

Discussion.

The Author. The AUTHOR exhibited and explained a number of lantern-slides illustrating the work described in the Paper, and in doing so called upon Major-General Sir William Liddell and Lieut.-Colonel C. E. P. Sankey to supplement the description of particular slides.

The President. The PRESIDENT, in moving a very cordial vote of thanks to the Author, observed that the Paper was the story of a wonderful organization, a story of which every member of The Institution could be proud, and The Institution was very greatly indebted to the Author for the Paper. Many of its young members had taken part in the work, and he thought the last words of the Paper should sink deeply into the mind of everyone, "that the bond which has been established in these strenuous years between the Civil Engineers of Great Britain, the Dominions and Colonies, and the Royal Engineers of the Regular Army, may ever remain a close one, to our mutual advantage, professionally and socially, but above all with a view to the most efficient use being made of our vast engineer resources." He sincerely hoped, too, that, as another result of the great war, the bond between workmen and employers would be tightened in all directions. Men had learned to understand each other and know more about each other, and the little jealousies that might have existed between Civil and Royal Engineers had vanished as a result of the great struggle.

The Author. The AUTHOR, in thanking the members for their reception of his Paper, remarked that he had only come very late on the scene. Though he had been asked to write the Paper, the credit of all the early organization of Engineers was due to Lieut.-General Sir George Fowke and General Sir Robert Spring Rice. The Paper could only be a sketch; it could not go into the details of all that had been done. He understood, however, that Papers were coming forward later which would deal in detail with the transportation work, railways, etc. He hoped that the Civil Engineers and the Royal Engineers would work very closely together in future wars, because there was no doubt that at the beginning of this war they were not very much in touch. The whole system of engineering education had lately been revised, and he thought it would have very happy results. Young officers were to be sent to the University of Cambridge for a longer and better course in

engineering science than they could hope to obtain at Chatham, and The Author. in certain other ways the idea of keeping in touch with all modern developments was being put into practice.

Sir ALEXANDER KENNEDY, Past-President, said that on the occa- Sir Alexander Kennedy. sion of the President's Address he had spoken strongly, and from the bottom of his heart, as to the importance of liaison between the Royal Engineers and the Civil Engineers. He was very glad to hear from so distinguished a soldier as General Heath that that feeling was as strong on his side as it was on the side of the Civil Engineers, and he hoped very much that it might bring forth fruit which would be of benefit not only to Civil Engineers professionally and to the Royal Engineers professionally, but to the whole country later on. His only personal recollection of quick engineering work in France was that 36 hours after Cambrai had been taken he drove from Arras to Cambrai, and found the roads were already quite decent. What they must have been 36 hours before could be readily imagined. The short time taken to put up bridges was an honour both to the designers and to the officers and men who carried out the work, and their feats would certainly be told to their children and grandchildren.

Mr. BEN HOWORTH remarked that the Author stated that the Mr. Howorth. saving of the situation at the outbreak of the war was the Territorial Force, and that the Royal Engineers had very few officers with civil engineering experience. The Author did not mention one branch of the Service which intimately concerned The Institution, namely, the Special Reserve of Royal Engineers. In 1909, The Institution called for civil engineers to volunteer for such service, a number of names were sent in, and the first batch was called up to Chatham in 1909. Several batches followed, up to the outbreak of war. When war broke out there were seventy or eighty members of The Institution who were officers of the Royal Engineer Special Reserve. He knew, from his own observation at Aldershot in 1914, that a number of the units of the Expeditionary Force would have gone overseas short of trained officers if it had not been for the Special Reserve. The Signal Service was mentioned in the Paper, the Author said, in all too brief a summary. The Signal Service was a highly specialized branch of the Royal Engineers, and the Author had given it an extraordinarily good notice. The Author's mention of "having their backs to the wall," recalled to him the time, at the end of March, 1918, when the Germans had nearly broken through between the two lines of the British and the French. In the mix-up of troops at that time, he happened to become a signal officer

Mr. Howorth. in what was called "Carey's Force," in which there was a large number of Royal Engineers, railway engineers, and signallers, who acted as infantry. They were put across a line between the Somme and the river Luce, a tributary of the Avre, and gave a very good account of themselves. A number of the signallers were men who had hardly fired a rifle at all except on the range; all they had done practically had been to thump a telegraph key in a comfortable signal office, and they had never experienced anything like what they had to go through at that time. These remarks about the Special Reserve were not made with the idea of claiming any special recognition for those officers but to emphasize the wish, expressed by the Author, for a closer bond between Civil Engineers and Royal Engineers, a wish with which he was sure every member of The Institution would heartily agree. It seemed to him that for the future that close association would be greatly helped if it were possible to recommence the granting of commissions to members of The Institution in the Special Reserve; that would enable a number of civil engineers every year to get into touch with Army ideas and traditions, and at the same time would keep warm a friendship which it would be a great pity to allow to become cool in the period between now and the next great war.

Brigadier-
General Paul.

Brigadier-General E. M. PAUL said that, not having had the advantage of being in France during the war, he could not add very much to what the Author had said, but he would like to say that in other theatres of war, in the Middle East, Salonica, Egypt and Palestine, he had had ample opportunities of observing the work done by members of The Institution who were associated with the regular officers in every kind of work. He had already had the advantage in previous years, when at Chatham, of being an instructor both in building construction and engineering, and also on the military side, in tactics and military training, when the first few batches of the Special Reserve came to Chatham. It was certainly an experiment, but one to which he personally looked forward at the time with great expectation, and years afterwards, having met several of those officers during the war, he could only say that those expectations had been admirably fulfilled. The regular officers had been proud to have the officers of the Special Reserve and many other engineers, both old and young, associated with them; and, whatever meed of praise had been granted by the public or by The Institution, or by any special bodies, to the Army, he could truthfully say they would like to place on record that the bulk of that praise must be given to their confrères in the civil profession.

Major-General Sir ANDREW STUART said he had had a good many of the Special Reserve under him. They were not numerous at the beginning, but no section of the Army was numerous at that time. The Engineers went out with 247 officers, and every Special Reserve officer joined up as a regular and was absorbed into the regular units; and so far as the initial force was concerned the Special Reserve officer might be said to have lost his identity as a Special Reserve officer and to have become thereafter a Royal Engineer. Possibly that was the reason why the Author had omitted to mention particularly the Special Reserve, thinking perhaps, as things turned out, that they had practically become absorbed. They did not constitute units like the Territorials or the Kitchener Army; they were actually the reserve. Another thing mentioned was the question of the mutual assistance of the Royal Engineers and Civil Engineers in time of war. The Royal Engineer's education in peace was in the art of war, and the art of war was more particularly practised at the front, and possibly the civil engineer when he joined a unit which proceeded to the front might find he was not so much at home as he was in that portion of the army that he (the speaker) had had to deal with, namely, lines of communication. His own work had been done by civil engineers who had had nothing to learn when they came out except to discover what it was that the Army wanted; and that was where he believed he had come in. He and a certain number of other Royal Engineers had been there to show what the Army wanted, and the manner in which they would be best pleased to have it done—not to show them how to do it, because they knew all about that. With that combination things went very well, and very soon it was found that a great many of the civil engineers knew as much about what the Army wanted as the Royal Engineers did, and carried on by themselves. He believed his best Commanding Royal Engineer in France was a Territorial officer; he certainly knew the regulations from end to end, and also knew everything about engineering; and where it was neither engineering nor regulations he knew how to get round a thing or do it. The first object, of course, was to try to avoid any engineering at all; if it was possible to persuade a person that he did not need what he asked for, they did so; and if they could not persuade him they tried to make him take as little as he would accept; but if he would not do that, then the work had to be got on with. There had been no trouble in getting officers; the trouble had been to get men to do the work, and materials to do it with, and when men and materials had been obtained, there was difficulty in connection with transport. If the engineers could

Major-General
Sir Andrew
Stuart.

Major-General
Sir Andrew
Stuart.

have got those things easily they would have been quite happy. He was afraid that trouble would always occur in war. When it came to building, endeavours had been made to use material which needed least labour and least transport. There was no necessity to think about the question of expense. As long as the result required was produced in the time available that was all that was needed.

General the
Hon. Sir H. A.
Lawrence.

General the Hon. Sir H. A. LAWRENCE remarked that the Paper dealt mainly with the military side of the work as carried out by the Royal Engineers. Time had not permitted the Author to deal at length with all the great work which was performed, largely by civil engineers, on the lines of communication and in various parts of the Army in the rear of the actual fighting line. He would like to take the opportunity, as in the last year of the war he happened to be connected with the higher command of the Army, to pay his public tribute to the work done by The Institution of Civil Engineers and by the engineers who came to France from all parts of the Empire. He did not believe it would have been possible for the war to have been carried to a successful conclusion if the Royal Engineers had not had the assistance of these gentlemen, many of them of the highest eminence in their profession. It was not only that The Institution gave the Army men who had risen to the highest positions, but also that the younger men came forward from the very beginning and made it possible for the force of Royal Engineers to be expanded to the gigantic army which it became in the last year of the war. It was obvious that to supplement the Regular Army it was necessary to draw on the civil population, and in that respect a great lesson had been learned. He hoped it would be realized that in future it would not be so necessary, as was imagined, to preserve a very large technical body of engineers in the standing Army, because there was such an immense wealth of talent to draw upon in the civil community, namely men who could adapt themselves so readily and so quickly to the conditions of modern war. He only wished it had been possible for the Author to give some further description of the work carried out on the lines of communication, but perhaps that would come later in one of the Papers yet to be given. The Author referred to the fact that, after the right wing of the Army was pressed back in March, no fewer than 5,000 miles of trenches were built in about six weeks—an extraordinary performance. Almost as extraordinary was the fact that the engineers had to prepare for all possible eventualities; the Army might have had to retreat to the Channel ports, or south across the Somme; and all the roads in Northern France had to be

reconstructed from that point of view. The work done by Sir Henry Maybury, and those who worked under him, passed all belief. To him, when acting as Chief of the Staff, to have to work with people of that kind was the greatest possible relief to his mind, and he was sure that if Lord Haig were present he would say the same thing. He echoed the wishes the President had expressed that the connection between The Institution of Civil Engineers and the Royal Engineers might become closer, and he could assure the members that it would be no fault of the Army if the connection between the Civil Engineers of this country and the Army did not become very much closer and more real.

General the
Hon. Sir H. A.
Lawrence.

Major-General P. G. GRANT thought the whole ground had been so well covered by the Author and previous speakers that there was very little left to say. There was one point, however, namely, that if there was to be thoroughly efficient co-operation between military and civil engineers, the organization in peace must be such as to enable that co-operation to be fully developed in war. He did not know whether he was trenching on forbidden ground, but it appeared to him that it was necessary to have in peace time an officer who would be in a position similar to that of the Engineer-in-Chief in war, one who would co-ordinate all the efforts of the Army Engineers and their expansion by Civil Engineers in war. What, he thought, was important was to know whether a really efficient organization was being prepared: he could not say whether such was the case, because at present he was not on the Active List. It had always seemed to him in France that what he might call the interior organization of the Engineers was not as strong as it might be. Just as it was found by the Allies that there must be unity of command, so the Engineers, to make the best use of labour, material, transport, and so on, must have unity of command; in other words, must have an Engineer-in-Chief who was really an Engineer-in-Chief, and who dealt with all branches of engineering. In addition to that, it was necessary to strengthen the control of engineering. That was somewhat difficult to explain, but he thought that, without in any way interfering with the military command, there could be a very strong chain of engineer command passing from the top to the bottom. It had always seemed to him that perhaps more might have been done, and that what had been done might have been done with a little more efficiency if that command had been in existence. In conclusion, he desired to bear his testimony to the assistance which the Royal Engineers had received from the Civil Engineers who joined them. He had sitting beside him at that moment an officer who did a great deal

Major-General
P. G. Grant.

Major-General
P. G. Grant.

of work for him during the battle of the Somme, and the only objection he had to that officer was that he made a habit of getting hit!

The Author.

THE AUTHOR, in reply, remarked, that he had looked upon the Special Reserve, as Sir Andrew Stuart had said, as part of the Regular Army, and he had mentioned in the Paper that what the Army was short of was engineering knowledge in some of the Territorial units. To the Special Reserve of officers, and to the system which produced such valuable engineers directly the war began, the Royal Engineers were deeply indebted; but once the war began they became Regulars. Although the Royal Engineers had a good sprinkling of thoroughly trained civil engineers in various branches, they had not enough of them—they had not enough specialists, and they would want more in another big war. The work done by the transport service was enormous; he had only referred to it very briefly, because it would be the subject of future Papers. Personally he had had no control over the work in connection with transportation. He concurred entirely in the remarks of General Grant as to unity of command and control of engineering matters in war. In the Great War the duties of the Director-General of Transportation and the Engineer-in-Chief were entirely separated. Undoubtedly efficiency would be increased if all engineering works could be co-ordinated by one head.

Correspondence.

Mr. Du-Plat-
Taylor.

MR. F. M. G. DU-PLAT-TAYLOR wished to draw attention to the number of civil and mechanical engineers who joined the Royal Artillery, in which he had had the honour of serving during the war. He believed he was right in saying that the expansion of the Royal Artillery during the war was greater than that of any other corps—the Siege Artillery, for instance, was practically created, as at the start there were only a very few batteries of heavy howitzers.

Not only was the Siege Artillery created, but the present methods of fire were largely invented during the war; and a good many of the improvements in *matériel*, instruments, and methods of observation and fire, were due to officers who, in private life, were civil or mechanical engineers.

The rapid expansion of the Artillery necessitated the training in the shortest possible time of a very large number of officers, not