

amplifying weak alternating currents such as were obtained in the reception of radio signals. This was achieved by applying a voltage to the third electrode inserted between the hot filament or cathode, and the plate, or anode. A few months later, de Forest extended the patent to cover the use of the three-electrode valve as a detector.

With a true inventor's imagination, Lee de Forest foresaw some of the possibilities of radio telephony and broadcasting; and, using an arc transmitter at the Metropolitan Opera House in January 1910, he was the first to broadcast opera arias sung by Caruso and other noted artists.

In 1914 the three-electrode valve was introduced as an oscillator and quickly replaced the arc as a source of continuous oscillations for radiotelephony. It was during the First World War, with the great demands it made on radio communications, that the thermionic valve was rapidly developed and applied to the generation of electromagnetic waves at the sending station, and to the detection and amplification of signal currents at both radio and audio frequencies at the receiver. During the period 1919-24, de Forest devoted most of his attention to the problems of talking cinematograph films, and his phonofilm was an early development in this field.

Altogether he held some 300 patents in the United States and other countries, covering such subjects as the guidance of aircraft by radio beams, the wire transmission of news pictures, and the measurement of cosmic rays. He was awarded the Cross of the French Legion of Honour, and his work was recognized in the United States by the receipt of the Edison Medal and Elliott Cresson Medal of the Franklin Institute, and by Gold Medals at the St. Louis Exhibition in 1904 and the Panama Pacific Exhibition in San Francisco in 1915. He was a founder, Fellow and past-president of the Institute of Radio Engineers (New York), the Gold Medal of which he won in 1922. Apart from various scientific papers, Lee de Forest was the author of *Television Today and Tomorrow* and his autobiography entitled *Father of Radio*.

R. L. SMITH-ROSE

Prof. B. Hague

PROF. BERNARD HAGUE died on September 29, 1960, in his sixty-eighth year, having occupied the James Watt chair of electrical engineering in the University of Glasgow since 1946, on the retirement

of Prof. G. W. O. Howe. Born at Barnsley, Yorkshire, he received his early education at the Grammar School, Eccles, and at the Central School, Rochdale. He started as a millwright apprentice in Rochdale at the age of fifteen and later served as a junior draughtsman with Messrs. Ferranti, Ltd., Hollinwood. He attended evening classes at Rochdale Technical School from where he obtained an exhibition enabling him to study at the City and Guilds College, London. He graduated with first-class honours in 1915, and in the following year obtained the diploma of the Imperial College of Science and Technology. During 1916-20 he was employed as a technical assistant at the Royal Aircraft Establishment, Farnborough, and he began his teaching career with an appointment as a lecturer at the City and Guilds College after being awarded an M.Sc. degree in 1919. His association with the late Prof. G. W. O. Howe, then a lecturer at the City and Guilds College, led to his appointment as a lecturer at the University of Glasgow in 1923, after the appointment of G. W. O. Howe to the James Watt chair of electrical engineering at that University in 1921.

In 1926 he was awarded the Ph.D. of the University of Glasgow, and became a D.Sc. in 1927 and a Fellow of the City and Guilds of London Institute in 1936.

Prof. Hague was a true scholar of wide knowledge and experience. His intellectual pursuits and admirable personal characteristics earned him the respect of many and the loyalty of his staff. He was the author of books on a.c. bridge methods, instrument transformers, electromagnetic problems in electrical engineering, an introduction to vector analysis and the method of symmetrical co-ordination in the theory of polyphase circuits. His *A.C. Bridge Methods* is still regarded as a reference text and has been translated into several languages.

Hague had a particular clarity of presentation both in his writing and in his teaching and this reflected a thoroughness and sincerity of personal endeavour. He appreciated the visual arts and had a deep interest in music, being himself an oboist of distinction. He was a member of the Royal Musical Association and previously a governor of the Royal Scottish Academy of Music.

Above all, his interest in his students was personal and genuine, and he was ever ready to give of himself to the benefit of others, thereby gaining great respect and affection from all with whom he came into contact.

J. LAMB

NEWS and VIEWS

Chemical Defence Experimental Establishment,
Porton : Dr. E. A. Perren

DR. E. A. PERREN has just retired from the post of director of the Chemical Defence Experimental Establishment, Porton, after thirty-eight years service in the War Department and Ministry of Supply. He studied chemistry at the Royal College of Science and obtained his Ph.D. in 1922 for researches in Prof. Jocelyn Thorpe's laboratory on three-carbon tautomerism. He then continued to work with Thorpe, as his assistant, at Porton and was absorbed later into the permanent staff there. He was concerned for many years with research into methods of producing

smoke-screens, and the results of this work were put to profitable use during the Second World War. His responsibilities afterwards widened and included spells of duty at headquarters and in supervisory work at the Establishment. During 1948-49 he returned to the laboratory to undertake some research in organic chemistry and was then loaned for two years to the Canadian Government to take charge of its Experimental Station at Suffield, Alberta. In 1955 he was appointed director at Porton and retires with the rank of chief scientific officer. Dr. Perren is to continue to serve the Chemical Defence Experimental Establishment in the research laboratories.