

OBITUARY.

Sir DUGALD CLERK, K.B.E., F.R.S., whose contributions to the scientific study and practical development of the internal-combustion engine placed him in the rank of great engineering pioneers, died at Ewhurst, Surrey, on the 13th November, 1932, in his seventy-ninth year.

He was the son of Mr. Donald Clerk, and was born at Glasgow on the 31st March, 1854. After serving as an engineering apprentice from 1868 to 1871, in the works of his father and of Messrs. H. O. Robinson and Co., Glasgow, he devoted the next five years entirely to the study of chemistry and physics, which he pursued at the Anderson College, Glasgow, and at the Yorkshire College of Science, Leeds, where he was an assistant to Professor J. E. Thorpe. He then returned to Glasgow, and was for a time senior assistant to Dr. E. J. Mills, Young Professor of Technical Chemistry at the Royal Technical College.

At that time (1876) the development of the internal-combustion engine, through the work of Lenoir, Beau de Rochas, and Otto and Langen, had reached the stage of the production of Otto's silent engine, and Clerk's attention was drawn to this form of prime mover by a 3-HP. Otto-Langen engine at work in a joiner's shop in Glasgow. As a result he designed an improved engine of the air pressure vacuum type, with which he experimented; and in 1877 he joined the firm of Thomson, Sterne and Co., of Glasgow, where he continued until 1885 to invent, design, construct, and test gas engines. In 1878 he built a true compression engine developing 3 B.H.P. at about 200 revolutions per minute, which was exhibited at the Royal Agricultural Society's show in July, 1879. In 1881 he produced an engine in which the two-stroke cycle (Clerk cycle) was adopted, and engines of that type were produced in considerable numbers until 1890, when the lapse of the Otto patent caused extensive adoption of the Otto cycle, and the Clerk cycle suffered a temporary eclipse until the increase in the power of internal-combustion engines rendered it necessary to adopt a type involving less bulk for a given power.

From 1886 to 1888 he was engaged on this work with Messrs. Tangyes, Birmingham. In the latter year he joined his personal friend Mr. G. Croydon Marks (now Lord Marks), Assoc. M. Inst. C.E., in his practice as a consulting engineer and international patent agent, and this partnership continued until Sir Dugald's death.

From 1892 to 1899 he was Engineering Director of Kynoch's, Ltd., Birmingham, and designed new works and machinery for the production of ammunition; and from 1902 he was a director of the National Gas Engine Company. Throughout his life he continued his researches on the internal-combustion engine and its thermodynamical problems, as well as on the application of gas as fuel and for heating and lighting. He made many contributions to the literature of those subjects and wrote a standard text-book on the internal-combustion engine.¹ His earliest Paper to The Institution,² "The Theory of the Gas Engine," was presented in April, 1882. It was discussed by many eminent engineers and scientists, and was awarded a Watt Medal and a Telford Premium. It was followed by Papers "On the Explosion of Homogeneous Gaseous Mixtures" (1886),³ "Recent Developments in Gas Engines" (1896),⁴ and "On the Limits of Thermal Efficiency in Internal-Combustion Motors" (1907).⁵ For this last Paper he was again awarded a Telford medal. In 1928 he contributed a fifth Paper⁶ on "Standards of Thermal Efficiency for Internal-Combustion Motors." He delivered two James Forrest Lectures before The Institution, one⁷ in 1904 on "Internal-Combustion Motors" and one⁸ in 1920 on "Coal Conservation in the United Kingdom."

He was a member of the Institution Committee on Standards of Efficiency of Internal-Combustion Engines, and was Joint Secretary of the British Association Committee on Gaseous Explosions.

During the war he was Director of Engineering Research at the Admiralty, a member of the Advisory Committee for Aeronautics at the Air Ministry, Chairman of the Internal-Combustion Engine Sub-Committee of that body, and a member of the Ministry of Munitions Inventions Committee. He was also a member of the Water-Power Resources Committee appointed by the Board of Trade in 1918, Chairman of the Water-Power Committee of the Conjoint Board of Scientific Societies appointed in 1917, and a member of the University Grants Committee.

For his services to the nation during the war he was created K.B.E. in 1917. In 1908 he was elected a Fellow of the Royal Society, from which he received in 1924 the Royal Medal.

The Honorary Degree of D.Sc. was conferred upon him by the Universities of Manchester and Leeds, that of LL.D., by Glasgow and St. Andrews, and that of D.Eng., by Liverpool University. He was President of the Junior Institution of Engineers in 1905, of the

¹ First published as "The Gas Engine" (London, 1886); subsequently as "The Gas, Petrol and Oil Engine." New ed., London, 1909.

² Minutes of Proceedings Inst. C.E., vol. lxix, p. 220.

³ *Ibid.*, vol. lxxxv, p. 1.

⁴ *Ibid.*, vol. cxxiv, p. 96.

⁵ *Ibid.*, vol. clxix, p. 121.

⁶ *Ibid.*, vol. 225, p. 265.

⁷ *Ibid.*, vol. clviii, p. 276.

⁸ *Ibid.*, vol. ccx, p. 268.

Engineering Section of the British Association in 1908, of the Institution of Gas Engineers in 1920, and of the Institution of Automobile Engineers in 1908-9; and Vice-President of the Institution of Mechanical Engineers in 1917-19. In 1915-17 he was Chairman of the Council, and in 1923 he became a Vice-President, of the Royal Society of Arts, which awarded him in 1922 the Albert Medal for his work in connection with the development of the internal-combustion engine. In 1906 he delivered before the society a course of Cantor lectures on that subject, and in 1917 the first Trueman Wood lecture on Discovery and Invention. He was Chairman of the Delegacy of the City and Guilds (Engineering) College from 1918 to 1920, and a member of the Court of the Goldsmiths Company, of which he was Prime Warden in 1926-7. His election in 1913 to the Athenæum Club took place under the rule which empowers the Committee to elect annually a number of distinguished men; and he was a member also of the Reform and other clubs.

Sir Dugald Clerk was elected into The Institution as an Associate Member on the 8th January, 1889, and was transferred to the class of Members on the 12th December, 1899. In 1913 he became a Member of Council, and in 1928 a Vice-President, and he was elected President for the year 1932-33 at the Annual General Meeting in May, 1932. In the following September, however, he intimated to the Council that the state of his health would not permit of his taking office, and, as already stated, he died on the 12th November.

He bequeathed to The Institution a legacy of £3,000 and a share (about one-tenth) of his residuary estate.

He married, in 1883, Margaret, daughter of Mr. Alexander Hannay, of Helensburgh; she died in 1930.

JOHN HENRY JOHNS, who died at Bordighera, Italy, on the 23rd November, 1932, was the second son of James Johns, Mining Engineer, of Camborne, and was born at St. Hilary, Cornwall, on the 5th December, 1857.

He was educated at the Camborne School of Mines and the Royal School of Mines, London, and obtained practical mining experience at the Wheal Bassett and other mines in Cornwall. In 1881 he went to India as Engineer and Manager of the Nine Reefs gold mine and was engaged in that capacity for 7 years. In 1889 he went to South Africa, where the remainder of his active engineering career was spent. His first work there (1889-93) was the management of the works of the Ferreira Gold Mining Company, and from 1893 to 1901 he was General Manager of that company, and of the Wemmer Gold Mining Company, as well as Consulting Engineer to the Worcester Gold Mining Company.

In 1901 he was appointed Consulting Engineer to the important group of gold mines controlled by Messrs. Barnato Bros. and the