

The Jubilee of the Institution of Electrical Engineers.

IT is now fifty years since the Society of Telegraph Engineers held its first meeting. The title of the Society was changed to that of the Institution of Electrical Engineers in 1883, and it has grown from a membership of about 100 in 1872 to one of more than 10,000 in 1922. Last year the Institution was granted a Royal Charter, and it celebrated its jubilee last week by holding meetings at which some of the pioneers of electricity gave recollections of the early days of the industry.

Prof. Fleming gave fascinating lectures on Michael Faraday. He showed how well this great investigator laid the foundations on which the impressive superstructure of modern electrical practice has been built. In particular he laid stress on the marvellous thoroughness with which Faraday stated the physical laws of electrolysis and electromagnetism. Many of Faraday's statements which survive intact in our modern text-books are models of lucidity. For its rapid development the industry is largely indebted to the unselfish labours of this great physicist.

Electrical engineering more than any other branch of engineering is based on pure science. The ease with which measurements of the highest accuracy can be made has been the greatest boon to engineers. It is not surprising, therefore, that electrical machines have gradually been evolved the efficiency of which approximates to a hundred per cent. No one appreciates more highly than the electrical engineer the value of scientific research, and no one takes a keener interest in every discovery in pure science.

Many of the reminiscences given by speakers at the commemoration meetings carried us back to the earliest days of the industry. It has to be remembered that the incandescent lamp was invented and the first telephone exchange was built only 44 years ago. Many of the speakers, therefore, had watched the growth of the industry from the start. Several tales were told of the founding of the Institution. It was pointed out that the ideas underlying any new movement are usually present in a vague way in the minds of many people and, therefore, it is difficult to assign the credit for the original idea with any degree of certainty. We think that greater stress might have been laid on the work done by Lord Lindsay—afterwards the Earl of Crawford and Balcarres—in founding the Society. He had a laboratory in a slum called Eaton Place (now swept away), lying between Green Street, Grosvenor Square, and Oxford Street. Some of the apparatus used is still in use at Faraday House, a college and testing institution which he helped to establish in 1889. It was in this laboratory that the first inception of founding a Telegraph Society was made in 1869. Cromwell and Arthur Varley, who worked in it, were anxious that the Society should be started at once, and they particularly wished that Sir William Thomson, who was then the leading electrical expert, should be the first President. It was not, however, until 1872 that the Institution got under way, the first President being Dr. Carl Siemens (Sir William Siemens). In 1874 Sir William Thomson became President for the first time, Lord Lindsay being one of his Vice-Presidents.

Listening to the speakers brought vividly back to the memory the halo of wonder that surrounded many of the early discoveries. The telephone, invented by Alexander Graham Bell, is regarded to-day as a mere domestic appliance. In 1876 the fact that you could hear a whisper at a distance of ten miles was rightly regarded as an almost supernatural achievement. Mr. Kingsbury recalled that Bell and his associates stated in 1877 in their first business

circular that they were "prepared to furnish telephones for the transmission of articulate speech through instruments not more than 20 miles apart." To-day conversation has taken place over 5000 miles, and if the necessity ever arose an Indo-European telephone could be made without the need of further research.

Mr. Judd, who has been intimately connected with submarine telegraphy for more than 50 years, pointed out that notwithstanding the fact that hundreds of thousands of miles of submarine cable are now in existence, yet so well had the foundations of the industry been laid by British engineers and men of science that the cables of to-day are of the same general type as in 1866. Sir William Thomson solved the problem of operating submarine cables, first with the mirror galvanometer and then with the siphon recorder. Both instruments remain practically unaltered. The first great change in cable operation was the introduction of duplex working by which messages could be sent simultaneously from both ends of the cable. Judd was convinced that submarine telegraphy would continue to play the rôle assigned to it by the early pioneers of drawing together all the nations of the world.

Col. Crompton began electrical work 44 years ago by installing Gramme dynamos and Serrin lamps. He said that he had to learn the technicalities of his art from the telegraph engineers. Accustomed to working with primary batteries they told him that the resistance of the armature should never be less than the resistance of the external circuit. In the year 1883, as the result of an escape of gas, the Ring Theatre in Vienna was burned down with a lamentable loss of life. The Austrian Emperor issued an order that gas lighting would not be allowed in any of the Imperial Theatres. The Vienna Gas Company, therefore, decided to take up the supply of electric light, and they invited Col. Crompton to assist in the design and erection of their Central Supply Station. This installation was the prototype of many central stations built in this country in the early 'nineties.

Mr. Partridge narrated how the Earl of Crawford and Sir Coutts Lindsay installed a portable electric light plant in a yard behind the Grosvenor Gallery in 1883. From this small beginning emerged the Grosvenor Gallery Station, which was the first to adopt the parallel system of using transformers, thus revolutionising all the methods then in use. This station was burned down in 1890. In this year, after overcoming many difficulties, Ferranti successfully transmitted electric power at 10,000 volts from Deptford to Trafalgar Square.

Sir Charles Parsons gave an interesting account of the first turbo-alternator. This machine ran at 18,000 revolutions per minute, the armature of the dynamo being less than three inches in diameter. It was essential to have the diameter small, as otherwise the centrifugal forces called into play would have been prohibitively high. These small machines were used on board ship; they were far from economical, but they worked satisfactorily for several years. The modern large turbine-driven generator constructed on the lines of Parsons' inventions is the most economical generator of electricity from steam at present in existence. All the proposed "super-power" steam stations will be equipped with these sets.

Sir Oliver Lodge directed attention to the invaluable pioneering work in electrical theory done by Oliver Heaviside, who has shown how to calculate the eddy-current losses in cores, and the effects pro-

duced by high-frequency currents in cylindrical wires. His most important discovery, however, was that of the distortionless circuit, a discovery which led to most important practical developments in long-distance telephony both in land and in submarine cables.

References were made to the discovery of X-rays, of radio-telegraphy, and of the atomic nature of electricity.

The Institution of Electrical Engineers has been fortunate in having so many eminent men of science as Presidents in its early days. Lord Kelvin was President three times, and John Hopkinson was President twice. Amongst others we may mention Sir William Crookes, Sir Joseph Swan, and D. E.

Hughes. The wonderful physical insight of Sir William Crookes is only now being fully recognised. Many years ago he had visions of electrons and even considered the possibility of isotopes.

The Institution was founded in order to promote the general advancement of electrical and telegraphic science. In its Journal many important scientific and mathematical papers have been published. In conjunction with the Physical Society of London it has published, at considerable expense, *Science Abstracts* for the past 24 years. Its activities are ever widening and we congratulate it on its well-merited success.

The American Association at Toronto.

THE second Toronto meeting of the American Association for the Advancement of Science and of the associated scientific societies, which was held during the last week of 1921, at the invitation of the University of Toronto and of the Royal Canadian Institute, was the seventy-fourth meeting of the association. It was successful in every way, and must go on record as the most satisfactory meeting thus far held, apart from the greater four-yearly meetings. Fourteen sections of the association were represented and twenty-six associated societies. About nine hundred addresses and papers were presented, and the official registration showed an attendance of 1832 persons. The sessions were held in the buildings of the University, which are excellently adapted for such purposes, while the majority of those in attendance were very conveniently housed in the University dormitories. These arrangements proved to be unusually convenient and satisfactory.

On the afternoon of Monday, December 26, the day before the official opening, the secretaries of the sections met with the general secretary and the permanent secretary to discuss some general problems of the association. On Tuesday afternoon Dr. F. R. Moulton, professor of astronomy in the University of Chicago, showed some very fine motion pictures on scientific subjects, illustrating the use of motion pictures in education.

The meeting was formally opened on the evening of Tuesday, December 27, under the able presidency of Dr. E. H. Moore, professor of mathematics in the University of Chicago. The president was introduced by the retiring president, Dr. L. O. Howard, chief of the Bureau of Entomology of the United States Department of Agriculture, who was permanent secretary of the association for many years. Sir Robert Falconer, president of the University, delivered an admirable address of welcome, emphasising the close and friendly relations that have so long obtained between Canada and the United States. This was followed by the address of the retiring president. In the first part of his address, among other interesting things, Dr. Howard directed attention to the fact that the average age of the presidents of the British and of the American Associations since 1895 is about the same, sixty-one years and eleven months for the British and sixty-one years and five months for the American. The second part of Dr. Howard's address dealt with the topic "The War against the Insects." It was pointed out that unceasing warfare must be waged by mankind against the almost countless and omnipresent forms of insect-life, which threaten the very existence of the human race. A report of the latter part of the address appeared in *NATURE* of January 19, p. 79. The opening sessions were followed by a reception in the

room behind Convocation Hall, where members and their friends had an opportunity to meet one another and to examine the fine series of exhibits of scientific apparatus and products brought together by the local sub-committee on exhibits, of which Prof. E. F. Burton was chairman.

The Wednesday evening session in Convocation Hall was of a twofold character. Dr. W. Bateson, director of the John Innes Horticultural Institution, Merton Park, Surrey, who was present at Toronto by joint invitation of the American Association and the American Society of Zoologists, delivered a stimulating address on "Evolutionary Faith and Modern Doubts." He clearly emphasised the point that students of evolution harbour no doubts as to the fact of evolution, but the exact mode of evolution remains still an unsolved problem. He dwelt on the important progress recently made in America in relation to inheritance and the problems of genetics, especially with reference to chromosomes.

At the close of this address the session was transformed into a convocation of the University of Toronto, Sir Robert Falconer presiding, and the degree of Doctor of Science *honoris causa* was conferred on Dr. Bateson, Dr. Howard, and Dr. Moore. A reception followed the convocation.

Sir Adam Beck, chairman of the Hydro-Electric Power Commission of Ontario, addressed a general session on Thursday afternoon under the auspices of Section M (Engineering). His subject was "Hydro-Electric Developments in Ontario," and he showed a series of moving pictures illustrating the various hydro-electric projects in Ontario.

The Thursday evening conversation in Hart House was one of the greatest social functions ever held in Toronto, and was unique in the history of the association. For three hours the two thousand guests of the University and the Royal Canadian Institute enjoyed the entertainment facilities of the magnificent students' social centre in Queen's Park.

The weather throughout the meeting was fine, though cold enough to be stimulating, and with an almost unclouded sky. The necessity for using artificial ice for winter sports in Toronto furnished an agreeable surprise to those who had anticipated arctic cold.

The Toronto meeting was especially international in character. It emphasised the point that the American Association is an international organisation. Although the majority of its members are now residents of the United States, it was clearly seen at Toronto how much the future of the association depends upon Canadians. The meeting was an occasion for a pronounced increase in the Canadian membership, and it is hoped that the time will soon come when Canadian men of science will all regard the association as theirs. A wonderfully fine