



THE MILITARY ENGINEER IN INDIA.

VOLUME I.



FIELD-MARSHAL LORD NAPIER OF MAGDALA, G.C.B., G.C.S.I.

THE
MILITARY ENGINEER
IN INDIA.

BY

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VOLUME I.

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To My COMRADES
OF
THE CORPS
OF
ROYAL ENGINEERS.

FOREWORD.

WHEN I happen to think of it, I always congratulate myself on my good fortune in that my service of thirty-two happy years in India included nearly all the "seventies" of the nineteenth century, when I was privileged to see a great deal of the British Government of India at the zenith of its success.

India, then and since, as never before in its history, enjoyed good and honest government with the best administration of justice that has ever been arrived at in this imperfect world. There was order and contentment everywhere from Cape Comorin to the farthest land frontiers in the north; and throughout this vast territory, peace and prosperity reigned. So we who were proudly taking part in maintaining the British Raj at that time saw every reason to regard it as a glorious and splendid success, likely to survive for many generations.

Now in the establishment of this glorious and splendid state of things, the men who directed and carried out the engineering works, defensive and other, in the early days of the East India Company, and their successors who gradually created and carried on the great Public Works Department of India in later times, had no small share. And these were the same Military Engineers and Corps of Military Engineers afterwards, whose names, titles and achievements are recorded by my friend and comrade, Lieut.-Colonel Sandes, in this book; inasmuch as in their time they were the only Engineers in British India, and did all the Engineering work there.

The Corps of Military Engineers that I have referred to were the famous Bengal, Madras, and Bombay Engineers, which were established in the middle of the eighteenth century and carried on all the engineering work in British India for more than a hundred years, creating in that time the great Public Works Department of India, completing a vast number of engineering works in all departments, and so contributing most importantly to the success of our rule in India, which began after we occupied Delhi in 1803.

These three distinguished Corps were amalgamated with the Royal Engineers in April, 1862, which Corps had begun to send officers to India in 1860. At that time also, owing to the great expansion of Civil Engineering work in India, and to the rise of the Civil Engineering profession, the Public Works Department began to be largely recruited with Civil Engineers; while in 1881 the Military Works Department was transferred from it to the Military Department. So at present the Royal Engineers furnish Officers for the Military Engineer Services in India, Officers and Warrant and N.C. Officers for

the three Corps of Sappers and Miners, and a few Officers and other ranks for other branches of the Indian public service.

Colonel Sandes gives in this book most complete details of all these matters, and also of the war services of the Military Engineers in India and on expeditions out of India, together with very judicious remarks on various Indian military subjects. He also gives very interesting information about the three Sapper Corps from their origins, about the beginning of the nineteenth century, until the present day, when they enjoy long-established reputations for efficiency in every respect.

I venture to think that the great majority of people who read this book, which Colonel Sandes has written after most extensive and laborious research and investigation, will learn a vast deal that they did not know before about the British connection with and position in India ; and accordingly I commend it to the notice of all who desire to increase their knowledge of the truth about that most interesting sub-continent.

BINDON BLOOD.

2nd November, 1932.

PREFACE.

WHEN Major-General Whitworth Porter, late R.E., wrote the Preface of his Volume I of the *History of the Corps of Royal Engineers* in 1889, he remarked that he had intended, when he first began his task, to have included the Indian branch of the Corps, but he found that its records were so numerous and full of picturesque interest that it demanded separate treatment. "The history of the Indian Engineers," said he, "remains to be written, and a valuable and interesting record it will prove. It is to be hoped that before long some member of that service will supply the void. The names of two men, pre-eminently qualified for the task, naturally suggest themselves—Lieutenant-General George Chesney and Colonel Henry Yule. In the hands of either of these, full justice would be done to a most attractive subject." Again, the author of Volume III, Colonel Sir Charles M. Watson, K.C.M.G., C.B., M.A., late R.E., wrote in July, 1914: "The work done by the Royal Engineers in India and the countries connected with it during the period 1886-1912 has been so important that it is hoped that a separate volume dealing with it may some day be published by the Royal Engineers' Institute; but it will have to be written by an officer who has served in India and is personally acquainted with the civil and military duties of the Corps in that part of the British Empire."

General Sir George Chesney, K.C.B., C.S.I., C.I.E., died in 1895, Colonel Sir Henry Yule, K.C.S.I., C.B., in 1899, and Colonel Sir Charles Watson, K.C.M.G., C.B., in March, 1915, within eight months of completing Volume III of the Corps History, and for many years the project remained in abeyance during the Great War and the difficult times which followed it. It was revived, however, in 1929, when I was greatly honoured by an invitation from the Institution of Royal Engineers to undertake the task, the magnitude of which I could not then foresee. While still in India, where I had served in military and civil employment for 28 years, I began to collect all possible information; and in June, 1930, in England, I wrote the first words of this volume, the completion of which has taken more than two and a half years.

The activities of military engineers in India having been equally conspicuous in military and civil engineering, it seemed advisable to deal with military and civil work in separate volumes. My plan was to devote Volume I to a history of the achievements of British Military Engineers and Indian Sappers and Miners in fortification and war, and to describe in Volume II the work of the former in the various

civil departments of the Government of India, such as Irrigation, Roads and Buildings, Railways, Telegraphs, Mints, Education and Survey. Volume I, accordingly, is purely military in nature. The field of three centuries which it covers is so enormous that it has been necessary to omit a number of entertaining episodes and adventures in the lives of the military engineers of the earliest times. The demands of compression are inexorable, but many personal touches are still to be found in the narrative.

The spelling of the names of places and persons in India has always been a matter of controversy. The "Hunterian System," under which Lucknow becomes Lakhnau, and Cawnpore appears as Khanpur, has such obvious drawbacks that I have adopted as far as possible the spelling given in the *Imperial Gazetteer of India* which is reasonable and modern. No separate bibliography is included, as the titles of the hundreds of historical works, despatches and records which I have consulted or studied are given in footnotes. A complete set of general maps will be found at the end of the volume.

In the course of my work I have received valuable and prompt assistance from a great number of Royal Engineer and other officers, for which I am deeply grateful. But my particular acknowledgments are due to General Sir Bindon Blood, G.C.B., G.C.V.O., the Representative Colonel Commandant of the Corps, who has written a Foreword to this volume and has shown unflinching interest in its progress; to Brigadier-General Sir James Edmonds, C.B., C.M.G. (late R.E.), to Sir William Foster, C.I.E., and to Lieut.-Colonel P. H. Kealy (R.E., retired), the Secretary of the Institution of Royal Engineers, who have read the typescript, chapter by chapter, and have offered most valuable suggestions. I desire also to thank the officials of the Military Secretary's Branch, the Records Department, and the Library of the India Office, and in particular, the Assistant Librarian, Dr. H. N. Randle, who has given me every facility in making use of the fine collection of historical works in his charge, without which this volume could never have been written.

Further acknowledgments are due to Lieut.-General Sir Fenton Aylmer, M.C., K.C.B., Major-General S. H. Sheppard, C.B., C.M.G., D.S.O., Brigadier-General P. T. Buston, C.B., C.M.G., D.S.O., Brigadier E. F. J. Hill, D.S.O., M.C., and Lieut.-Colonels E. P. Le Breton, D.L., J.P., and F. G. Drew, O.B.E., all retired or serving officers of the Corps, for copious notes of their personal experiences; and to Lieut.-General Sir George MacMunn, K.C.B., K.C.S.I., D.S.O., Major-General G. H. Addison, C.M.G., D.S.O. (Engineer-in-Chief, India), the Commandants of the three Corps of Sappers and Miners, Brigadier-General F. J. Moberly, C.B., C.S.I., D.S.O., Sir Evan Cotton, C.I.E., Colonel C. B. Thackeray, D.S.O. (late R.A.) and Major V. C. P. Hodson (I.A., retired) for useful information and advice. I have

received energetic help also from Mr. J. G. Scott, the Librarian of the Corps Library in Whitehall.

My aim has been to write a readable story rather than a precise and exhaustive (and perhaps exhausting) military record—a tale which may encourage and guide others in a more detailed research into the engineering history of the campaigns which I have outlined. The growth of British power in India has been due to those campaigns, supplemented by wise administration; and a goodly part of the foundation on which our Eastern Empire has been built is the work of the military engineers of India.

E. W. C. SANDES.

13th February, 1933.

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APPENDIX I.

THE MILITARY ENGINEER SERVICES.

The Military Engineer Services, whose evolution from the Public Works Department, first as the "Military Works Department" and later as the "Military Works Services," has been described briefly in Chapter XX, control all military engineering works in India and Burma except in a few small stations where these works are in charge of the Public Works Department. They control also all works of the Royal Air Force, and in addition they are in charge of all civil and military works, except railways and irrigation, in Baluchistan and the tribal areas of the North-West Frontier Province.¹

The organization of the Military Engineer Services is complicated but well adapted for its purpose. There are three branches—the Buildings and Roads, Electrical and Mechanical, and Furniture and Stores—and the basic formation, the unit as it were, is the Sub-division. Each Buildings and Roads Subdivision is under a Sub-divisional Officer (S.D.O.), who may be either a soldier or a civilian, and who is assisted by one or more civilian Overseers in charge of Sections. Where necessary, Subdivisions are formed in the Electrical and Mechanical or Furniture and Stores Branches. All Subdivisions are grouped into Divisions under Garrison Engineers,² who are usually assisted by one or more Assistant Garrison Engineers and a Technical Overseer. In large headquarter stations, a Garrison Engineer's staff may include officers or subordinates with special qualifications in Electrical and Mechanical or Furniture and Stores work. Divisions of the Military Engineer Services are grouped into Districts under Commanders, Royal Engineers,³ whose functions are both executive and administrative. Each Commander, Royal Engineers, is assisted, according to the size of his District, by Assistant Commanders, Royal Engineers⁴ (Works, and Electrical and Mechanical), and by a Technical Subdivisional Officer.⁵ The

¹ The raising of the status of the North-West Frontier Province to a Governor's province, and the subsequent reorganization of the Public Works Department, led to the handing over by the Military Engineer Services to the Public Works Department of all works in the settled districts as distinct from the tribal areas. This came into effect on April 1st, 1933.

² The Garrison Engineer (G.E.) corresponds approximately to the Executive Engineer in the Public Works Department. He is usually a Captain or subaltern of the Royal Engineers.

³ The C.R.E. corresponds approximately to the Superintending Engineer in the Public Works Department. He is usually a Lieut.-Colonel of the Royal Engineers.

⁴ Usually Majors of the Royal Engineers.

⁵ In special cases there may be also an Inspector of Royal Engineer Machinery or a Departmental Officer of the Electrical and Mechanical Branch.

organization in an Independent Brigade Area is a compromise between that of a District and a Division. The Districts, and Independent Brigade Area organizations, are grouped in the four military Commands of India—the Northern, Western, Eastern (including Burma) and Southern—those in each Command being under a Chief Engineer¹ and the whole organization under an Engineer-in-Chief.²

The officers of the Military Engineer Services consist of Royal Engineers, Royal Engineers (Indian Army),³ Inspectors of Royal Engineer Machinery, Departmental Officers promoted from among the Military Subordinates of the Indian Unattached List, and civilian Assistant Engineers appointed directly or promoted from among the Civilian Subordinates. Most of the officers, however, are Royal Engineers who may be required at any moment for mobilization and meanwhile are usefully and economically employed in the Military Engineer Services. Indians (civilians) are now being recruited in increasing numbers in the lower grades of the Services except in those branches in which the requirements of mobilization necessitate the maintenance of a strong military element. Military Subordinates for the Buildings and Roads Branch were formerly recruited from British units in India and were trained at the Thomason Civil Engineering College, Roorkee; but, owing to the closing of the military class at that college in July, 1924, these subordinates are now recruited from among the Military Foremen of Works in the United Kingdom. The Military Subordinates for the Electrical and Mechanical Branch are also recruited from the United Kingdom, but those for the Furniture and Stores Branch come from British units in India.

There are substantial differences between the systems of Military Works organization in England and India. In India, Royal Engineer officers are responsible for many duties which are performed in England by separate branches such as the Lands Branch and the R.A.S.C. Barrack Department. Again, in India, there is no grade corresponding to that of Surveyor of Works, nor is there any technical audit. The whole system of accounts in the Military Engineer Services has been changed since the Great War through the assumption by the Military Accounts Department of the duty of keeping and auditing these accounts under a new Account Code, and more of the time of the Royal Engineer officer in these Services is spent in the intricacies of finance than is the case in England.

In 1914 there were three categories of Royal Engineer officers on the India establishment, (i) those in the Military Works Services, (ii) those in the Sappers and Miners, and (iii) those in civil employment such as the Departments of Public Works, the Survey of India

¹ A Colonel (late R.E.) with the rank of Brigadier.

² A Major-General (late R.E.).

³ An establishment created during the Great War and now dying out.

and Railways. The senior Royal Engineer officer in India was called the Director-General of Military Works, and although he had an *ex-officio* position as Inspector of Sappers and Miners, his duties were actually confined almost entirely to the Military Works Services.¹ In 1921, however, his title was altered to "Director of Works" and he was placed under the Quartermaster-General. At the same time, an independent Inspector of Sappers and Miners and Pioneers was appointed. But two years later the system was changed again, and with this change came the first step towards real unity of control of all the Engineer services in India. The new organization, which was introduced on December 4th, 1923, placed all the Engineer services² under an Engineer-in-Chief directly responsible to the Commander-in-Chief, and included the affiliation of the four Corps of Pioneers³ for technical training in peace and for employment in war. The Engineer-in-Chief became the technical adviser of the Commander-in-Chief on all military engineering matters through different departments of the General Staff, and he became also the Engineer Adviser to the Royal Air Force, Royal Indian Marine, Ordnance Department, and the Foreign and Political Department. He was assisted by two Deputy Engineers-in-Chief (Works, and Electrical and Mechanical), a Brigadier, R.E. (for Sappers and Miners and Pioneers), and other Staff officers.⁴ The Chief Engineers of Commands became similarly the technical advisers of the General Officers Commanding-in-Chief of the Commands. The system remains substantially the same to this day, but the Works Branch is now recognized as being definitely under the control of the Quartermaster-General.

A sound knowledge of all the main departments of engineering work, as carried out in India, is demanded of each Royal Engineer officer. This he obtains by attachment to, or service with, the Sappers and Miners, and by employment in the Military Engineer Services. The difficulty, and at the same time the interest, of the work in these Services is often enhanced by the fact that in some parts of India the Engineer has to begin by making his own bricks and felling his own trees. Work is generally done by contract; but there are many cases where daily labour is used, and sometimes, as in Waziristan and on the Kajuri Plain, large numbers of Sappers and Miners and Pioneers are employed. Many and varied have been the works executed by the Military Works and Military Engineer Services. In the "sixties" a new hill station was built at Chakrata on a site selected by Colonel Sir Frederick Roberts, *V.C.*⁵ This

¹ The D.G.M.W. had the right of direct access to the Commander-in-Chief.

² Three Corps of Sappers and Miners and the Military Engineer Services.

³ The Madras, Bombay, Sikh and Hazara Pioneers.

⁴ The appointment of Brigadier, R.E., was abolished in 1932 for reasons of economy.

⁵ Afterwards Lord Roberts of Kandahar. Lord Napier of Magdala, who was then Commander-in-Chief in India, did a great deal towards improving the accommodation for British troops and their families.

involved an approach road 77 miles long from Saharanpur, the nearest point on the railway. The road rises to a height of 7,100 feet above sea-level and has several large bridges. In the "nineties" a pipeline, 22 miles long, was laid to serve the hill station of Murree, descending at one point to a depth of 1,400 feet below its mean gradient, and so forming what is believed to be the deepest anti-syphon in the world. Another important work executed at this period was the preparation of defences around Attock, Rawalpindi and Quetta which, though now obsolete, were considered to be essential at that time.

Lord Kitchener's schemes for the reorganization of the Army in India from 1903 onwards entailed extensive building such as new lines for troops and vast additions to arsenals and ordnance factories. A new cantonment was built at Risalpur, close to Nowshera, many existing cantonments were greatly enlarged, and the electrification of British barracks and hospitals was begun. Up to this time almost all the buildings in the lines of Indian troops had been constructed and maintained under regimental arrangements from a "Hutting Grant"; but Lord Kitchener established the principle that, when a set of lines had to be built or rebuilt, the work was to be carried out by the Military Works Services.¹ In later years, when the transfer of the capital of India from Calcutta to Delhi was announced² and the building of New Delhi was begun, 15 square miles of land were acquired for a new cantonment at Delhi and the work was started in 1913. It was retarded by the Great War, but is now complete. These are a few only of the many activities of the Military Works Services before the cataclysm of 1914.

On the outbreak of the Great War the despatch of large numbers of Royal Engineer officers and Military Subordinates on active service overseas was counter-balanced to some extent by the engagement of temporary personnel. Many officers were detached for expeditions on the North-West Frontier. Schools of instruction, extensions to arsenals, depots of various kinds, temporary lines for Indian troops,³ and many other projects, were taken in hand. The cost of work rose, and materials (especially imported steelwork) became scarce.⁴ Thus the period of the Great War was one of extreme strain, and the Armistice did not ease the situation appreciably, for it was followed soon by the Third Afghan War and the campaign in Waziristan when demobilization was arrested and large temporary building schemes had to be continued. Officers came and went, and many were inexperienced.⁵ Then came the opening up of Waziristan by the great

¹ In 1919, the Hutting Grant was abolished, and *all* work, whether of construction or repair, was taken over by the Military Works Services.

² The transfer was sanctioned on December 12th, 1911.

³ Temporary accommodation was constructed for nearly half a million men.

⁴ The annual expenditure mounted to more than double the pre-war figure.

⁵ The Rawalpindi District had 13 officers in successive charge between May, 1918, and November, 1919.

Circular Road when the staff of the Military Engineer Services worked hand-in-glove with the Sappers and Miners and Pioneers. Throughout India there were immense arrears of building and repair work caused by the Great War, coupled with a scarcity of personnel and funds and much confusion in accounts.

Gradually the tangle was straightened out, and with the return of Royal Engineer officers from field service and the reorganization of the Engineer services under an Engineer-in-Chief, large permanent works were taken in hand once more. One of the most extensive was a mechanical transport depot at Chaklala near Rawalpindi, with barracks, workshops, garages and stores covering an area of several square miles, and with the usual ancillary services of water supply, electric light and power, roads and drainage.¹ In various parts of the country the Military Engineer Services prepared aerodromes for the Royal Air Force, made provision for the needs of the Royal Corps of Signals and the Royal Tank Corps, reconstructed the lines of Indian units, and electrified and drained cantonments. India now bears little sign of the confusion created by the Great War, but the result has been achieved at considerable cost. In 1872 the annual expenditure on original military works for the entire Bengal Army amounted to no more than 28 lakhs of rupees (about £280,000), and half as much on repairs. At the present time, however, these figures are sometimes exceeded in a single district. But the Army in India to-day is housed, watered and lighted on a scale which is very different from that of 1872. This has been the achievement of the Military Engineer Services, and it has been attained because these Services have been treated since 1900 as the normal regimental employment of Royal Engineer officers in India and have been plentifully supplied with them in times of peace.

¹ Two of the workshop buildings cover an area of five acres. They were built in 1922 at a cost of £180,000.

APPENDIX II.

QUEEN VICTORIA'S OWN MADRAS SAPPERS AND MINERS.

Remarks on the history and development of the Corps of Madras Sappers and Miners have appeared from time to time in this volume, but it may be well to recapitulate some of the main features. The Corps was raised at Madras in 1780 by Lieutenant Joseph Moorhouse as two companies of Pioneers. In 1793 it was increased to six companies and formed into a battalion known as the Madras Pioneer Battalion. This formation was expanded successively to eight, ten, fourteen and finally, in 1803, to sixteen companies, organized in two battalions and styled the 1st and 2nd Battalions of Madras Pioneers. The 1st Battalion became the Corps of Madras Sappers and Miners in 1831, and the 2nd Battalion was absorbed into that Corps two years later. In 1876 the Corps became the "Queen's Own Corps of Madras Sappers and Miners," in 1903 the "2nd Queen's Own Sappers and Miners," in 1911 the "2nd Queen Victoria's Own Sappers and Miners," and in 1923 it received its present designation. It is proposed in this appendix to deal only with some of the reorganizations and changes which have taken place in the Madras Corps during the present century.

In 1900 there were six Service Companies (Nos. 1 to 6), the Burma Service Company, and "A" and "B" Depot Companies. Each Service Company was organized in two half-companies, each of which was composed of two sections which were further divided into two sub-sections. The establishment of a Service Company was two British officers, two British other ranks, three Indian officers and 168 Indian other ranks.¹ "A" Company consisted of four Telegraph Sections, two Field Printing Sections and two Field Litho Sections. A reserve of 60 men had been formed in 1899, but it was still 23 under strength in 1901. Four Service Companies, and "A" and "B" Depot Companies, were normally stationed in Bangalore; one Service Company was at Secunderabad, another on the North-West Frontier, and the Burma Company at Mandalay.

The Corps was composed of various classes of Madrassis in proportions which were fixed by the Commandant, and the units and sub-units consisted, like the Corps, of mixed classes. In 1900 the proportions of the various castes and classes were as follows:—

¹ Four of the Service Companies had 18 first-line equipment mules and the necessary drivers, and by 1902 the two remaining Service Companies and the Burma Company were similarly equipped.

Indian Christians and Paraiyans (or Pariahs, now called Adi-Dravidians), 50% ; Tamil Hindus, 21% ; Telegu Hindus, 12½% ; Muhammadans, 12½% ; other castes, 4%. It has always been a tradition of the Madras Corps that in Service matters, caste should not be recognized. In this respect, the Madras Sapper and Miner differs not only from his brethren of Bengal and Bombay, but from the remainder of the Indian Army.

In 1903 the Service Companies were renumbered, Nos. 1 to 6 becoming Nos. 9 to 14 respectively. The Burma Company became No. 15, and "A" and "B" Depot Companies reappeared as "C" and "D." The establishment of the reserve was raised to 274 in 1904, and to 304 in 1908. The year 1909 was chiefly remarkable for the change of the title "Service Company" to "Field Company," and for the cessation of the enlistment of Recruit or Pension boys. The establishment of Recruit boys, which had existed since 1813,¹ provided the Corps with a valuable supply of recruits whose upbringing, nutrition and training had been closely supervised. It had the further advantage that recruits joined the Corps well drilled and with an elementary knowledge of some trade. Divisional Signal Companies of Sappers and Miners were formed in 1910, and two of these became part of the Madras Corps. The result was the end of "C" Company, for the Telegraph Section of that unit was then removed from the Corps and the remaining Sections (Printing and Litho) were transferred to "D" Company. The training of recruits for the new formations began in Bangalore in 1911. The only other change prior to the Great War which calls for special remark occurred in 1912 when the Indian Submarine Mining Section at Rangoon, which had been affiliated to the Corps in 1910, was abolished and replaced by a Defence Light Section.

The Great War caused an enormous increase in the strength of the Madras Corps. While on March 31st, 1914, there were 21 British officers, 25 Indian officers, 31 British Warrant and non-commissioned officers (R.E.) and 1,509 Indian other ranks, on March 3rd, 1919, the corresponding numbers were 144, 60, 85 and 7,019.² On August 4th, 1914, the Corps consisted of only seven Field Companies, one Field Park, two Photo-Litho Sections, two Printing Sections, one Depot Company and a Defence Light Section ; but on November 11th, 1918, it had three Field Troops, 19 Field Companies, one Bridging Train, a Chitral Section, and no less than 16 Depot Companies in addition to the Field Park and Specialist and Defence Light Sections as before.³ Of 295 officers who served with the Corps during the war, 59 were Royal Engineers (regulars), 56 held R.E. Territorial or

¹ The establishment was finally abolished in 1911.

² In 1914, 149 recruits passed to the ranks ; in 1918 the number was 3,494.

³ The Field Troops were Nos. 2, 3 and 8. The Field Companies were Nos. 9, 10, 11, 12, 13, 14, 15, 16, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70 and 94. The Bridging Train was No. 7 and from it No. 96 Field Company was raised in Mesopotamia. The units raised during the War were disbanded or abolished between 1919 and 1922.

Temporary Commissions, 14 were Indian Army officers, and 166 came from the Indian Army Reserve of Officers (I.A.R.O.). The Corps would have been in great straits for officers if it had not been supported so nobly by this reserve of civilians who were mostly engineers. As an indication of the improvisation necessary in 1914 it may be mentioned that both the Sappers and equipment of a Field Troop (No. 2), which was formed on September 10th of that year were carried in 30 *tongas*¹ obtained from the Gwalior Imperial Service troops, and it was not till 1917 that the unit was provided with horses.

During 1915, separate establishments of Indian other ranks were laid down for field service and for India; and three Depot Companies, which were finally expanded to 16, were formed at Bangalore, each of the strength of a Field Company and organized as such. Steps were taken also to augment the establishment of British Warrant and non-commissioned officers by enlisting skilled men in India for service in the Royal Engineers. No. 15 (Burma) Company was mobilized in Mandalay for service overseas in 1916, and three sections embarked at Rangoon for Mesopotamia on October 9th, leaving one section in Mandalay as a depot.² In 1917 a Bridging Train³ was formed at Bangalore; it embarked for Basra in December and received its equipment after its arrival in Mesopotamia. During the period of the Great War, recruits came forward in such large numbers that the demands of each successive increase in establishment were met easily; but there were always difficulties in producing efficient training staffs and proper equipment for the new units which were raised. These units were usually raised in Bangalore,⁴ and sent overseas—mostly to Mesopotamia—after a short period of training.

After the Great War, the reduction of the Corps and its reorganization on a new peace establishment were much delayed by the campaigns in Afghanistan, Waziristan, Mesopotamia⁵ and Malabar, and by some punitive expeditions in Burma, to all of which the Corps had to despatch units which in some cases were due for disbandment. As a result of the findings of several committees which assembled at Army Headquarters during 1920 and 1921, some new units were authorized for all three Corps of Sappers and Miners to bring their organization into closer agreement with that of the Royal Engineers at home. Army Troops Companies were formed in the Madras Corps from existing Field Companies, reduced to about half-strength, and Divisional Headquarter Companies were added. No. 15 (Burma) Company, the Mandalay Depot and the Rangoon Defence Light

¹ Two-wheeled pony carriages.

² The three sections took part in the advance on, and capture of, Baghdad in 1917. The depot was used subsequently to raise reinforcements and extra companies.

³ No. 7 Bridging Train, with an establishment of 118 Indian ranks and six followers.

⁴ They were raised from drafts from Depot Companies. An extra Depot Company ("C") was formed in 1917 to accommodate men returning from service overseas.

⁵ The Arab Insurrection (1920).

Section were removed from the Corps and became the "4th Burma Sappers and Miners."¹

There were other changes between 1920 and 1923—the year in which the "2nd Q.V.O. Sappers and Miners" became the "Q.V.O. Madras Sappers and Miners."² The Chitral Section having been handed over to the Bengal Corps in 1920, the section posted there returned to Bangalore and was disbanded. Two Field Companies were allotted as covering troops in Waziristan, and Rawalpindi and Secunderabad were abolished as out-stations of the Corps. A Field Troop was allotted to Sialkot and posted to the 2nd Indian Cavalry Brigade. A Field Company (No. 63) was maintained in Mesopotamia, surplus to the establishment of the Corps and working under the Royal Air Force, its personnel being relieved by yearly drafts from Bangalore of about half the strength of the unit. As a result of these various reorganizations the units included in the Corps on April 1st, 1923, were two Field Troops, five Field Companies, two A.T. Companies, one Divisional H.Q. Company, two Photo-Litho and Printing Sections and three Depot Companies, together with the extra Field Company in Mesopotamia. The strength of the Corps was then 36 British officers, 56 Warrant and non-commissioned officers and 2,167 Indian ranks—an immense reduction from the total of 7,308 of all ranks in March, 1919. The distribution in peace stations was as follows:—*Bangalore*, three Field and three Depot Companies, one Field Troop, and the Army Troops and D.H.Q. Companies and Photo-Litho and Printing Sections; *Waziristan*, two Field Companies; *Sialkot*, one Field Troop; *Mesopotamia*, one (extra) Field Company. Each Field Troop had two British officers, a small H.Q. Section (administrative) and two mounted half-troops each of about 40 Indian ranks, including drivers. Tool-carts had replaced pack mules as 1st Line transport, and the 2nd and 3rd Line transport was carried in A.T. carts instead of on pack mules or camels. Some motor vehicles had been provided for Army Troops and D.H.Q. Companies to carry part of the unit equipment. The organization of four Sections in a Field Company had been altered to three Sections and an H.Q. Section, with two British officers in peace-time and five in war.³

After 1923, although there were some changes in the terms of service and other matters, no major alterations occurred in the organization or strength of the Madras Corps until those introduced recently in connection with the abolition of Pioneers from the Indian Army. In 1925, Indian ranks were required to enrol for seven years with the colours and eight years with the reserve. A new reserve of two classes (A. and B.) was introduced. Class A. consisted of

¹ The 4th Burma Sappers and Miners came into existence on January 10th, 1922, under A.I.I. 20 of that year.

² *Gazette of India*, No. 367, of March 9th, 1923.

³ These numbers were increased respectively to three and six in 1928.

reservists with a total service of under ten years, and Class B. of those with a total of under 15 years. In 1928, Mandalay became an out-station of the Corps, and No. 15 Company, Burma Sappers and Miners, took over one of the Corps out-stations in Waziristan. In the following year, on the disbandment of the 4th Burma Sappers and Miners, No. 63 (Burma) Company, which had returned from service in Mesopotamia, was renumbered No. 15 Field Company, and Mandalay became a permanent out-station of the Madras Corps. Henceforward, three Field Companies were stationed in Bangalore and three in out-stations. Mechanization began in 1930, during which year and 1931 the Field Troops were reorganized, the tool-carts and limbered and G.S. wagons removed, and mechanical transport substituted. One half-troop was dismounted and carried in six-wheeled vehicles. A beginning was made also in the work of mechanizing the Field Companies. In 1932 came the proposal to abolish the Pioneers, a scheme which has produced important reorganizations in the Madras Corps ; but as these changes have affected all three Corps of Sappers and Miners equally they are dealt with in Appendix V.

APPENDIX III.

KING GEORGE'S OWN BENGAL SAPPERS AND MINERS.

The Corps of Bengal Sappers and Miners had its origin in the Corps of Bengal Pioneers formed by Captain T. Wood, B.E., at Cawnpore, in 1803. Two complete companies of the Pioneers, and a large number of selected men from other companies, were taken in 1819 to form a Corps of Bengal Sappers and Miners which was raised at Allahabad by Major Thomas Anbury, B.E., and into which the remainder of the Pioneers were absorbed in 1833. The new Corps became the "Bengal Sappers and Pioneers" in 1847, reverted to the title of "Bengal Sappers and Miners" in 1851, became the "1st Sappers and Miners" in 1903, the "1st Prince of Wales Own Sappers and Miners" in 1906, the "1st King George's Own Sappers and Miners" in 1910, and in 1923 took its present designation.¹ These remarks recapitulate some of the early history of the Corps which has appeared already in this volume. It is proposed to deal in this Appendix only with the reorganizations and changes in the Corps during the present century.

In 1900 the Corps of Bengal Sappers and Miners included six Service Companies (1st to 6th), a composite unit called "A" Company² and "B" (Depot) Company for recruits. There was also an Active Service Reserve of 250 men, which was afterwards increased. An experimental Balloon Section was formed at Rawalpindi in July and August, 1901³ and was added to "A" Company; and in 1903 a Mounted Detachment, similar to the unit specially raised for service in China in 1900 and disbanded in 1901,⁴ was included in the Company.⁵ The year 1903 saw the whole Corps rearmed with Lee-Enfield magazine rifles and bandoliers in place of the Lee-Metford magazine rifles issued in 1900. In general it may be said that up

¹ The title "1st Sappers and Miners" was given to the Corps in 1903 under Lord Kitchener's reform scheme of amalgamating the Presidency Armies. The change of title in 1906 took place when H.R.H. The Prince of Wales consented to become Colonel-in-Chief of the Corps. On his accession to the throne as King George V. in 1911, the title was altered by permission to the "1st King George's Own Sappers and Miners." During the Great War, however, it was found that the numerical designation led to confusion in the field, so it was dropped and the territorial designation (Bengal) was restored.

² "A" Company had Printing and Photo-Litho Sections, a Telegraph Section and a Pontoon Section. It could be mobilized for field service, and was not at that time a Depot unit as it afterwards became.

³ I.A.O. 106 of February 15th, 1901.

⁴ Its strength was one B.O., one B.N.C.O. and 24 Indian ranks.

⁵ With the introduction of telephones, a telephone unit was added to the Company in 1904.

to 1914 there was very little change in organization except in the composition of "A" Company, and that alterations in equipment were confined mainly to the Telegraph, Balloon, and Bridging formations.¹

In 1907 the class composition of the Corps was fixed as follows :—²

No. 1 Company	... ..	$\frac{1}{2}$ Sikhs, $\frac{1}{2}$ Punjabi-Mussalmans.
No. 2 Company	... ..	$\frac{1}{2}$ Sikhs, $\frac{1}{2}$ Punjabi-Mussalmans.
No. 3 Company	... ..	Hindustanis. ³
No. 4 Company	... ..	$\frac{1}{2}$ Sikhs, $\frac{1}{2}$ Pathans.
No. 5 Company	... ..	$\frac{1}{2}$ Sikhs, $\frac{1}{2}$ Punjabi-Mussalmans.
No. 6 Company	... ..	Hindustanis.
Balloon Section	... ..	Punjabi-Mussalmans.
Mounted Detachment	... ..	Sikhs.
"A" and "B" Companies	... ..	Mixed.

All the Service Companies were stationed in peace-time at Roorkee except one company at Peshawar and another at Rawalpindi.

The Service Companies were designated "Field Companies" in 1909, as in the Madras and Bombay Corps. Two years later, owing to the establishment of Signal Companies of Sappers and Miners, the Telegraph Section was removed from "A" Company, and Mounted Detachment, and Printing and Photo-Litho Sections, were transferred to "B" Company. The Pontoon Section of "A" Company was reduced to a cadre, and, with the abolition of the Balloon Section, "A" Company disappeared for a time from the Corps. An Indian Submarine Mining Corps had been in existence for some years, and two sections of it—at Calcutta and Karachi—were attached in 1910 to the Bengal Sappers and Miners; these were added permanently to the Bengal Corps when the Submarine Mining Corps was abolished in 1912. For some time prior to the Great War, experiments were carried out at Roorkee with hand-grenades and small mortars⁴ which proved of considerable value in 1914; and the training of a few men in motor driving in 1913 foreshadowed the great mechanical transport activities of the Corps in 1929-32.

As regards the organization of the Corps before the Great War, the Headquarters (as in Bangalore) included a Commandant (a Lieut.-Colonel or Major, R.E.), a Superintendent of Park and a Superintendent of Instruction⁵ (Majors or Captains, R.E.), an

¹ Berthon boats were purchased in 1909, and the full equipment for a Berthon boat bridge was completed in 1912. A Wireless Telegraphy Section was formed in 1912 and had the first wireless set in the Indian Army.

² I.A.O. 112 of 1907.

³ The class composition of both Nos. 3 and 6 Companies was altered in 1911 to half Hindustani Hindus and half Punjabi and Hindustani Mussalmans (I.A.O. 55 of 1911).

⁴ Also with the "Bangalore Torpedo," made of sections of metal tubing filled with explosive to be pushed under wire entanglements and exploded. (Designed by the Madras Sappers.)

⁵ The appointment of Superintendent of Instruction was amalgamated with that of Superintendent of Park in 1915, but was revived in 1918.

Adjutant¹ (a Captain or Lieutenant, R.E.), a Medical Officer, and five Warrant and non-commissioned officers, R.E. There was no separate appointment as Quartermaster. The Bridging Train was a cadre of only 20 men, and the remainder of "B" Company consisted of recruits and instructors. Each Field Company had a peace establishment of two British officers,² two British non-commissioned officers (R.E.), three Indian officers and 189 Indian other ranks, including 20 Sapper drivers. There were only 18 (Ordnance) Engineer Equipment mules on the establishment although the equipment was arranged in 48 mule-loads. The Mounted Detachment consisted of a Lieutenant, R.E., one British N.C.O. (R.E.), two Indian officers and 59 Indian other ranks. Its Engineer equipment was carried on pack horses and pack mules.

The strength of the Corps increased enormously during the Great War. On August 1st, 1914, there were 21 British officers, 47 British Warrant and non-commissioned officers, 25 Indian officers and 1,396 Indian other ranks. These formed the Corps Headquarters, six Field Companies, a Mounted Detachment, three Printing Sections and three Photo-Litho Sections,³ two Defence Light Sections and "B" (Depot) Company.⁴ But when the war ended the strength of the Indian ranks, including officers, had risen from 1,421 to 8,363, and there were 54 units in the Corps—21 Field Companies, one Field Squadron, three Field Troops, three Bridging Trains, one Frontier Searchlight Section,⁵ seven Printing and Photo-Litho Sections, two Engineer Field Parks, two Defence Light Sections, 13 "B" (Depot) Companies and one "A" (Depot) Company.⁶ Twenty-seven new field units had been raised, including 15 Field Companies, four Field Troops, and three Bridging Trains. The supply of officers to meet this huge expansion was greatly facilitated during the opening years of the war by the Indian Army Reserve, many of whose officers were civil engineers and needed only a short course in field engineering and interior economy before being posted to units. In 1917-18, R.E. Temporary Commissioned officers became available, and in 1918 many R.E. Regular officers began to arrive from England. Altogether, 33 R.E. Regular officers, 74 R.E. Temporary Commissioned officers, and no less than 174 officers of the Indian Army

¹ At the end of 1917, the Adjutant was assisted by one Assistant Adjutant for Routine and two more for Training.

² On mobilization, however, two Lieutenants, R.E., were added by Army Headquarters from the M.W.S. or the P.W.D. or Survey Department.

³ One of each (extra and temporary) was in China.

⁴ "B" Company included a Bridging Train cadre, and had the equipment only of an Engineer Field Park.

⁵ Formed on November 9th, 1917, for service in garrisons on the N.W. Frontier of India at Malakand, Fort Lockhart (on the Samana Ridge), Tank and Jandola. The unit had 20 oxy-acetylene portable searchlights. It consisted of only 20 Indian other ranks. It was disbanded in August, 1920.

⁶ Formed in 1917 to equip and despatch men to, and to receive men from, service overseas.

Reserve¹ joined the Corps at Roorkee during the war. The establishment of British non-commissioned officers was maintained by the gradual transfer of 171 of these ranks from British units in India. Recruiting for the Indian ranks proceeded vigorously, the Punjabi-Mussalman being the backbone of the Corps. In 1914-15 the Oudh Hindustani Hindu did not come forward; but from 1916 the Garhwali and Kumaoni sections² came in, and from 1917 the recruiting of Hindustani Hindus was general throughout Oudh. The recruiting of Trans-Frontier Pathans ceased early in 1915. Among the Sikhs, recruiting was slack until 1918 when more than 500 joined the Corps. While the total number of recruits enlisted in 1915 was only 777, it rose to 2,686 in 1918. These figures give some idea of the activities at Roorkee during the war. The Corps of Bengal Sappers and Miners in 1918 was almost as large as a division in the field; yet it was commanded by a Lieut.-Colonel of the Royal Engineers.³

The years immediately following the Great War were devoted almost entirely to disbanding units specially raised for the war, and to reorganizing the remainder on the new establishments which were notified in 1921. Several new types of units were introduced as a result of experience gained in the war. An Army Troops Company, Divisional Headquarter Companies, Field Troops and a Bridging Train became part of the Corps on its peace establishment. The Field Companies were organized into three sections and a headquarters section, and the equipment was arranged so that sections could act independently. The Army Troops Company and the Divisional Headquarters Companies were organized on the lines of the British A.T. Company and Field Park Company respectively, but with smaller establishments. A Chitral Platoon was formed in 1920 and attached to the Field Company at Rawalpindi, the tour of duty in Chitral being one year; afterwards, when the platoon became a separate Chitral Section, the tour of duty was extended to two years. Corps Headquarters at Roorkee were increased by six British officers in 1921, and there were other internal changes. By March, 1922, the reduction of strength had been pushed so energetically that the Corps had only seven Field Companies, three Field Troops, one A.T. Company, two D.H.Q. Companies, one Bridging Train, two Defence Light Sections, the Chitral Platoon and three Depot Companies,⁴ and by October it had almost reached its post-war authorized establishment.

Much attention has been given at Roorkee in the last decade to the question of equipment. Before the war the Engineer equipment was manufactured largely in the Park Workshops of the Corps or

¹ Including a few "Non-Technical" officers.

² Hill men.

³ Lieut.-Colonel A. H. Cunningham, R.E.

⁴ One of these ("A" Company) had Printing and Photo-Litho Sections attached to it.

purchased locally. This system was replaced after the war by substituting articles of regular ordnance supply or specially made by the Ordnance Department. Loading tables were revised, portable water-pumping sets and canvas troughs were provided, assault bridges were designed, and from 1929 mechanization received the closest attention. In 1925, new terms of service were applied to the Sapper and Miner personnel, the men being enrolled for seven years' service with the colours and eight years with the reserve. The Calcutta Defence Light Section was reduced to cadre in the same year. In 1927, each Field Company was given a third British officer, and the Bridging Train (No. 7) was disbanded. The mechanization of one of the Field Troops and three of the Field Companies began in 1930, and the process of general mechanization continued steadily till, by the middle of 1932, the Headquarters Transport, the two Field Troops, five Field Companies, the two D.H.Q. Companies and the A.T. Company had all been mechanized. In conclusion it may be mentioned that important changes in the organization of the Corps were initiated in 1932 in connection with the abolition of Pioneers from the Indian Army. These are alluded to in Appendix V on these subjects.

APPENDIX IV.

ROYAL BOMBAY SAPPERS AND MINERS.

The first engineering unit in the Bombay Presidency was a company of Pioneer Lascars raised by Major Lawrence Nilson, the Chief Engineer, at the end of 1777. This company was reinforced gradually by other Pioneer companies so that, when the Third Maratha War began in 1817, four companies were in existence. But it was not until 1820 that Sappers and Miners made their first appearance in Bombay. On August 20th of that year a company of these men was formed by Captain Thomas Dickenson, of the Bombay Engineers, from a small Corps of Engineer Lascars and a Pontoon Train which had taken part in the Second Maratha War in 1803. Another company of Sappers and Miners was added in 1826, and at the end of 1829 the two companies were called "Engineers." These two units were incorporated with six companies¹ of the Bombay Pioneers on September 29th, 1830, to form an "Engineer Corps" which became the Corps of "Bombay Sappers and Miners" in 1840, the "3rd Sappers and Miners" in 1903, the "3rd Royal Bombay Sappers and Miners" in 1921, and took its present designation in 1923. This is a recapitulation of some of the early history of the Corps which has appeared already in this volume. The information given in this appendix will be confined to the reorganizations and changes which have occurred during the present century.

In 1900 the Corps of Bombay Sappers and Miners included only four Service Companies² (Nos. 1 to 4), "A" and "B" Depot Companies, and the equipment for one Bridging Train. Pontoon, Telegraph, Bridging, and Photo-Litho and Printing Sections were grouped in "A" Company, and "B" Company was for recruits. The establishment of the Corps consisted of a Commandant, a "Superintendent of Instruction, Park and Train," an Adjutant, a Medical Officer, six Company Commanders (British), five Company Officers (British), 22 British Warrant and non-commissioned officers, 15 Indian officers, 849 Indian other ranks, 40 Indian driver ranks and 12 recruit boys. The class composition was settled by the Commandant. The peace distribution of units provided for Headquarters, two Service Companies, and "A" and "B" Companies at Kirkee, one Service Company at Aden, and another at Quetta. In

¹ The Bombay Pioneers had been increased to six companies in 1819 and to eight companies in 1822.

² A Service Company contained 192 Sappers.

1902, two more Service Companies (Nos. 5 and 6), and also a Fortress Company, were added to the establishment.

The year 1903 saw important changes in the Corps. Not only was its title altered to "3rd Sappers and Miners," but all the companies were renumbered and an official class composition was issued for the first time. Nos. 1, 2 and 3 Companies became Nos. 17, 18 and 19 Companies respectively, and each was to be composed of one-quarter Rajputs, one-quarter Marathas, one-quarter Mussalmans and one-quarter Mixed. Similarly, Nos. 4, 5 and 6 Companies became Nos. 20, 21 and 22 Companies with the same authorized composition but substituting Sikhs for Rajputs. The Fortress and "A" Companies were changed into No. 23 (Fortress) and "E" Companies respectively with a mixed class composition, and "B" Company emerged as "F" Company composed of all classes.¹ Of these units, one Service Company was normally at Quetta, the Fortress Company at Aden, and the remainder at Kirkee. The appointment of Superintendent of Instruction, Park and Train, was abolished in 1903 and replaced by separate appointments of Superintendent of Instruction and Superintendent of Park and Train. Beyond an expansion of "F" (Depot) Company and an increase in the Reserve,² nothing of much importance occurred after this until the Service Companies were renamed "Field Companies" in 1909, as in the Madras and Bengal Corps.

In 1910 a new class composition was authorized; one-half of the men were to be Mussalmans (Punjabis), one-quarter Sikhs and one-quarter Marathas.³ The Telegraph Section of "A" Company was absorbed into the newly-raised Signal Companies, and the Pontoon Section was reduced to cadre; the Printing and Photo-Litho Sections, and the cadre Pontoon Section, were then transferred to "F" Company, and "E" Company vanished. In the same year an additional Field Company was transferred to Quetta from Kirkee, and the Bombay and Aden Defence Light Sections joined the Corps. They were formerly part of the Indian Submarine Mining Corps, but since 1909 their duties had been confined to defence lights, telephones and pumping installations.⁴

The Great War caused a very large expansion of the Corps. In addition to the pre-war strength of 20 British officers, 20 British

¹ It was laid down that the class composition of the Corps as a whole was to be one-quarter Marathas, one-quarter Mussalmans, one-quarter Mixed, one-eighth Sikhs and one-eighth Rajputs. The term "Mixed" included Brahmans in addition to Ahirs, Telegus, etc. From 1907, Mussalman recruiting was in practice confined to the Punjab.

² The Reserve reached a strength of 205 in 1907, 232 in 1911, and 254 in 1914.

³ The Field Companies had not yet reached this composition in 1914. Each company then had one and a quarter Sections of Punjabi-Mussalmans, one Section of Marathas, small numbers of Mixed Hindus and Hindustani-Mussalmans, and one Section (or nearly one section) of either Sikhs or Rajputs. (These figures are approximate.)

⁴ Five Defence Light Sections were formed in 1910, two of which were added to the 3rd Sappers and Miners (Bombay). The Indian Submarine Mining Corps was disbanded in June, 1912.

Warrant and non-commissioned officers, and 1,400 Indian ranks, there passed through the Corps, between August, 1914, and November, 1918, approximately 250 British officers, 90 British Warrant and non-commissioned officers, and 6,000 Indian ranks. In the same period the original six Field Companies, one Fortress Company, one Depot Company and one Pontoon Park (cadre only) developed into 16 Field Companies, one Field Squadron, two Field Troops, one Fortress Company, three Pontoon Parks, a Seistan Detachment and a Karun Section, and nine Depot Companies including "E" Company which was re-formed.¹ Reinforcements of officers came chiefly from the Indian Army Reserve and were mostly men in civil engineering work in India. The earliest reinforcements were Royal Engineer officers from the Military Works Services and the Public Works and Survey Departments, followed in 1915 and later by officers of the Indian Army Reserve, officers holding Temporary R.E. commissions and officers of the Territorial Force (R.E.). British non-commissioned officers were obtained from England and also by transfer from British units in India. The establishment of Indian ranks was maintained by increased recruiting. The losses in the 20th and 21st Companies² during 1914-15 were so heavy that the Maler Kotla Imperial Service Sappers and Miners were absorbed into the Corps as reinforcements for these units and so remained until early in 1916, when they were replaced by recruits from Kirkee. A further loss occurred when the 17th and 22nd Companies surrendered to the Turks at Kut-al-Amara in April, 1916. Altogether, the supply of men to replace casualties was most difficult. The great increase of strength in 1917 and 1918 necessitated the enrolment of Rajputs, Hindu Jats and other Hindus; but in general it may be said that newly-raised units were composed of two sections of Punjabi-Mussalmans and two sections of Hindus who might be either Marathas, Hindustani Hindus, or Jats. At one time during 1915 the single Depot Company ("F") contained over 1,000 men; but it was soon expanded into four companies, and in 1917 to six companies ("F.1" to "F.6") together with a new "E" Company. In 1918 the Depot had eight "F" Companies and "E" Company. In addition to training and supplying recruits, the Corps manufactured at Kirkee an enormous amount of equipment for new units and for the Indian Munitions Board.

No allusion has yet been made in this appendix to the Railway Companies of the Bombay Sappers and Miners which did such good work in East Africa and elsewhere during the Great War. Nos. 25 and 26 (Railway) Companies went to East Africa in November, 1914, after working on the North-Western Railway in India, and Nos. 27 and 28 (Railway) Companies were formed in East Africa during 1916

¹ Defence Light, Printing, and Photo-Litho Sections have been omitted from these lists for brevity.

² These were the companies which suffered so severely in France.

when the whole were combined into a Railway Battalion of Sappers and Miners. After the companies had returned to India in 1918, No. 29 Company was raised, but the battalion organization was abolished in 1921¹ and only Nos. 25 and 27 Companies retained, the latter being renumbered No. 26. The men of the Railway Companies were chiefly Punjabi-Mussalmans.

From 1919 to 1922 the Corps was in the process of reduction and reorganization. The establishment was fixed in 1920 at a Headquarters, six Field Companies, two Railway Companies, one Fortress Company, one D.H.Q. Company,² three Depot Companies, two Defence Light Sections (Bombay³ and Aden) and Printing and Photo-Litho Sections. Of these the Headquarters,⁴ three Field Companies, one Railway Company, the Depot Companies and the Printing and Photo-Litho Sections were stationed at Kirkee, two Field Companies were at Quetta and one at Kohat, one Railway Company was on railway work, one Defence Light Section was at Bombay, and the other and No. 23 (Fortress) Company at Aden.⁵ The strength of the Corps in 1920 was 32 British officers, 49 British Warrant and non-commissioned officers, 49 Indian officers and 2,323 Indian other ranks. Nos. 17 and 22 Field Companies, which till then had each consisted of four sections (192 Indian other ranks), were reorganized in 1921 into units each with three sections and a headquarter section and a strength of two British officers, three British Warrant and non-commissioned officers, four Indian officers and 224 Indian other ranks. The equipment was also adapted to make each section self-contained. On mobilization a Field Company was to receive three additional British officers so that it would then have an Officer Commanding, a Second-in-Command and three Section Commanders.⁶ The class composition at this time in all six Field Companies was one-third Marathas and one-third Punjabi Mussalmans, while the remaining one-third was of Hindustani Hindus in Nos. 17, 18 and 19 Field Companies and of Sikhs in Nos. 20, 21 and 22. The Fortress and D.H.Q. Companies were of "mixed" composition.

Both the remaining Railway Companies (Nos. 25 and 26) were disbanded in 1931, and No. 42 D.H.Q. Company was increased in strength. In the process of these alterations, the last Hindustani Hindus disappeared from the Corps. This class is no longer enlisted. At the end of 1931 the class composition was two sections of Punjabi

¹ Early in 1919 the Railway Battalion was officially recognized in India with headquarters and depot at Sialkot.

² Actually raised at Kirkee in 1921 and subsequently called No. 42 D.H.Q. Company. It was transferred to Quetta in 1924.

³ The Bombay D.L. Section was reduced to cadre in 1923.

⁴ The Headquarters were expanded in 1921, the Adjutant receiving two Assistants and the Superintendents of Instruction and Park one each.

⁵ In 1927 the Aden D.L. Section and No. 23 (Fortress) Company were amalgamated as the "Aden Fortress Company," and in 1928 this unit was converted into a British Fortress Company and all the Indian ranks were withdrawn.

⁶ In 1928 the peace establishment of British officers for a Field Company was increased from two to three. The war establishment then rose to six.

Mussalmans and one of Marathas in three of the Field Companies (Nos. 17, 18 and 19), and one section each of Punjabi Mussalmans, Marathas and Sikhs in the remaining Field Companies (Nos. 20, 21 and 22). The strength of the Corps was then 32 British officers, 42 British Warrant and non-commissioned officers, 40 Indian officers, 1,853 Indian other ranks, and 149 Indian driver ranks, and the Reserve had reached a total of 704 Indian other ranks. Important changes in the establishment and organization of the Corps were initiated in 1932 in connection with the scheme for the abolition of Pioneers from the Indian Army. These are alluded to in Appendix V.

APPENDIX V.

THE ABOLITION OF PIONEER CORPS AND THE REORGANIZATION OF THE SAPPERS AND MINERS IN 1932.

There have been Pioneers in the Indian Army from the middle of the eighteenth century almost to the present day, first as Engineer troops who were mostly converted into Sappers and Miners, and then as infantry with some engineering training. In the British Army they appeared before the reign of Henry VIII., and in the early part of the sixteenth century were a properly organized Corps;¹ but they were absorbed by the Engineers in later times and did not reappear as units of that Army until a Pioneer battalion was raised during the Great War of 1914-18 for every British division of infantry. After the war it was decided that these British battalions should be amalgamated with the R.E. field companies, but the process was not applied to the Pioneer battalions of the Indian Army because their high traditions seemed to justify their continued existence. In 1923 there were four Corps of Indian Pioneers—the Madras, Bombay, Sikh and Hazara Pioneers—the first three totalling 12 battalions and the last being an independent battalion;² before 1932, however, amalgamations had reduced the total to six battalions³ and the Hazara battalion. It was soon apparent that, under modern conditions, Pioneers could hardly be both fully trained infantry and expert engineers, and that by reason of their organization and training they were better fitted to be engineers than infantry. Up to 1914 they were most useful as roadmakers in expeditions across the administrative border on the N.W. Frontier; but as such expeditions are now rare, and the regular garrisons stationed across the border are provided with permanent roads built by civil contract, Pioneers are no longer needed for road work. It is desirable also that the Engineer troops of any division should be homogeneous. These facts, coupled with serious financial stringency, caused the Government of India to make the important decision in 1932 that Pioneers should be abolished from the Indian Army and that a part of the financial saving so effected should be applied towards an increase in the strength of the three Corps of Sappers and Miners.

¹ They were disbanded on the termination of a campaign. *History of the Corps of Royal Engineers*, by Major-General W. Porter, Vol. I, p. 22.

² The first Madras Pioneers were formed in 1758, the first Bombay Pioneers in 1777, the first Sikh Pioneers in 1857, and the Hazara Pioneers in 1904.

³ The Madras, Bombay, and Sikh Corps each had two battalions.

The scheme, as approved, was that every Field Company of Sappers and Miners should be changed from a three- to a four-section basis both in peace and war, with the addition of one British officer to its establishment. There was to be a small increase in the size of a section. It was specified that the number of artificers in a Field Company should be raised from 24 to 56, and that extra transport should be allotted to the extra section. The strength of a Field Company would be raised from 234 to 320. Each Divisional Headquarter Company was to be increased by approximately the same numbers, and reorganized in Headquarters, a Field Works Section and a Workshop Section; and each Army Troops Company was to have two sections only. Minor changes were proposed in the Field Troops. The Headquarters and Depots of each Corps were to be completely reorganized into a Training Battalion of three Training and one Depot Companies, a Records unit, and Workshops. The number of Field Companies was to be reduced from 18 to 17 by the conversion of a Field Company of the Bengal Corps into an Army Troops Company, so that that Corps and the Madras Corps should each have two Army Troops Companies. The Chitral Section was to be abolished as a separate unit; Field Companies were to supply it in future. Some changes were to be made also in the locations of units.

The strengths of the three Corps of Sappers and Miners on reorganization (including recruits) were expected to be:—

Q.V.O. Madras Sappers and Miners	...	...	3,518
K.G.O. Bengal Sappers and Miners	...	...	3,365
Royal Bombay Sappers and Miners	...	...	2,925
			9,808

These large increases above the previous establishments would be provided for by extensive transfers from the Pioneers. Thus the Q.V.O. Madras Sappers and Miners were to receive approximately 715 Madrassis from the Madras Pioneers; the Bengal Corps about 160 Meos from the Bombay Pioneers, and 320 Mazhbi and Ramdassia Sikhs from the Sikh Pioneers; and the Bombay Corps about 133 Marathas and 160 Lobana Sikhs from the Bombay Pioneers, and 160 Lobana Sikhs and 320 Mazhbi and Ramdassia Sikhs from the Sikh Pioneers. Many of the Pioneers who could not be absorbed into the Sappers and Miners would be given openings in the Indian Infantry or in the machine-gun platoons of British Infantry regiments in India. The remainder would be mustered out with the usual concessions. The battalion of Hazara Pioneers would be disbanded. Most of the British officers of the Pioneer units would be absorbed into the Indian Infantry.

It was anticipated that, with the increased numbers of British officers with the Sappers and Miners, it would be possible to provide the C.R.E. Rawalpindi District (C.R.E. 1st Indian Division) and the C.R.E. Baluchistan District (C.R.E. 2nd Indian Division) with full-time Adjutants, and that the Sapper and Miner units forming the Divisional Engineers could then be placed directly under the C.R.E.s concerned. Sapper and Miner units in other forward stations, such as Covering Troops, Field Companies, Army Troops Companies and Field Troops, would be brought gradually into closer touch with, and under the control of, the District C.R.E. Chief Engineers of Commands would carry out annual technical inspections of Sapper and Miner Headquarters, and encourage intercourse and interchange between Royal Engineer officers of the Sappers and Miners and the Military Engineer Services. Modifications are to be expected in any new scheme, but the foregoing description gives a general outline of the Sapper and Miner reorganization of 1932 including the abolition of the Pioneers.¹

¹ Further details are given in an article entitled "Engineer Reorganization in India," by Captain H. B. Harrison, R.E., appearing in *The R.E. Journal*, Vol. XLVI, December, 1932. An important modification was made in 1933, when it was decided that there should be Sikhs of the Jat class alone in the Bengal Corps, and of the Mazhbi or Ramdassia classes alone in the Bombay Corps. This involved an extensive exchange of new personnel.

APPENDIX VI.

SUBMARINE MINING IN INDIA.

Submarine mining was first contemplated in India in 1868 in the form of "torpedo" defences (fixed mines) for Calcutta and Rangoon, but little happened until 1879 when a company of Madras Sappers and Miners, and another of the Bombay Corps, were assembled at Bombay to be instructed by a few non-commissioned officers (R.E.) who had arrived from England in charge of the first consignment of submarine mining stores. The instruction was interrupted by the outbreak of the Second Afghan War, and nothing further was done for several years. By 1885, however, a small establishment of four British officers, 38 British non-commissioned officers and 118 Indian Sappers and Miners had been authorized for the mining defences of Bombay, Calcutta, Karachi and Rangoon, and, up to 1888, schemes of defence were prepared and unsuccessful efforts were made to train the Indian ranks in their aquatic duties. The situation improved when the formation of a proper Indian Submarine Mining Company was authorized on October 15th, 1891, with an establishment of one Major, R.E., four Lieutenants, R.E., and 74 British non-commissioned officers, R.E. This unit was associated with a corps of 140 Lascars which had been formed in May, and the whole soon became an efficient body as the Indian personnel were expert watermen. Major A. M. Stuart, R.E., the Q.C. Indian Submarine Mining Company,¹ began to develop electric light defence schemes in 1899, and in the following year a small section was authorized for electric defence lights, telegraphs and telephones at Aden where there was no submarine mining. An improvement was effected in 1902 by the amalgamation of the Indian Submarine Mining Company with the Corps of Submarine Mining Lascars to form an "Indian Submarine Mining Corps." In 1903, some R.E. rank and file were sent from home to make the new Corps more like a British Submarine Mining unit, and the sections at Karachi, Bombay, Calcutta and Rangoon were formed into companies; but three years later, consequent on a decision to abolish submarine mining defences on the Hugli, the Calcutta Company was reduced to a small section to operate defence lights in peace-time.² Then came the decision in 1907 that submarine mining should cease at all Indian ports, and the companies

¹ He was also Inspector of Submarine Mining Defences in India.

² It was to be assisted in war-time by a local company of Electrical Engineer Volunteers. Similar volunteer companies could give assistance at Karachi, Bombay and Rangoon.

were reduced to sections whose duties from 1909 were confined solely to defence lights, telephones and pumping installations. The five Submarine Mining Sections were attached in 1910 to one or other of the Sapper and Miner Corps.¹ They were replaced in 1912 by Defence Light Sections, incorporated as such in the Sappers and Miners, and in that year the Indian Submarine Mining Corps was abolished. Small Defence Light Sections have existed since that time in Karachi, Bombay, Calcutta and Rangoon,² though most of them were reduced to cadre between 1923 and 1925. More than 70 Royal Engineer officers served with the Submarine Miners in India before the Corps was abolished in 1912, and a large number have been in charge of the Defence Light Sections since that date.³

¹ Those at Karachi and Calcutta, to the Bengal Sappers and Miners; those at Bombay and Aden to the Bombay Sappers and Miners; and the section at Rangoon to the Madras Sappers and Miners.

² The section at Aden was amalgamated with No. 23 (Fortress) Company, Bombay Sappers and Miners, in 1927.

³ Further details of the Indian Submarine Mining Service are given in the *History of Submarine Mining in the British Army*, by Lieut.-Colonel W. Baker Brown, R.E., Chapter X, pp. 189-200.

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THE rank shown against an individual is his highest rank mentioned in the book, and not necessarily the highest rank attained by him.

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