OWEN CHARLES DALHOUSIE ROSS, third son of Mr. Edward Dalhousie Ross, was born at St. Germain, near Paris, on the 8th of January, 1823. After being educated at Heidelberg and at Darmstadt, he became a pupil of Mr. Edward Oliver Manby, a younger brother of Charles Manby, in June, 1841. Two years later he was removed to the Paris office of John and Edward Manby; and in 1844 he went to Spain, where he was engaged for three years as an assistant engineer at the works and mines of the Asturian Iron Company and on railway construction in Andalucia.

In the spring of 1847 Mr. Ross was again in England, and for the following three years he was engaged on various railway works at home. During a brief visit to Paris in the early part of 1848 he witnessed the second French revolution and the flight of Louis Philippe. In 1851 he returned to Spain as Resident Engineer on the Madrid and Alicante Railway, the first of the great trunk lines constructed in that country, and for two years and a half had charge of the execution of the works on a division of 35 miles of that line. On the completion of that undertaking he was occupied for some years, in conjunction with his brother, the late Mr. Henry Francis Ross, on the surveys for several hundred miles of railway in different parts of Spain—from Aranjuez to Cuença (100 miles), Castillejo to Toledo (17 miles), Almorchon to the coal-fields of Belmez (40 miles), Belmez to Cordova (45 miles), Rivadeo (a port in the Bay of Biscay) to Lugo (65 miles), and thence to Monforte (62 miles); all of which required careful study, as they traversed much rough country, such as the Sierra Morena and the Cantabrian Mountains. With the exception of the branch from Rivadeo to Lugo, these lines have since been constructed and are now open to traffic.[1] From 1862 to 1866 Mr. Ross was in charge of the execution of the works of the Utrera-Moron and the Utrera-Osuna railways in Andalucia, and he was subsequently engaged on the construction of the lines between Seville and Cordova *viâ* Ecija, and between Seville and Malaga *viâ* La Roda. He was also in practice on his own account in Madrid, and constructed tramways in that city from the Puerto del Sol to the Fuente Castellana, and obtained a concession for the "Mataderos" (slaughter-house and market), afterwards erected by the late Mr. George B. Crawley, contractor.

In 1868 Mr. Ross was in London busily engaged in working out the details for, and in projecting, a deep-sea cable from England

[1] Minutes of Proceedings Inst. C.E., vol. cxvi. p. 384.

to Bombay, *viâ* Gibraltar, Malta, Alexandria, the Red Sea and Aden. The original Red Sea cable having failed in 1860, the only means of telegraphic communication between England and India was *viâ* Constantinople and the Persian Gulf, and in their transit through various foreign countries messages were frequently delayed and inaccurately repeated. It was most desirable, therefore, to lay down an entirely English line, under one management and control. He spent much time on this project, which, however, the India Office declined to take up.

Mr. Ross's connection with Spain was renewed in 1870 under circumstances which proved most unfortunate for him. In July of that year he purchased the Hellin sulphur mines in the province of Murcia and formed an English company to work them. For a year and a half he was in Spain endeavouring to work those mines, but his efforts were unsuccessful and the capital he had thus embarked was practically lost. He returned to England and from that time failed to obtain remunerative engineering employment. He devoted himself to the prosecution of various inventions and to such literary work as he could obtain, and indeed for the last twenty years of his life may be said to have had a hard struggle for bare existence. In 1874 he published a short work in which, in view of the possible exhaustion of the coal-fields of Great Britain, he advocated the utilization of petroleum and other mineral oils as fuel and as gas.[1] After a series of experiments commenced in the autumn of 1881, Mr. Ross produced a primary battery—which he called his "water battery"—capable of generating electric energy without the use of steam-engines, dynamos or accumulators. A full description of this invention may be found in a pamphlet entitled "The Ross Primary Battery," which is preserved in the Library of the Institution.[2] He devoted many years to this subject and in 1889 patented a nitrate battery, from which the zinc could be recovered and the nitrate solution, after it had done duty in the battery, could be used for the fertilisation of land.[3] He also wrote a popular lecture on "The Three Allied Forces: Chemical Affinity, Electricity, and Magnetism,"[4] which contained some original views and suggestions interesting to the student of electricity. Among his miscellaneous writings are pamphlets entitled "Spain and the War with Morocco,"[5] "The Depression in Agriculture and

[1] "Air as Fuel; or, Petroleum and other Mineral Oils utilized by Carburetting Air and rendering it Inflammable." London, 1874. E. & F. N. Spon.

[2] Tracts 8vo., vol. 437.

[3] *Ibid*, vol. 517.

[4] *Ibid*, vol. 493.

[5] *Ibid*, vol. 178.

Trade,"[1] and "Reminiscences of Grattan's Parliament."[2] To the Institution he presented in 1875 a Paper on "Petroleum and other Mineral Oils applied to the Manufacture of Gas,"[3] and for many years he was a constant and valued contributor to Section III. of the Minutes of Proceedings devoted to abstracts of articles appearing in foreign Transactions and periodicals. The inventions for which he from time to time took out patents embraced a wide range, including the utilization of petroleum as fuel, the separation of sulphur from ores, refrigerating apparatus for railway-carriages, galvanic batteries, electric lamps for mines, and the utilization of waste products from electrical batteries.

In 1894 Mr. Ross was busy with an ingenious idea for a boiler, which, owing to its large heating-surface, he thought might effect great economy of fuel. In January, 1895, just after he had prepared the specification and taken out a provisional patent for this invention, he was struck down with paralysis, from which he never completely recovered. As soon as he got a little better his thoughts went back to his boiler, for the invention had to be completed and put into workable shape. He was powerless, however, to make drawings or to explain his meaning, and there is no doubt that the anxiety and worry of this matter hastened his death. He went to St. Leonards-on-Sea, where he suffered a second seizure in the street and died on the 24th of June, 1895, without regaining consciousness.

A well-educated and accomplished gentleman, Mr. Ross unfortunately spent the latter part of his life in the pursuit of ideas, phantoms which could never be realized. He bore his losses, however, and the persistent bad fortune of his latter years, with a courage and dignity which inspired admiration and respect. As a friend he was amiable and true, and the variety of his knowledge and the neat way in which it was stored in his brain made him a most interesting and instructive companion. He was elected an Associate on the 29th of June, 1847, and was transferred to the class of Member on the 19th of May, 1868.

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[1] Tracts 8vo., vol. 434. [2] *Ibid*, vol. 434.
[3] Minutes of Proceedings Inst. C.E., vol. xl. p. 150.