. or N.C.Os. Feeling sometimes ran high and matches were arranged for considerable stakes. In 1899, General Sir Charles Warren, when G.O.C. Thames and Medway District, presented a challenge shield for a championship race on the River Medway, which was won that year by the Naval School of Gunnery, Sheerness. When the Submarine Mining School was removed from Chatham, in 1905, the tradition of the cutter rowing on the Medway was continued by good crews from the Fieldwork squads.

Rifle Shooting

Another inter-Corps competition in which the R.E. took a prominent part was rifle shooting, partly by entries at the National Rifle Association Annual Meeting and partly through the R.E. Rifle Association. The best-known name among the R.E. is that of Colonel J. A. Cowan, who was for many years a member of the Army Eight and also shot for Scotland in international matches. Another well-known name was that of Sapper Gale of the 34th Company, who also shot for the Army. To encourage rifle shooting in the R.E. the Royal Engineer Inter-Company Rifle Matches were started in 1881 and managed by a Committee at Chatham. The competition included a series of small prizes each year for the various ranks, for scores at 200, 500 and 600 yds., the best shots of each unit being grouped into a team of eight. The names of the winning teams were entered on a shield on the base of a Challenge Cup, which was held for the year by the winning unit.

Further details of sporting activities are given in Volume VII.

CHAPTER XVIII

PERSONAL NOTES—VICTORIA CROSS—BIOGRAPHICAL NOTICES

FOLLOWING the precedent of Volumes II and III, this chapter is composed of personal notices of individuals.

VICTORIA CROSS

During the period covered by this volume, the Victoria Cross has been won on five occasions by members of the Corps. The following are extracts from the official Gazettes :

CAPTAIN FENTON JOHN AYLMER, Royal Engineers.

" For his conspicuous bravery in the assault and capture of the Nilt Fort, on 2nd December, 1891. This officer accompanied the storming party, burst open the inner gate with gun-cotton, which he placed and ignited, and though severely wounded, once in the leg and twice in the right hand, fired nineteen shots with his revolver, killing several of the enemy, and remained fighting until, fainting from loss of blood, he was carried out of action."—*The London Gazette*, 12th July, 1892.

LIEUTENANT THOMAS COLCLOUGH WATSON, Royal Engineers.

" This officer on the 16th September, 1897, at the village of Bilot, in the Mamund Valley, collected a few men of the Buffs (East Kent Regiment) and of No. 4 Company, Bengal Sappers and Miners, and led them into the dark and burning village to dislodge some of the enemy who were inflicting loss on our troops. After being wounded and driven back, he made a second attempt to clear the village, and only desisted after a second repulse and being again hit and severely wounded."—*The London Gazette*, 20th May, 1898.

LIEUTENANT JAMES MORRIS COLQUHOUN COLVIN, Royal Engineers.

" On the same occasion, after Lieutenant Watson had been incapacitated by his wounds from further effort, Lieutenant Colvin

continued the fight and persisted in two more attempts to clear the enemy out of the dark and still burning village. He was conspicuous during the whole night for his devotion to his men in the most exposed positions under a heavy fire from the enemy."—*The London Gazette*, 20th May, 1898.

CORPORAL FRANK HOWARD KIRBY, Royal Engineers.

" On the morning of the 2nd June, 1900, a party sent to try to cut the Delagoa Bay Railway were retiring, hotly pressed by very superior numbers.

During one of the successive retirements of the rearguard, a man whose horse had been shot was seen running after his comrades. He was a long way behind the rest of his troop and was under a brisk fire. From among the retiring troop Corporal Kirby turned and rode back to the man's assistance. Although by the time he reached him they were under a heavy fire at close range, Corporal Kirby managed to get the dismounted man up behind him and take him clear off over the next rise held by our rearguard. This is the third occasion on which Corporal Kirby has displayed gallantry in the face of the enemy."—*The London Gazette*, 5th October, 1900.

LIEUTENANT ROBERT JAMES THOMAS DIGBY JONES, Royal Engineers.

No. 459, **TROOPER H. ALBRECHT,** Imperial Light Horse.

" Would have been recommended for the Victoria Cross had they survived, on account of their having, during the attack on Waggon Hill (Ladysmith) of the 6th January, 1900, displayed conspicuous bravery and gallant conduct in leading the force which reoccupied the top of the hill at a critical moment just as the three foremost attacking Boers reached it, the leader being shot by Lieutenant Jones and the two others by Trooper Albrecht."—*The London Gazette*, 8th August, 1902.

BIOGRAPHICAL NOTICES

As in the previous volumes, notices are only included of officers after their decease, but owing to the late publication of this volume, it has been possible to include the names of many officers who, though they survived after 1914, had by that time practically completed their work for their Corps and Country and have since died.

An attempt has also been made to include not only officers distinguished for military service but also notices of officers who were distinguished for work in connexion with some of the many branches of Engineering and Government service in which R.E. officers have been employed.

As no biographical notices were included in *The Military Engineer in India*, it has been thought best, to complete this History up to date, to include notices of a few officers of the lists of the old Indian Engineers, as well as of several officers of the R.E. who rendered distinguished service, wholly or partly, in India.

To make room for the additional numbers, the biographies have been curtailed to what is, in most cases, a record of facts, but anyone interested in the life of any individual officer can obtain additional information by referring to the Index of this and previous volumes; a reference to other sources of information is added in each case.

The notices are arranged according to the date of the first commission.

General Sir James F. M. Browne, K.C.B.
Colonel Commandant, R.E.

James Frankfort Manners Browne was born in Dublin in 1823; he was the son of the Dean of Lismore who was the second son of Lord Kilmaine.

Commissioned in the R.E. in January 1842, he went on foreign service to Canada in 1845, and, in 1847, he was sent on special service with a party of Sappers to join the garrison at Fort Garry, on the site of the present city of Winnipeg. In 1854 Browne as a 2nd Captain was appointed to the command of the 1st Company of the Royal Sappers and Miners and in January, 1855, embarked with his unit for the Crimea. Here he was soon moved into the trenches before Sebastopol, rendering conspicuous service in the attack on the Quarry when Captain (later Field-Marshal) Wolseley was his Assistant Engineer. For his services on this occasion Browne was Mentioned in Despatches and in July was awarded a Brevet Majority. In the same month, Browne became the Engineer Director of the right attack until he was severely wounded by a bullet in the left arm and shoulder, which necessitated his being invalided home. For his services in this campaign he received the C.B. and

a second Brevet of Lieut.-Colonel, which was gazetted in December, 1856.

In 1859 he was in command of the Engineers in the Bombay Presidency and in 1860 was C.R.E. at Mauritius. In 1861 he was appointed Superintendent of Military Discipline (later called Assistant Commandant) at the S.M.E. and in 1866 was moved to the War Office as A.A.G., succeeding to the higher appointment as D.A.G., R.E. in 1871. In 1877 he was promoted Major-General (afterwards ante-dated to 1870) and placed on half pay, until in 1880 he was appointed Governor of the Royal Military Academy. He remained there for seven years, being promoted Lieut.-General in 1881. He was promoted General in February, 1888, and retired in May of that year. In 1890 he was appointed a Colonel Commandant R.E. and in May, 1894, was created K.C.B.

A memoir was published in the *R.E. Journal* of June, 1911.

Colonel Sir Charles B. Nugent, K.C.B.

Charles Butler Nugent was commissioned in the R.E. in 1845. He served at Nova Scotia, Bermuda and Alderney in the construction of defences and in 1854 was selected to command a detachment of R.E. for services in the Baltic, under Admiral Sir Charles Napier, where he was present at the capture of the Aland Islands and Bomarsund. In 1855 he was again sent to the Baltic and was present at the bombardment of Sweaborg. He was promoted Brevet Major for his services. He was Adjutant at Chatham till 1859 and was employed as C.R.E. at Weymouth and then at Halifax and Bermuda, returning to England in 1870. In this year he was President of the Torpedo Committee, appointed to select the first gear for the Submarine Mining Service, and in 1873 he became Assistant Director of Works (Fortification) at the War Office, becoming Deputy Director in 1875. Promoted Colonel in 1878 he became a Member of the Ordnance Committee with which he remained till 1882 when he was selected as C.R.E. of the British force in Egypt, with the rank of Brigadier-General. During the battle of Tel-el-Kebir he was in command of the troops at the advanced base of Kassassin. He was created K.C.B. for his work in this campaign and retired under the age clause in 1884. After retirement he lectured on military subjects at the United Service Institution. He died in 1900 at the age of 74.

A memoir was published in the *R.E. Journal* of February, 1900.

Colonel A. R. Clarke, C.B., F.R.S.

Alexander Ross Clarke was commissioned in the R.E. in 1847, he became Colonel in 1877 and retired in 1881,

Early in his service he joined the Ordnance Survey, where he became head of the Trigonometrical branch and one of the foremost geodesists of his day, see Volume II, page 247. He was awarded the Gold Medal of the Royal Society in 1887. He died in February, 1914.

Lieut.-General Sir J. Bevan Edwards, K.C.B., K.C.M.G. Colonel Commandant, R.E.

James Bevan Edwards was born in 1834 and was commissioned in the R.E. in 1852. In July, 1855, he was sent to the Crimea where he was employed on demolition of docks, and in 1856 he was sent to Corfu to demolish the fortifications there. In 1857 he saw service in India with the 21st Company R.E., which was with the Central Indian Force. In one battle the 21st Company charged the enemy at a critical moment and determined the fate of the battle. Edwards was three times Mentioned in Despatches and received the Brevet of Major.

In 1863 he went out to China just in time to join Gordon's " Ever Victorious " Army in its last engagements. On return home he remained in England in various employments, reaching the rank of Lieut.-Colonel and Brevet Colonel in 1877, when he was given the C.B. ; in 1885 he was appointed C.R.E. of the Suakin Field Force. Later in the same year he was appointed Commandant S.M.E., with the substantive rank of Colonel, and was promoted Major-General in 1887. In 1889 he became G.O.C. Hong Kong but resigned the following year. While in Hong Kong he had been sent to report on the forces of the Australian Colonies and was created K.C.M.G. in 1891. He was promoted Lieut.-General in 1891 and retired in 1893. In 1895 he was Member of Parliament for the Hythe Division, but was not re-elected in 1899. He was President of the Council of the Imperial Institute from 1909 to 1915. He became Colonel Commandant R.E. in 1903 and was created K.C.B. in 1912. He died in 1923.

General Sir Harry N. D. Prendergast, V.C., G.C.B.
Colonel Commandant, Royal (Madras) Engineers

Harry North Dalrymple Prendergast was born in 1834, and commissioned in the Madras Engineers in 1854. He went to India in October, 1856, and served with " B " Company, Madras Sappers and Miners, in Persia, taking part in the action at Mohumerah. In June, 1857, he was on service with his company in Central India, taking part in the Siege of Dhar, the action at Mundisore (where he was wounded), the Siege of Ratghar, the Relief of Saugor, the Siege of Jhansi, the battle of Betwa (where he was wounded again). He received the Victoria Cross for gallantry at Mundisore and elsewhere. He was invalided to England on account of his last wound. On return to India he served for some years in the Public Works in various Madras Stations and, in 1867, went in command of three companies of Madras Sappers to the Abyssinian War, where he acted as Field Engineer and was present at the action of Arogi and the capture of Magdala ; for this he received a Brevet Lieut.-Colonelcy. He was Commandant of the Madras Sappers and Miners from 1869 to 1880 ; during this period, he commanded the four companies of Madras and Bombay Sappers and Miners which went in 1878 to Malta and afterwards to Cyprus. In 1880 he was appointed Brigadier-General and commanded at Cannanore, and in 1881 at Bellary. In the autumn of 1882 he was promoted Major-General and became Q.M.G. of the Madras Army. In April, 1883, he assumed command of the Burma Division, and in November, 1885, commanded the British-Indian Army in the last Burma War, occupying Mandalay on 30th November, thereby adding Upper Burma to the British Empire. He spent the next few months in organizing the future occupation of Burma, but in March, 1886, he vacated his command on promotion to Lieut.-General. For his services in the conquest of Upper Burma he was created K.C.B.

This was his last military employment, but he served till 1892 in the political Department, being in turn Resident at Mysore, Baroda and again at Mysore, and he acted for a short time as Agent to the Governor-General in Baluchistan.

He was created G.C.B. in 1902, and was appointed Colonel Commandant Royal (Madras) Engineers in October, 1908. He was also Colonel of the Q.V.O. Madras Sappers and Miners.

He died in 1913.

A memoir was published in the *R.E. Journal* of September, 1913.

General Robert Nicholl Dawson-Scott
Colonel Commandant, R.E.

Robert Nicholl Dawson was born in 1836. He was the son of Colonel Robert Kearsley Dawson, C.B., R.E., who served under Colby on the Survey of Scotland (Volume II, page 33), and the grandson of Robert Thomas Dawson of the Corps of Military Surveyors. He assumed the name of Dawson-Scott in 1872. He was Commissioned in the R.E. in 1854. After service in Ireland, Halifax, Nova Scotia, and the West Indies, he joined the little group of officers who were developing the Field Troop under Colonel Duff and on the formation of the B Equipment Troop in 1863, he was appointed to command this unit. After a tour of service at Bermuda he was employed for three years on constructing the new defences at Fareham and in 1873 rejoined at Aldershot, where he was appointed second in command, R.E. Train. In 1877 he was D.A.A.G., R.E., at the War Office and in 1879 became C.R.E. Home District. In 1881, on promotion to Colonel, he rejoined the War Office as Assistant Director of Works (Barracks) and in 1882 was advanced to Deputy Director. He held this appointment for five years during which occurred the great expansion of the Barrack work of the Corps described in this volume. He took a prominent part in connexion with the various Committees and inquiries into the work and establishment of the Corps. In April, 1888, he was appointed Commandant S.M.E., where he remained five years, being promoted Major-General in 1890. He received further promotion to Lieut-. General in 1894 and to General in 1897. He retired in 1898 and interested himself in various Corps activities. He was appointed Colonel Commandant R.E. in 1905 and died in 1922.

This memoir is compiled from information supplied by his family and from the *R.E. Journal.*

Colonel Sir Edward T. Thackeray, V.C., K.C.B.

Edward Talbot Thackeray came of an old Yorkshire stock and was first cousin of William Makepeace Thackeray. He was born in 1836, and received his commission in the Bengal Engineers in 1854. He arrived in India in 1857 and was posted to the Bengal Sappers and Miners at Roorkee. On the outbreak of the Mutiny in May, 1857, he took part in the advance on, siege and capture of Delhi,

and subsequently in the operations in Oudh, including the capture of Lucknow, and in Rohilkhand. He was awarded the V.C. in 1862 for gallantry at the capture of the Magazine at Delhi on 16th September, 1857.

After the Mutiny he served for twenty years in the Public Works and Military Works in what is now the United Provinces. In 1879, during the second Afghan War, he was appointed Commandant, Bengal Sappers and Miners, and proceeded at once on service as C.R.E. of the Khaibar Column of the force advancing on Kabul. On General Gough's advance to join Sir F. Roberts at Kabul, Thackeray was left in command of the post at Jagdalak Kotal, and on 23rd December was severely wounded while defending it against a strong attack by the enemy.

On returning to India, in 1881, he resumed command of the Bengal Sappers and Miners at Roorkee, vacating in 1886. Then after a period of service in the Intelligence Branch at A.H.Q., India, he retired as a full Colonel in 1888. He was appointed C.B. in 1886.

After his retirement, he became a Knight of Grace of the Order of St. John of Jerusalem and in 1892 was appointed First Commissioner (afterwards Chief Commissioner) of the Order; in this capacity he rendered very important service which was rewarded in 1897 by a K.C.B. In 1898 he went to live at Bordighera in Italy, where he spent the rest of his life. Here during the Great War, as President of the local branch of the Red Cross and the Order of St. John, he had much work in connexion with the British Military Hospital established there, and was again Mentioned in Despatches, and received the two medals. He thus had the almost unique distinction of wearing the medals of the Mutiny and the Great War.

He died at Bordighera on 3rd September, 1927.

A memoir appeared in the *R.E. Journal* of June, 1928.

Major-General E. R. Festing, C.B., F.R.S.

Edward Robert Festing was commissioned in the R.E. in 1855, a few months before he completed the sixteenth year of his age. In 1857 he was sent to India with the 21st Company, R.E., and served in the campaign in Central India under Sir Hugh Rose, being Mentioned in Despatches. In 1864 he joined the staff of the Department of Science and Art at South Kensington and worked

there for the remainder of his service, until he retired in 1885 with the rank of Major-General.

The work with which his name was closely associated was the development of the Science Museum, which he built up from very small beginnings and of which he was finally Director. There was at first a great shortage of funds, but Festing begged for contributions of exhibits and gradually accumulated the nucleus of the present fine collection. In 1878 he was one of the officers employed as Inspector of the Science and Art Schools throughout the Kingdom. During his long residence in London, he was closely associated with all Corps interests and was for many years a member of the Council of the Institution. He died in 1912.

A memoir was published in the *R.E. Journal* of August, 1912.

General Sir Richard Harrison, G.C.B., C.M.G.

Richard Harrison was born in 1837 and, after education at Harrow, was commissioned in the R.E. in July, 1855. From 1856 to 1859 he served in India during the Mutiny, taking part in operations under Outram. In 1859 he was in Sir Hope Grant's expedition to China, including the capture of the Taku Forts. For this he was recommended for a Brevet Majority, which he received in 1864. After a short service in Canada he joined the S.M.E. Chatham in 1861, where he became Brigade Major and was Secretary, R.E. Committee, 1866 to 1869. In 1875 he passed the final examination at the Staff College. From 1876 to 1879 he was at Aldershot with the R.E. Train and in 1879 was sent out to South Africa for the Zulu War with the 30th Company R.E. He then held the rank of Lieut.-Colonel and on arrival in South Africa he handed over the duties of C.R.E. and O.C. Company to his second in command, Captain Bindon Blood, to take up the appointment of A.Q.M.G. (Intelligence), which he held throughout the campaign, receiving the C.B. for his services. In 1880 he became A.Q.M.G., Aldershot. In the Egyptian War of 1882 he was appointed A.A.G. and Chief Staff Officer to Major-General Earle who was in command of the Line of Communications and received the C.M.G. In 1884 he was invalided home and was for a short time on half pay until he was appointed C.R.E., S.E. District, in 1886, and C.R.E., Aldershot, 1886 to 1888.

Promoted Major-General in July, 1888, at the age of 51, in June, 1889, he was Commandant, Royal Military Academy, until in 1890 he was appointed to the Command of the Western District where

he remained till 1895, having been promoted Lieut.-General in 1893 and General in 1895.

In 1897 he was temporarily appointed Quartermaster-General at the War Office and transferred to Inspector-General of Fortifications in 1898, which he held until his retirement in 1903. He was promoted K.C.B. in 1889 and G.C.B. in 1903.

After his retirement he continued to take a great interest in everything which affected the Corps and gave most valuable assistance and advice during the changes of organization which followed the abolition of the office of I.G.F. In 1907 he suggested the formation of the R.E. Corps Committee to take over some of the social duties of the I.G.F. and acted as President of this Committee for fifteen years. He was very interested in the R.E. Museum at Chatham and assisted in the negotiations which resulted in the use of the old model room for this purpose.

Throughout his service he had always been trusted by his superiors and subordinates alike, and it was fortunate for the Army and the Corps that he was at the head of the Engineer branch of the War Office during the crucial times of the South African War. He died in 1931 at the age of 94.

A memoir was published in the *R.E. Journal* in December, 1931.

Colonel Sir Colin C. Scott-Moncrieff, K.C.S.I., K.C.M.G.

Colin Campbell Scott-Moncrieff was commissioned in the Bengal Engineers in 1856 and saw service in Oudh during the Indian Mutiny. In 1862 he was for two years Assistant Principal at the Civil Engineering College at Roorkee and from 1876 to 1877 was on famine relief in Madras, for which he received the C.S.I. For the rest of his service in India he was employed in improving and maintaining various systems of irrigation. In 1881 he was appointed Chief Engineer in Burma, but retired with the rank of Colonel in 1883. On his way home he was stopped by Lord Dufferin in Egypt and asked to report on the irrigation of the Delta. This was the beginning of a period of nine years' further work during which he reconstructed the Delta barrage, which had been badly constructed, and was successful in so improving the whole irrigation system that Egypt from being a bankrupt country became comparatively flourishing. He also started a full investigation of the whole system for the control of the waters of the Nile, which led to the construction of the Assuan Dam. Another improvement which was much to his

heart was the abolition of the system of *corvée* or forced labour, which involved great hardship. This was rendered possible by the improved financial condition of the country. He was created K.C.M.G. for his services. Retiring from Egypt in 1892 he joined the public service and was Under Secretary for Scotland from 1892 to 1902. In 1901 he was appointed Chairman of a Commission on Indian Irrigation and on conclusion was promoted K.C.S.I. He died in 1916 in his eightieth year.

A memoir was published in the *R.E. Journal* of October, 1917, in which the writer emphasizes the "honesty combined with tact" which he showed in all his dealings.

General Sir Charles Warren, G.C.M.G., K.C.B., F.R.S.
Colonel Commandant, R.E.

Charles Warren was born at Bangor, North Wales, in 1840. Educated at Cheltenham, he was commissioned in the R.E. in 1857. From 1858 to 1865 he served at Gibraltar, making a survey of the Rock. He was Assistant Instructor in Surveying at the S.M.E. till 1867, when he was selected for special employment at Jerusalem under the Palestine Exploration Fund (see Volume II). From 1868 he was employed on engineer duty at Shoeburyness and Waltham on experiments with heavy ordnance and in charge of *Ordnance* buildings. In 1876 he was selected by Lord Carnarvon as Special Commissioner between the Orange Free State and Griqualand West, receiving the C.M.G. In 1878, on the outbreak of the Kaffir War, he was appointed to command the Diamond Fields Horse (see Volume II, Part III, Chapter V). For this he received the Brevet of Lieut.-Colonel. In 1878 he was appointed Instructor in Survey at the S.M.E. In August, 1882, he was selected for special duty in Egypt, in charge of the expedition to discover Professor Palmer and his companions (see Volume II, Chapter XXVI). For this service he was made a Brevet Colonel and given the K.C.M.G. He resumed his duties at Chatham till 1884 and in November of that year he was appointed H.M. Commissioner for Bechuanaland, where he was completely successful without actual fighting (see Volume II, Part I, Chapter XXIV). By his efforts British Bechuanaland was established as a Crown Colony. Warren received the G.C.M.G. for his services.

He was next employed to command the troops at Suakin, with the rank of Major-General, but in 1886 accepted the appointment of

Chief Commissioner Metropolitan Police, which he held during the Golden Jubilee of H.M. Queen Victoria, when he was made K.C.B. He resigned this appointment in 1888, when he was still on the Regimental list as a Lieut.-Colonel, but in April, 1889, he was promoted Colonel and appointed Colonel on the Staff to command the troops at Singapore, which had just been separated from the Hong Kong Command. He held this appointment for five years, being promoted Major-General in 1893 at the age of 53. From 1895 to 1898 he was G.O.C. Thames and Medway District, being promoted Lieut.-General in 1897. In October, 1899, he was given the command of the 5th Division in South Africa and joined the Army under Sir Redvers Buller which was endeavouring to relieve Ladysmith. Warren was in command of the troops attacking Spion Kop (see Volume III) and took part in the final relief of Ladysmith.

In April, 1900, he was in charge of an expedition to put down a rebellion in north-west Cape Colony, Griqualand West and British Bechuanaland. He cleared the country between the Orange River and the Vaal and defeated a Boer force. Order was restored by August, when Warren returned to England. He was promoted General in 1905 and was made Colonel Commandant the same year. He died in 1927 at the age of 87.

A memoir was published in the *R.E. Journal* of December, 1927. An account of the action at Spion Kop was given in *Warren and Spion Kop* by "Defender" (Colonel R. H. Vetch), see also Dictionary of National Biography.

Colonel R. Y. Armstrong, C.B., F.R.S.

Robert Young Armstrong was born at Calry, Co. Sligo, in 1839, and educated at Trinity College, Dublin. He was commissioned in the Corps in 1858. After service at Dover and in Canada he was employed as an Assistant Instructor in Signalling under Major Stotherd at the S.M.E., and in 1870 was sent to Aldershot to instruct the troops in signalling and to take charge of the signalling arrangements for big field days.

In 1871 he returned to Chatham as Assistant Instructor in Telegraphy, which included Electricity and Submarine Mining, and in 1876 was appointed Instructor, which he held till 1883. These twelve years were very important, not only in the application of electricity to military purposes, but in the growth of electrical science.

In January, 1883, he was appointed electrical adviser to the

Board of Trade. Electric lighting was then coming into use and an Electric Lighting Act had been passed to secure public safety and an efficient supply. Armstrong took a leading part in the preparation of the necessary provisional orders and regulations and held inquiries in cases of accidents.

In June, 1884, Armstrong succeeded Colonel Malcolm as Inspector of Submarine Defences at the War Office, but continued to advise the Board of Trade till 1888.

He held the appointment at the War Office for seven years, during which occurred the great expansion in the system of Coast Defence and the use of submarine mines described in this volume. For details see *History of Submarine Mining*. The purchase of the Brennan torpedo occurred during his tenure at the War Office. He represented the War Office at several electrical exhibitions both at home and abroad. He was promoted Colonel in 1890. In 1891 he was given the C.B. and in the same year was elected a Fellow of the Royal Society. In 1891 Armstrong was appointed the R.E. member of the Ordnance Committee, but ill health compelled him to resign this appointment in December, 1892, and he passed away in November, 1894.

In his honour the Corps gives an "Armstrong" prize to the Cadet in each batch at the R.M.A., who is most distinguished for electrical work (later science) and also a prize for the best Electrician Mechanist of the year in the courses at Chatham.

A notice was published in the *R.E. Journal* of January, 1895.

Lieut.-Colonel Sir Henry Trotter, K.C.M.G., C.B.

Henry Trotter was educated at Addiscombe and received his commission in the Bengal Engineers in 1860. He began his career in the Survey of India when the great trigonometrical branch was spreading its network to India's hinterland in the Himalaya and beyond. His share, in 1873–4, as geographer to Sir Douglas Forsyth's mission to Yarkand earned him the gold medal of the Geographical Society, and improvement on Montgomerie's method of employing natives in the field of geographical research was successful in securing trustworthy mapping of the Oxus regions. Later he devoted himself to diplomacy in the nearer East. After special service in China in 1876, he became Assistant Military Attaché at Constantinople during the Russo-Turkish War of 1877–8, and was present at the Siege of Kars and several of the battles in Asia Minor. After this he

became Consul in Kurdistan and, after superintending relief operations in Scio, following the great earthquake, was again appointed to Constantinople as Military Attaché. For four years he was Consul-General in Syria, then *Chargé d'Affaires* at Bucharest and finally Consul-General in Rumania, 1894–6, and Delegate on the Danube Commission. He retired from the Army in 1890 and died in 1919. He was awarded a Brevet Majority in 1878, the C.B. in 1880, and created K.C.M.G. in 1906.

Sir Thomas Holdich, in a memoir published in the *R.E. Journal*, December, 1919, comments on his record as a sportsman and suggests that he was the first European to shoot *ovis poli* in the Pamirs and one of the very few to have shot lions in Gujrat, and considered that few men had lived a more strenuous and adventurous life than he.

General Sir Bindon Blood, G.C.B., G.C.V.O.
Chief Royal Engineer

Bindon Blood, who was born on 7th November, 1842, came of an old Irish family which settled in County Clare about the end of the sixteenth century. Colonel Thomas Blood, who attempted to steal the Crown Jewels in 1671, was a member of this family, and the son of Thomas, Brigadier-General Holcroft Blood, was an officer of the Royal Engineers, whose biography is included in Volume II of the Corps History.

Bindon was the eldest son of Mr. W. B. Blood who was then the head of the family. He was educated at the Royal School at Banagher in King's County and in 1859 passed for a Cadetship at the Royal Military Academy, but actually joined the Indian Military Seminary at Addiscombe. He was commissioned in the Royal Engineers in December, 1860. In the first ten years of his service he was stationed at Chatham and Aldershot and in 1867 was responsible for a new pattern of pontoon bridge, which was adopted in 1870 and, with some later improvements, remained the service type till the end of the Great War 1914–18. In 1870 he was the first officer appointed to the newly formed Telegraph Troop, but the following year he exchanged with an officer serving in India and thus started his brilliant career in that country, which lasted with short breaks for thirty-six years. He was posted to the Bengal Sappers and Miners and was promoted Captain in 1873, but it was not till his eighteenth year in the Army that he first saw active service, when

he commanded two companies of Sappers and Miners in a small expedition against the Jowaki Afridis. In 1878, on completion of his first tour of Indian service, he was posted to Chatham and the next year was ordered on active service during the Zulu War, with the 30th Company, R.E. The company was commanded by Major and Brevet Lieut.-Colonel Richard Harrison and on arrival in South Africa, Harrison was made A.Q.M.G. Intelligence, and Blood became C.R.E. of the 1st Division, which had some months of trying duty on the Tugela river, but did not take part in any of the fighting. For his services Blood received the Brevet of Major. On return to England at the end of 1879 he was ordered to India to join Sir Frederick Roberts's force at Kabul, where he arrived in March, 1880, but the campaign was then drawing to a close and in September, 1880, Blood returned to Roorkee, where he officiated as Commandant of the Sappers and Miners.

In the spring of 1882 he returned to England and was placed in command of the 26th Field Company at Shorncliffe, which he took out to Egypt in July. The company took part in the battle of Tel-el-Kebir and at the end of the campaign Blood was promoted Brevet Lieut.-Colonel.

In 1885 Blood returned to India as Commandant of the Bengal Sappers and Miners at Roorkee, which he held for the next seven years. During this time he completed a reorganization of the Corps, which he had started in 1880. He was made a Colonel in the Army in 1886.

In 1894 he was appointed Colonel on the Staff at Rawalpindi and in March of the following year he was Chief Staff Officer to Major-General Sir Robert Low, Commanding the Chitral Relief Force. He was created K.C.B. for his services in this campaign.

He was next given the command of the Bundelkand Brigade, with headquarters at Agra, but in 1897 there was a very serious rising on the North West Frontier and Sir Bindon Blood was given the command of the Malakand Field Force with the temporary rank of Major-General. In a series of brilliant operations which are described in *The Military Engineer in India*, Volume I, Chapter XXI, he completely overcame the opposition of the tribes in the short space of six months and so effectively that there was comparative peace on the frontier for the next ten years. Sir Bindon was, in May, 1898, promoted Major-General for distinguished service in the field, at the age of 55.

For the next two years he commanded the Meerut Division, but in January, 1901, he was ordered to South Africa, where, with

the local rank of Lieut.-General, he was in command of the Eastern Transvaal. He returned to India in October, 1901, to take over the Punjab Command which numbered about 85,000 all ranks.

He held this appointment until his retirement in 1907 at the age of 65. During this time he acted as Commander-in-Chief in India during the temporary absence of the holder of this appointment. For his services in the field he had been mentioned in Despatches eight times, had earned seven war medals with several clasps, as well as the Order of the Osmanieh for his services in Egypt.

On retirement Sir Bindon settled in England and interested himself wholeheartedly in everything which concerned the Corps. He was created G.C.B. in 1909 and G.C.V.O. in 1932. In July, 1914, he was appointed a Colonel Commandant R.E. and three years later became the Representative Colonel Commandant, which he held for the next sixteen years. Shortly after his ninetieth birthday he was entertained by the Corps at the Headquarter Mess at Chatham.

In October, 1936, the post of Chief Royal Engineer was re-created and H.M. the King selected Sir Bindon to fill this honourable post. He resigned this appointment in 1940 and a month later passed away at the age of 97.

Throughout his whole service, Sir Bindon had been a keen supporter of all forms of sport; he was a noted shot, got his first tiger near Roorkee and in later years increased the tale to over fifty! When over 90 years of age he wrote an account of his life under the title of *Four Score Years and Ten.*

Physically he was a splendid specimen of manhood, very active, endowed with great endurance. At the age of 90 he did not look a day older than 60, and could endure and enjoy a long day of inspections. There was no limit to the trouble he would take to serve the interests of the Corps.

A memoir on which the above account is based was published in the *R.E. Journal* of September, 1940; the writers end their appreciation in these words: "The Corps has lost a very great Sapper and the nation is the poorer through the passing away of a very great gentleman."

Captain Sir William de W. Abney, K.C.B., F.R.S.

William de Wiveleslie Abney was commissioned in the R.E. in 1861. His early service was spent in India, but in 1871 he was appointed Assistant Instructor in the Special Schools at the S.M.E.,

in charge of the branch of Chemistry and Photography, where he soon made a name as an original investigator. In 1877 he accepted an appointment in the Science and Art Department at South Kensington under Sir John Donnelly. He remained there for thirty years in charge of the laboratory. During this time he was closely associated with the development of dry plate photography. He became a Fellow of the Royal Society in 1876, and was an active member of the Royal Astronomical, Photographic and Physical Societies and Chairman of the Royal Society of Arts. He retired from the R.E. in 1881 with the rank of Captain. He was given the K.C.B. in 1904 and died in 1921 in his seventy-eighth year.

A memoir was published in the *R.E. Journal* of February, 1921.

COLONEL SIR THOMAS H. HOLDICH, K.C.M.G., K.C.I.E., C.B.

Thomas Hungerford Holdich was born in 1843 and was commissioned in the Corps in 1862. He went to India in 1865 and accompanied the Bhutan Field Force as an assistant surveyor in the winter of 1865–6. At the close of the campaign he was appointed permanently to the Survey of India, with which he remained till his retirement in 1898.

He accompanied the Abyssinian Expedition of 1867–8 as a Surveyor, and during the second Afghan War he carried out survey work in 1878–9 on the Kandahar line and in 1880 on the Kabul line and on Roberts's march from Kabul to Kandahar; for this he was awarded a Brevet Majority. In 1881 he accompanied the Waziristan Expedition on survey duty and then, after a period in charge of the Kohat Survey, he was placed in charge of the Baluchistan Survey and saw active service against the Shirannis. In 1884 he assumed charge of the Survey party of the Russo-Afghan Boundary Commission and for his services was promoted Brevet Lieut.-Colonel in 1887, and also awarded the Gold Medal of the Royal Geographical Society. On his return he carried out more survey work in Baluchistan. In 1892 he was appointed Superintendent of Frontier Surveys and as such controlled, from 1894 to 1895, the delimitation of the Durand Line, himself carrying out the demarcation in the Kunar Valley. In 1895, he was appointed Chief Survey officer of the Pamir Boundary Commission, and later in the same year, Chief Commissioner of the Perso-Baluch Boundary Commission.

In 1897, Holdich directed the Survey parties on active service during the frontier wars of that year and was himself engaged in

the Tirah Expedition and he retired on reaching the age limit of 55. During his service he had had experience in survey of practically the whole of the North West Frontier, from the Pamirs to the sea. He was made a C.B. and C.I.E. in 1894 and promoted to K.C.I.E. in 1896.

After his retirement he was appointed, in 1900, a member of the Arbitration Tribunal that solved the long-standing boundary dispute between Chile and Argentine. In this capacity he visited this frontier in 1902 and his recommendations were embodied in the award made by H.M. King Edward VII ; and in 1903 he again visited this frontier at the request of the two Powers actually to demarcate the line. For his services in this commission he was created K.C.M.G.

After his retirement, he recorded his experiences in many books : *The India Borderland* (1901) ; *India and Tibet* (1904 and 1906) ; *The Gates of India* (1909) ; and *Political Frontiers and Boundary Making* (1918).

He died on 2nd November, 1929.

A memoir was published in the *R.E. Journal* of June, 1930, and a fuller record of his services will be found in *The Military Engineer in India*, Volume II.

Lieut.-Colonel the Rt. Hon. Sir Fleetwood I. Edwards, G.C.V.O., K.C.B., I.S.O.

Fleetwood Isham Edwards was born in 1842. Educated at Uppingham and Harrow, he was commissioned in the R.E. in June, 1863. After some service at Dover he was appointed, in 1867, Private Secretary and Aide-de-Camp to General Sir Frederick Chapman, Governor of Bermuda, where he remained for two years. Then, after service at Fermoy and Woolwich, he was asked by Sir Lintorn Simmons, just appointed I.G.F., to become his A.D.C., which post he held till 1878, accompanying his chief to the Berlin Congress of that year. The appointment of an equerry to the young Prince Leopold (later Duke of Albany) was under consideration and Edwards had already been noticed by those in authority, including Lord Beaconsfield, not only as an efficient and zealous Staff Officer but by his personal charm and his steady and determined character. His name was, therefore, submitted for this appointment which was approved, but, after a short delay, Edwards was offered the higher post in the Queen's household of Assistant Privy Purse

and Assistant Private Secretary. He remained in this appointment up to the death of Her Majesty in 1901, rising to the appointment of Privy Purse, which involved the administration of the Privy Purse, also of the income of the Duchy of Lancaster and the charge of the private properties of Osborne and Balmoral, the farm at Windsor, and the Queen's charities. During the whole of his employment at the Court he was honoured by the entire confidence of the Queen, who appointed him C.B. and later K.C.B., while in 1895 he was made a Privy Councillor. He also received the I.S.O. On the accession of King Edward VII, Edwards was created G.C.V.O. and appointed Sergeant-at-Arms to the House of Lords, which he held till his death in 1910.

A memoir written by General Sir Richard Harrison was published in the *R.E. Journal* of March, 1911.

Major-General Sir Elliott Wood, K.C.B.
Colonel Commandant, R.E.

Elliott Wood was born in 1844 and educated at King's College. He was commissioned in the R.E. in January, 1864, and after a tour of service in Cape Colony was put in charge of the building of the Barracks at Guildford. This was so successful that he was selected to take charge of the building of the new barracks at Knightsbridge. He was promoted Captain in 1877, after nearly 14 years' service. He served in Malta from 1880 in command of the 17th Company and on the outbreak of the Egyptian campaign of 1882 was sent with this unit to Alexandria and subsequently took part in the battle of Tel-el-Kebir and was with the first party of troops to enter Cairo; for this campaign he received the Brevet of Major. In 1884, with the 17th Company he was ordered to Suakin and served there with General Graham's expedition of that year, receiving the Brevet of Lieut.-Colonel. In 1885 the company again joined Graham's force at Suakin and Wood was present at the battle of Tofrek. On the withdrawal of the expedition, Wood with the 17th Company returned to Chatham. He received the C.B. for this campaign. In 1885 he was appointed A.A.G., R.E., at the War Office where he remained for five years. In 1894 he was made C.R.E. Malta, with the substantive rank of Colonel, becoming C.R.E., Aldershot, in 1899. On the outbreak of the South African

War he was made the Chief Engineer of the force under Sir Redvers Buller, with the rank of Major-General, and on arrival in South Africa was detached by General Buller to command a force in Cape Colony. On the arrival of Lord Roberts, Wood joined the latter's staff as Engineer-in-Chief and remained in that position till the end of the war. During the latter stages of the war, Wood suggested to Kitchener the use of blockhouses, which Wood had used successfully at Suakin in 1885, though the merit of working out the details of the system must be given to other officers.

For his services in this campaign, Wood was promoted Major-General and given the K.C.B. On return to England he was appointed Chief Engineer of the 1st Army Corps at Aldershot, but resigned this appointment the following year. He was made a Colonel Commandant in 1931. Wood was a keen lover of the canoe and spent many of his holidays on the river, sometimes with his brother C. K. Wood and other friends. During his early service in Cape Colony he explored in a canoe two rivers which were previously almost unknown. He died in 1931.

A memoir was published in the *R.E. Journal* of March, 1932.

Captain Sir Montagu F. Ommaney, G.C.M.G., K.C.B., I.S.O.

Montagu Frederick Ommaney was born in 1842 and educated at Cheltenham College. He was commissioned in the Royal Engineers in 1864. At the S.M.E. he was the first recipient of the Fowke Medal. From 1866 to 1870 he was employed on special duty at the War Office and Admiralty. He was one of the original members of the Council of the R.E. Institute and, in 1872, designed the Institute building at Chatham. After a short period as an Instructor at the Royal Military Academy, he entered the Colonial Service in 1874 as Private Secretary to Lord Carnarvon and in 1877 was given the new appointment of third Crown Agent to the Colonies, which was followed by his retirement from the Active list of the Corps in 1878 with the rank of Captain. He remained in the Colonial Office until 1907, having been selected by Mr. J. Chamberlain in 1900 for the appointment of Permanent Under Secretary for the Colonies. He was largely instrumental in pushing on the railway development in the Colonies, especially of the Uganda Railway, but also in Sierra Leone, the Gold Coast and Nigeria. He received well-merited promotion in the Order of the Bath in 1901, and St. Michael and

St. George in 1904, and was King of Arms of the latter order. He received the I.S.O. in 1903. He died in 1925.

Memoirs were published in the *R.E. Journals* of September, 1925, and March, 1926.

Field-Marshal Lord Nicholson, G.C.B.

Colonel Commandant, R.E.

William Gustavus Nicholson was born in 1845, the son of W. N. Nicholson, Esq., of Roundhay Park, Leeds. He was commissioned in 1865. In 1871 he volunteered for service in India where he completed thirty years' service. His first employment was in the Public Works Department in the Punjab Irrigation Branch and on military works at Rawalpindi and Peshawar. In 1878, after thirteen years' service as a subaltern, he was promoted Captain and in the same year was on active service in the campaign in Afghanistan as Field Engineer with the column which advanced through the Bolan Pass to Kandahar; he was employed on roads and water supply and was Mentioned in Despatches. The next year he was Field Engineer in a column which marched through unknown country back to the Punjab. Lieut.-Colonel James Browne, R.E., was the Political Officer with this column and Nicholson established a firm friendship with him, which served him well in later years.

In September, 1879, occurred the murder of Sir Louis Cavagnari at Kabul, followed by the dispatch of a column under the command of Sir Frederick Roberts, with Colonel Æneas Perkins as C.R.E. Nicholson was again appointed Field Engineer with this column. Kabul was occupied, but the Afghans rose and Roberts with his force was besieged in the Sherpur cantonments. Nicholson was at the time employed on the communications with a working party of Sappers and Miners with whom were Lieutenants Hon. M. G. Talbot and G. Scott Moncrieff. Nicholson managed to get all his party with supplies of stores into the fort at Lataband where there was a small garrison, which was fiercely attacked but held out until relieved in the following December. Much of the credit for the successful defence was given to Nicholson.

In 1880 Nicholson was attached to the 2nd Brigade of the force which, under General Roberts, marched to Kandahar and defeated an army of Afghans. Nicholson's previous knowledge of the ground was found very useful. He was promoted Brevet Major for his services. Returning to India he was appointed Secretary of the Defence

Committee which dealt with Coast Defence and Frontier Defence.

On the dispatch of the Indian contingent for the campaign in Egypt in 1882, Nicholson was appointed Field Engineer. He was present at Tel-el-Kebir with the Indian Cavalry Brigade which, after the battle, cut the railway and captured several trains. After the campaign Nicholson was appointed A.A.G. for R.E. in India. In 1886 he was A.A.G. with the headquarters in the Burma campaign and in 1890 he became Military Secretary to Lord Roberts.

In 1895 he was appointed D.A.G. and Chief Staff Officer, Punjab Army, and in this capacity took part in the Afridi campaign of 1897, for which he was promoted to K.C.B.

In 1898 he was appointed Adjutant-General in India, but when Lord Roberts was made C.-in-C. in South Africa in December, 1899, he took Nicholson with him. The latter was at once detailed to reorganize the transport and took part in the operations under Lord Roberts up to the middle of 1900, when he returned to duty in India. For his services Nicholson was promoted Major-General at the age of 55. The following year, 1901, after Lord Roberts had been appointed C.-in-C. in England, he brought Nicholson to London to take up the duty of Director-General of Mobilization and Intelligence at headquarters. This appointment was abruptly terminated by the Esher Committee at the beginning of 1904 and Nicholson was sent as Chief Military Attaché to the Japanese Army during the Russo-Japanese War. At the end of 1905, after Nicholson had declined a command in the Mediterranean, he was brought into the War Office again as Quartermaster-General and third Military Member of the Army Council, and in 1908, at the age of 63, was appointed Chief of the General Staff and First Military Member which he held till 1912 and was promoted G.C.B. The status of this appointment was altered later to that of Chief of the Imperial General Staff. In this capacity he contributed very materially to the organization of the British Expeditionary Force and had the complete confidence, not only of Mr. Haldane, the Secretary of State for War, but of the Government. He was advanced to the rank of Field-Marshal in 1911 and on retirement in 1912, at the age of 67, was appointed to the Peerage with the title of Lord Nicholson of Roundhay.

In 1912 he was Chairman of a Committee on the expenditure of the Indian Army and was made a member of the Committee of Imperial Defence. In 1916 he became Colonel Commandant R.E. He died in September, 1918, at the age of 73.

A memoir written by Major-General Scott Moncrieff appeared in the *R.E. Journal* for December, 1918, in which the writer sums up Nicholson's career as follows :—

" He never commanded even a small unit in peace or war, yet he rose to be a Field-Marshal ; he never graduated at the Staff College, yet he rose to be the Chief of the Imperial General Staff ; the greater part of his Army service was in India, yet when he came to serve at home his influence at once became felt. He had in a most remarkable degree the gift of clear perception of the ultimate aim and relative importance of every subject he handled and the consummate skill with which he expressed his views and the strength with which he insisted on their adoption commanded the respect of those associated with him in his life's work."

Colonel Sir Charles M. Watson, K.C.M.G., C.B.

Charles Moore Watson was born in Dublin in 1844 and educated at Trinity College, where he took his degree as B.A. in 1865. He entered Woolwich in 1863 as head of his batch and retained his position for two years, receiving the Pollock Medal. He was commissioned in 1866. After a few years at Cork Harbour he joined the 4th Company at Chatham just after the company had been allotted to the Submarine Mining Service. In 1872 with a detachment of this company he was sent to Woolwich to receive and inspect the first supply of Submarine Mining Stores, where he organized the branch which developed later under the I.R.E.S. In 1874 Watson joined Gordon in his work in the Sudan, but was invalided the next year, much to his disappointment as he had established a close friendship with Gordon, which endured till the death of the latter at Khartoum. In 1877 Watson was A.D.C. to Sir Lintorn Simmons, the I.G.F., and in 1880 he passed the final examination for the Staff College. On the outbreak of the Egyptian campaign, 1882, Watson joined the Intelligence Service and was attached to the Cavalry Brigade with which he served in the battle at Tel-el-Kebir and then accompanied the brigade in their ride to Cairo, where Watson personally received the surrender of the Citadel ; for his services he received a Brevet Majority. He returned to Egypt as Surveyor General in 1883 and remained in Cairo during the attempt to relieve Gordon, with whom Watson was in communication up to the end. In 1886 Watson was for some months the Governor General

of the Red Sea Littoral. Reverting to British service in 1887, he joined at Chatham for charge of the Balloon Detachment and School. In 1889 he joined the Barrack branch of the War Office for work in connexion with Barrack Loans and remained there till his retirement in 1902, having been successively A.I.G.F. and D.I.G.F. He was promoted Colonel in 1896 and was given the C.B. in 1902. He was appointed Secretary of the Royal Commission for the Exhibition at St. Louis in 1903 and created K.C.M.G. for his services.

He was a Fellow of the Royal Geographical Society from 1875 and served on their Council in 1893 and 1912. He was a member of the Committee of the Palestine Exploration Fund in 1890 and was Chairman from 1905 till his death in 1916. During his service he always took the keenest interest in Corps affairs, served on the Council of the Institution and contributed articles to the *Journal*, and was a busy writer on general affairs, especially on Egypt and Palestine.

In 1906 he undertook the writing of Volume III of the Corps *History* which was published in 1915.

A memoir was published in the *R.E. Journal* of June, 1916.

Colonel Sir Herbert Jekyll, K.C.M.G.

Herbert Jekyll was the son of Captain E. J. H. Jekyll of the Grenadier Guards. He was born in 1846 and commissioned in the R.E. in 1866 and on completion of instruction at the S.M.E., joined the little group of officers who were starting the Submarine Mining branch of the R.E. In 1870 he was transferred to the 22nd Company for work on the Post Office Telegraphs and in 1873 he was selected to command the Telegraph Detachment for the Ashanti campaign of 1873–4, returning on the completion of the campaign to work with the Post Office. In 1876 he became Private Secretary to the Earl of Carnarvon, then Secretary of State for the Colonies, and when the latter was appointed President of a Commission to report on the defences of British possessions and commerce abroad, Jekyll became Secretary of the Commission which finally reported in 1882. He then joined the War Office as one of the group of younger officers formed by Sir Andrew Clarke to carry out the new schemes of fortification. Jekyll designed the original defences of Singapore and was the first Secretary to the Colonial Defence Committee when it was re-formed in 1885, and in 1886 he was Secretary to the R.A. and R.E. Works Committee.

In 1885 Jekyll was for a short time Private Secretary to Lord

Carnarvon when the latter was Lord Lieutenant of Ireland and, from 1892 to 1895, he was again Secretary to another Lord Lieutenant—Lord Houghton. From 1895 to 1897 he returned to military duty as C.R.E. Cork District, reaching the rank of Colonel in 1896. He was then appointed Secretary to the Royal Commission for the Paris Exhibition of 1900, for which he was created K.C.M.G. in 1901. In July of that year he retired from the Army to take up an appointment under the Civil Service as Assistant Secretary to the Railway Department of the Board of Trade, when he served on important Committees dealing with light railways, electrical standardization and canals. From 1907 he was the first chief of the London Traffic branch, until his retirement in 1911. During this time he prepared valuable reports on London traffic, following the introduction of motor transport, and made a comprehensive scheme for new roads and improvements to existing roads, which formed the basis of much of the roadwork carried out after the Great War.

During the 1914–18 War he concentrated on work for the Order of St. John of Jerusalem, of which he was Secretary-General for ten years and Chancellor from 1911 to 1918. He died in 1933.

A memoir was published in the *R.E. Journal* of March, 1933.

General Sir Edward P. Leach, V.C., K.C.B., K.C.V.O.

Edward Pemberton Leach was the second son of Lieut.-Colonel Sir George Leach, K.C.B., late R.E., and was commissioned in 1866. In 1868 he went to India where he served with the Bengal Sappers and Miners and in the Public Works Department. Later he joined the Indian Survey and was employed on survey work with the Lushai expedition and under Holdich in Central India. In 1878 he was again employed on survey work on active service and during a reconnaissance into the Shinwari country his party was attacked by a large body of natives. The other officer with him was wounded and to enable him to be brought back, Leach, at the head of his party, attacked the enemy and, in hand-to-hand fighting, shot four of the enemy with his own rifle and, though wounded in the arm, was successful in covering the retirement; for this gallant action he received the V.C. and the following year was given a Brevet Majority. In 1880 he was with the force sent from Kandahar to cover the retreat of the British force which was broken at Maiwand, and during the confused retreat which followed was indefatigible in checking the advance of the enemy and in bringing in wounded;

for this he received the Brevet of Lieut.-Colonel. In 1882 he reverted to Home Service and took command of the 24th Company at Shorncliffe. In 1885 he took this company on active service with Sir Gerald Graham's force at Suakin, where it was present in the action at Tofrek when the British working parties were rushed by the Arabs. For his services in this campaign, Leach received the C.B., and later commanded brigades at Korosko and Assuan. After service on the Regimental list at Plymouth and Halifax, he was promoted Major-General in 1897 at the age of 50. In 1899 he was G.O.C., Belfast, and from 1903 to 1907 he was G.O.C., Scottish Command, during which time he was promoted Lieut.-General in 1905 and created K.C.V.O. and K.C.B. He was promoted General in 1911 and retired in 1912. He died in 1912, a few months before the death of his father.

A memoir was published in the *R.E. Journal* in November, 1913.

Lieut.-General Sir Henry H. Settle, K.C.B., D.S.O.
Colonel Commandant, R.E.

Henry Hamilton Settle was educated at Cheltenham and was commissioned in the R.E. in 1867. He first saw active service in the Sudan campaign of 1884–5 as D.A.A. and Q.M.G. at Gemai, where the whalers started for their voyage up the Nile. He received the Brevet of Major. From 1886 to 1892 he served with the Egyptian Army, taking part as Chief Staff Officer in the operations outside Suakin in 1888, under Major-General Grenfell, and in the further operations in 1891. For his services Settle received the D.S.O. and was made Brevet Lieut.-Colonel. In 1892 he became Inspector-General of the Egyptian Police. He was made Brevet Colonel in 1893 and in 1895 joined the War Office as A.I.G.F. (Barracks), where he remained till 1899, when he was appointed Colonel on the Staff and C.R.E. Malta. In October of the same year he was ordered to South Africa as Inspector-General of Communications and served throughout the war. He was given the command of Cape Colony in 1901 and was promoted Major-General for distinguished service in the field, and was created a K.C.B. In 1905 he was G.O.C. Southern Coast Defences at Portsmouth, which he held till he was promoted Lieut.-General in 1908. He retired in 1911 and was made Colonel Commandant in 1921. He died in 1923, aged 71.

A memoir was published in the *R.E. Journal* of June, 1923.

Lieut.-General G. Henry, C.B.
Colonel Commandant, R.E.

George Henry was commissioned in the Corps on 8th January, 1868. After his Chatham courses, he went to India to the Madras Presidency, where he served at first with the Madras Sappers and Miners, of which he was adjutant in 1873. In 1874 he became Assistant Garrison Instructor, Bangalore, and Garrison Instructor there in 1876. He was on leave at the beginning of the Second Afghan War, but saw service in it in 1880 as Assistant Field Engineer on the Khyber line. In 1881 and 1882 he was with the Madras Sappers and Miners at Bangalore, and in 1883 till 1885 was D.A.Q.M.G., Western District, at Bellary. In 1886 he went to Burma, first as A.Q.M.G. of the British Burma Division at Rangoon, and from April to November as D.A. & Q.M.G. with the Expeditionary Force. He returned to India at the end of 1886 as D.A.Q.M.G., Nagpur Force, and in 1887 and 1888 was D.A.Q.M.G., Southern District. In 1889 he was again with the Madras Sappers and Miners at Bangalore, but in September went to Burma as C.R.E. till June, 1890, during which time he took part in the Chin-Lushai Expedition of 1889–90. He next was Executive Engineer, Military Works Department, Ambala, till 1893, and in 1894 he returned to Staff work, holding appointments as A.A.G., Quetta, 1894–5; A.Q.M.G. at Army Headquarters 1895–7; D.A.G., Bengal Command, 1897–9; Commander, Allahabad District, 1899–1900, and D.A.G. Madras Command in 1900. In October, 1900, he became Quartermaster-General in India, and from 1903 to 1908, G.O.C. Meerut District. During this period he acted, from July, 1906, to May, 1907, as G.O.C., Eastern Command. He retired in November, 1908, with the rank of Lieut.-General.

He was made a C.B. in 1903, and appointed Colonel Commandant of the Corps in 1916.

He died on 19th November, 1922.

Colonel Lord Sydenham of Combe, G.C.S.I., G.C.M.G., G.C.I.E., G.B.E., F.R.S.

George Sydenham Clarke was born in 1848 and was commissioned in the Corps in 1868. From 1871 to 1880 he was Instructor in Practical Geometry and Engineering Drawing at the Indian Engineering College at Cooper's Hill. After service at Bermuda and

Gibraltar he was sent to Egypt in 1882, where he made a special report on the effect of the bombardment of Alexandria. At the end of the year he joined the staff of the I.G.F. at the War Office, but was detached in 1885 for the campaign at Suakin as a Special Service Officer. From 1885 to 1892 he was Secretary to the Colonial Defence Committee and took a prominent part in the design of defences for our coaling stations; on vacating this appointment he was created K.C.M.G. After two years' service at Malta as a Lieut.-Colonel, he was made Superintendent of the Carriage Department at the Royal Arsenal, Woolwich, which he held till he was appointed Governor of Victoria in 1901. In 1903 he was brought home to become a member of Lord Esher's Committee on the reorganization of the Army; on the conclusion of this he became Secretary of the Committee of Imperial Defence, which had been reorganized and enlarged. He retired from the Army as a Colonel in 1905 and was promoted G.C.M.G.

In 1907 he was made Governor of the Bombay Presidency, during which he had to repress serious riots in Bombay City. He was created G.C.I.E. in 1907 and G.C.S.I. in 1911 and on leaving India was created Baron Sydenham of Combe.

During the Great War he was Chairman of the Central Appeal Committee and served for a short time on the Air Board. He was created G.B.E. in 1917.

Throughout his life he was a prolific writer on military subjects and had for some years a semi-official position on *The Times*, but his advanced ideas did not always find favour with the heads of the War Office. In the House of Lords he made many able speeches, particularly on Indian Administration. He died in 1933.

A memoir was published in the *R.E. Journal* of June, 1933.

Major Sir Henry Pilkington, K.C.B.

Henry Pilkington was commissioned in the Corps in 1869. After four years' service at Devonport, he entered the Staff College for the full two-year period. In 1877 he was transferred to India, serving till 1882 in the Railway Department, Bombay.

In 1883 he returned home and was appointed the Assistant Inspector of Works at the Royal Arsenal. In 1886 he was lent to the Admiralty as Superintending Engineer, Chatham Dockyard, and in 1890 became Director of Engineering at the Admiralty, which appointment he held till December, 1894. He retired in December

of that year with the rank of Major, to take up a new appointment under the Admiralty as Engineer-in-Chief, Naval Loan Works, which he retained till 1905. During this period he was responsible for large extensions at all our principal Dockyards at home and abroad. He received the C.B. in 1895 and was promoted K.C.B. in 1902. He died in 1930.

This notice was compiled from the *R.E. Journal.*

General Sir Reginald C. Hart, V.C., G.C.B., K.C.V.O.
Colonel Commandant, R.E.

Reginald Clare Hart was the son of Lieut.-General H. G. Hart and was born in 1848. Educated at Marlborough and Cheltenham, he was commissioned in the R.E. in January, 1869. Electing for Indian service, he was Assistant Garrison Instructor in the Bengal Command from 1874 to 1878 and in 1879 took part in the second Afghan War, during which he received the V.C. for a gallant rescue of a wounded sowar. In 1880 he passed the final examination of the Staff College and, after service in West Africa, received a Brevet Majority in January, 1882. In the Egyptian campaign of 1882 he was A.D.C. to Major-General Graham and received the Brevet of Lieut.-Colonel. In 1885 he resumed duty as Garrison Instructor, Bengal Command, and in 1886 became Colonel by Brevet at the age of 38. In 1889 he was made Director of Military Education in India with the substantive rank of Colonel. In 1896 he was given the command of the Belgaum District with the rank of Brigadier-General and in 1897 he commanded the 1st Brigade in the Tirah Expedition. After further service on the N.W. Frontier, he was promoted Major-General in 1902 and appointed Commandant S.M.E. and G.O.C., Thames Defences. In 1907 he was G.O.C., Cape Colony, leaving this appointment on promotion to Lieut.-General in 1908, but returned to the Cape in 1911 as G.O.C., South Africa, which he held till the garrison was reduced in June, 1914, when he was promoted General. During the Great War he was Lieut.-Governor and C.-in-C. Guernsey and Alderney, and finally retired in 1918 on reaching 70 years of age. He was created K.C.B. in 1898 and K.C.V.O. in 1904, when he received H.M. King Edward VII at Chatham, on the latter's assumption of the appointment of Colonel-in-Chief of the Corps. In 1931 he was promoted G.C.B. He was made Colonel Commandant R.E. in 1922.

As a young man, before he joined the Corps, he was given the silver medal of the Royal Humane Society for rescuing a Frenchman at the entrance to Boulogne Harbour in a rough sea and in 1884, in India, earned a clasp to his silver medal for the rescue of a man in a dangerous river on the frontier. He died in 1931.

A memoir was published in the *R.E. Journal* in March, 1932.

Major Sir Hanbury Brown, K.C.M.G.

Robert Hanbury Brown was born in 1849 and educated at Marlborough College. He was commissioned in the Royal Engineers in 1870. He went to India in 1872 and was posted to the Irrigation branch of the Bengal Public Works Department, where he worked until 1884. He was called out for military duty in the Afghan campaigns of 1878-80 and was twice Mentioned in Despatches. In 1884 he was lent to the Egyptian Government in connexion with the irrigation works of the Nile and remained in that service for nearly twenty years, working first under Sir Colin Scott-Moncrieff and later becoming Inspector-General of Irrigation for some years before he retired in 1903. He had retired from the Corps as a Major in 1893 and was created K.C.M.G. for his services in Egypt in 1902. He was elected a member of the Institution of Civil Engineers in 1904 and received the Telford Medal in that year for a paper on "The Use of Cement Grout at the Delta Barrage." He died in 1926.

A memoir was published in the *R.E. Journal* of September, 1926.

Lieut.-General Sir Herbert C. Chermside, G.C.M.G., C.B.
Colonel Commandant, R.E.

Herbert Charles Chermside was born near Salisbury in 1850. Educated at Eton, he passed in and out of Woolwich top of his batch and was commissioned in the R.E. in 1870. After an exciting trip to Paris and a long leave of five months as photographer to an Arctic expedition, he joined the Submarine Mining Service in 1873 and worked in this branch at Chatham, Portsmouth and Devonport. In 1876 he was ordered to Turkey to take part in the series of British Commissions in the Near East, which were engaged in defining the areas of the Balkan States, and in 1879 he joined the staff of Sir Charles Wilson, R.E., in Anatolia.

In 1882 Chermside was appointed D.A. & Q.M.G. for Intelligence

with the force in Egypt and later served with the Egyptian Army, in command of a battalion which he led in the expedition to Suakin in 1884. In this year he was appointed Governor-General of the Red Sea Littoral, when he had the duty of assisting in the withdrawal of the Egyptian garrisons from the Red Sea and Somaliland. In 1886 Chermside was transferred to command the troops at Wadi Halfa where he was able to check the northward advance of the invaders. In 1887 he returned to his Consular duties and as Military Attaché at Constantinople. In 1896 he was British Commissioner at Crete and Colonel on the Staff Commanding the British troops in that island; for his services he was given the K.C.M.G. and promoted Major-General. On arrival home he was given the command of the troops at the Curragh, but a few months later was ordered to South Africa where he commanded the 3rd Division, with which he took part in various operations, returning to England early in 1901. In 1902 he was appointed Governor of Queensland, which he resigned in 1904. He retired from the Army in 1907 with the rank of Lieut.-General, the G.C.M.G. and the C.B. He was appointed Colonel Commandant R.E. in 1916. He died in 1929.

A memoir was published in the *R.E. Journal* in June, 1930.

Major P. Cardew

Philip Cardew was the grandson of Captain H. Cardew, of the Royal Engineers, and his father served some years in the 74th Highlanders. He was born in 1851 and passed first into and out of the Royal Military Academy at the head of his batch, leaving in 1871 with the Pollock Medal and Sword of Honour. After service at Bermuda where he was in charge of the military telegraphs, he joined the Submarine Mining Service in 1876 and in 1878 became the Assistant Instructor in Submarine Mining and Telegraphy at the S.M.E.

Some account of Cardew's work has been given in Volume II, Part II, Chapter IV. In 1878 the whole science of electricity was still in its infancy, there were no accurate measuring instruments, while the arc lamp, though known, was not used outside the laboratory. Cardew developed a genius for invention and many of his instruments obtained world-wide fame, especially his hot-wire voltmeter and his vibrating sounder. He was in charge of the Telegraph School in 1883, as Instructor in Electricity. In 1888 he succeeded Colonel Armstrong as Electrical Adviser to the Board of

Trade. This ended his military service, though he remained on the strength of the Corps till he retired as a Major in 1894. Cardew's work at the Board of Trade was vital to the future of the electrical industry. One of his first duties was to sit with a brother officer, Major Marindin, on a long inquiry into various proposals for the electric lighting of London and, at its conclusion, to draw up a set of regulations concerning the supply of electricity for power and light. These proved very successful.

Cardew retired from the Government service in 1898 to enter into partnership with Sir William Preece, formerly Engineer of the Post Office, and in 1902 he joined the Board of the London, Brighton and South Coast Railway. He served on the Council of the Institution of Electrical Engineers for many years and was a Vice-President 1901–2. He died in 1910 at the early age of 59.

Cardew was a keen yachtsman and took a leading part in the selection and purchase of the *Buccaneer* in 1885 and the following year acted as her Skipper when she won her first ocean race from Port Victoria to Ostend.

In his early Submarine Mining days he jumped overboard fully clothed to help a Sapper who had fallen into the sea in the strong tide off Sheerness. Both were rescued just in time.

A notice was published in the *R.E. Journal* in October, 1910.

Colonel Sir Henry E. McCallum, G.C.M.G.

Henry Edward McCallum was the eldest son of Major H. A. McCallum, R.M.L.I., he was commissioned in the R.E. in 1871, winning the Pollock medal at Woolwich and the Fowke Medal at the S.M.E. In 1875, after a short time at the War Office, he was selected as Private Secretary by Sir William Jervois, on the latter's appointment as Governor of the Straits Settlements; McCallum took part in the Perak War of 1876 and after three years of Corps work at Hong Kong, Singapore and Woolwich, returned to Singapore as Deputy Colonial Engineer in 1880. He was appointed Colonial Engineer in 1884 and remained in this post till 1897, becoming a member of the Legislative and Executive Councils and Commandant of the Singapore Volunteer Artillery. During this period he carried out, on behalf of the War Office, a revision of the defences of Singapore and received the C.M.G.

In 1897 he was appointed Governor of Lagos, at a time when important discussions were in progress with the French about the

occupation of the hinterland. For the successful conclusion of these negotiations he was promoted K.C.M.G., but his health failing, he was appointed Governor of Newfoundland in 1898 and the same year was made A.D.C. to the Queen. In 1901 he was Governor of Natal, where he had to carry out the settlement of the Colony at the end of the Boer War, which involved the addition of 9,000 square miles to the area under his control. He also dealt successfully with a period of unrest among the natives. He was promoted G.C.M.G. in 1906, and was appointed Governor of Ceylon, where he interested himself in the improvement of railways, roads and agriculture. He also developed the harbour of Colombo. He remained on the Active list of the Army until he retired in 1909 with the rank of Colonel. He died in 1919.

A memoir was published in the *R.E. Journal* in March, 1920.

Major Sir Maurice A. Cameron, K.C.M.G.

Maurice Alexander Cameron was the son of Lieut.-Colonel Alexander Cameron of the 42nd Royal Highlanders (Black Watch). He was born in 1855 and educated at Wellington College, passing first into Woolwich where he gained the Pollock Medal and Sword of Honour. He was commissioned in the R.E. in 1875. He joined the Submarine Mining Service in 1877 and in 1879 edited the first Manual of Submarine Mining. After service at Malta and Trincomalee, he was ordered to Singapore in 1883, where he was the only Sapper officer. Later in that year he was appointed Deputy Colonial Engineer and Surveyor-General at Penang where he served till 1892, but this period was broken by his recall to Singapore for the Russian war scare of 1887, and he then acted for a year as Colonial Engineer at Singapore. In 1894 he accepted the appointment in London as third Crown Agent for the Colonies and remained with this branch of the Government service till 1920, when he had become the first Crown Agent. He retired from the Active list as a Major in 1897 and died in 1936. For his service under the Colonial Office he received the C.M.G. in 1900 and was promoted K.C.M.G. in 1914. He was a keen yachtsman and in 1921 served on the Committee of the National Lifeboat Association, of which he was Vice-President in 1933.

The above is compiled from the *R.E. Journal* and from a notice in *The Times* of 18th May, 1936.

MAJOR-GENERAL SIR. J. RONALD L. MACDONALD, K.C.I.E., C.B., LL.D.

Colonel Commandant, R.E.

James Ronald Leslie Macdonald was the eldest son of Surgeon Major James Macdonald. He was born in 1862 and educated at Aberdeen University, whence he passed first into Woolwich. He was commissioned in the R.E. in 1882, taking the Pollock Medal and Sword as well as most of the prizes. Electing for Indian service he was employed on the Harnai railway in Baluchistan. In 1888 he served in the Hazara Expedition and was Mentioned in Despatches. He was then employed at Simla on fortification plans for the N.W. Frontier and in 1890 and 1891 was engaged in a railway survey up the gorge of the Kabul River and in the Zhob Valley. In 1891 he accepted the appointment of Chief Engineer of a railway survey from Mombasa to Lake Victoria. His work on this survey and in a subsequent expedition to East Africa in 1897 are described in Chapter VI of this volume. Macdonald was instrumental in preserving Uganda for the Empire and, in addition to two medals for campaigns he conducted, received the Brevets of Major and Lieut.-Colonel and the C.B. On return to England he was put in charge of the Balloon Factory at Aldershot and after dispatching three Balloon Sections to South Africa, was himself sent in charge of a Balloon Section to take part in the Boxer Campaign. He was appointed Director of Railways in North China at the end of this campaign, as described in Chapter VII of this volume. On return to India he was selected in 1903 to command the escort for a Political Mission to Tibet, but the Tibetans resisted and a difficult campaign ensued, carried out under great physical difficulties. The number of troops engaged reached 25,000 and Macdonald was successful in forcing an entry into Lhasa, where a treaty was signed, and in the safe withdrawal of the force to India. For his services Macdonald was created K.C.I.E. In 1905 he was given the command of the Presidency Brigade, being transferred to Lucknow in 1907. He was promoted to Major-General in 1908, at the early age of 46, and from 1909 to 1912 he was in command of the troops at Mauritius. Here his health, which had been undermined by his arduous labours in Uganda and Tibet, finally broke down, so he resigned his appointment and the following year retired from the Army. During the Great War he tried to rejoin the Army, but could not pass a Medical

Board so had to be content with serving on the Emergency Committee of the Aberdeen District. Macdonald was regarded by his contemporaries as one of the most reliable and most brilliant officers of his generation. He died in 1927.

A memoir was published in the *R. E. Journal* of September, 1927.

Major Sir John E. Clauson, K.C.M.G., C.V.O.

John Eugene Clauson was educated at Clifton College and was commissioned in 1885. His first employment was with the 38th Field Company and the Bridging Battalion at Aldershot. After two years in Malta, he passed into the Staff College (first place) in 1892, where he remained for two years. In 1895 he joined the mobilization branch of the War Office and in 1899 was appointed Secretary, Colonial Defence Committee, which he held till 1906. In this year he retired from the active list with the rank of Major and accepted an appointment under the Colonial Office as Chief Secretary to the Government of Cyprus. Five years later he was made Lieut.-Governor and Chief Secretary, Malta, and in 1915 returned to Cyprus as High Commissioner and Commander-in-Chief, when he was promoted to K.C.M.G. He held this appointment till his early death in 1918 at the age of 52. He received the C.V.O. from King George V when the latter visited Malta in 1912. Clauson was a B.A. London (Hons.) in 1887 and was admitted to the Inner Temple in 1897.

The above is based on a notice in *The Times* of 3rd January, 1919.

Captain M. R. Kennedy, C.M.G., D.S.O.

Macdougall Ralston Kennedy was educated at Edinburgh Academy and commissioned in the R.E. in 1893. In 1898 he was employed in Crete on temporary duty with a detachment of the 24th Company and in 1899 he was transferred to the Egyptian Army, taking part in the operations in the Sudan of that year. He remained in the Sudan in the Department of the Director of Works, Khartoum, till 1918. In 1909 the Military and Civil Works Department were separated and Kennedy was made Director of Public Works. In this capacity he was responsible for the rebuilding of Khartoum. He was the first to point out, in 1904, the deficiencies of Suakin as the main port of the Sudan, and it was at his suggestion that, in the following year, Port Sudan, a harbour about thirty miles

north of Suakin, was selected. Kennedy prepared the original schemes and estimates for the layout of the new port. He received the C.M.G. in 1912. His work in Egypt was interrupted in 1915, when he was employed at Gallipoli in charge of the engineer work on the Lines of Communications. His early death occurred in 1924 at the age of 50.

This notice is based on the information in *The Royal Engineers in Egypt and the Sudan* and on a notice in *The Times* of the 27th November, 1924.

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Note.—The rank shown against a person's name is, generally speaking, the highest rank mentioned in this work, not necessarily the highest attained.