OBITUARY.

SIR GEORGE BARCLAY BRUCE, born at Newcastle-on-Tyne on the 1st October, 1821, was the son of the late Mr. John Bruce, the founder of an academy at that place, of high reputation throughout the northern counties. In his father's academy the subject of this memoir received his early education, and at the age of 15 he was apprenticed to the firm of Robert Stephenson and Company, serving for 5 years in the locomotive works at Newcastle, where most of the engines for the early railways were built. Robert Stephenson had himself been a pupil at Mr. John Bruce's academy and sought to repay his old teacher by giving the son a start in life, besides befriending him in many ways in his after career.

Having served his apprenticeship as a mechanical engineer, young Bruce turned his attention to railway construction, and from 1842 to 1844 he was engaged upon the construction of the Newcastle and Darlington Railway, which was opened in the latter year. He then acted as Resident Engineer on the Northampton and Peterboro' Railway, and subsequently, while still only 24 years of age, he was appointed by Robert Stephenson and Thomas Elliot Harrison, as Resident Engineer on the Royal Border Bridge which carries the North Eastern Railway over the Tweed at Berwick. This splendid example of a masonry viaduct, among the largest of its kind in the world, is 2,160 feet in length and 126 feet in height from the bed of the river to the top of the parapets. The construction of the work called for considerable resource on the part of the young engineer and on its successful completion in 1850 it was opened by Queen Victoria. The account[1] of its erection which George Bruce presented to The Institution in 1851 won for its Author a Telford Medal. Subsequently he was entrusted with the construction of

[1] "A description of the bridge over the River Tweed on the line of the York, Newcastle and Berwick Railway;" Minutes of Proceedings Inst. C.E., vol. x, p. 219.

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the Haltwhistle and Alston Branch of the Newcastle and Carlisle Railway, including some difficult work over Hurlston Moor, but before its completion his services were transferred to a distant sphere.

In 1851 he became one of the pioneers of railway construction in India, and for the first 18 months he was engaged upon the construction of the Calcutta section of the East Indian Railway. In 1853 he was transferred to the appointment of Chief Engineer of the Madras Railway, a position which he held until the end of 1856, when in consequence of his health breaking down he was obliged reluctantly to close his service in India. To Sir George Bruce belongs the credit of having introduced in the construction of the Madras Railway the departmental system of carrying out works without the intervention of contractors. From experience gained in Bengal he learned the difficulty of obtaining reliable men of this class and he decided to dispense with them in Madras, taking upon himself the responsibilities and risks of direct construction. He also set himself against the method commonly employed in India of carrying out public works by forced labour, and succeeded by patience and upright dealing in attracting the natives to his works as free labourers. In railway construction he adopted the method of building bridges in sandy foundations upon brick wells sunk by native divers, described in his Paper on the Poiney Viaduct [1] presented to The Institution in 1857.

Sir George Bruce laid out and partly constructed about 500 miles of the Madras Railway, and before leaving in 1856 he had the satisfaction of seeing the first length opened for traffic at a cost of only £6,000 per mile, a figure which justified his experimental adoption of the departmental system and demonstrated the economy of his management. Although his actual residence in India was of comparatively short duration, his work was not without its influence on later railway construction there, and he retained until the end of his life a warm interest in Indian Railways.

Shortly after his return home he became Consulting Engineer to what is now the South Indian Railway, a system of some 1,300 miles on the metre gauge, a position which he held for the long period of 50 years. From 1894 he also acted as Consulting Engineer to the Great Indian Peninsula and Indian Midland systems, comprising a length of over 2,800 miles of broad-gauge line.

He took an active part in the "battle of the gauges" which was fought over the question of the gauge of Indian Railways, and gave

[1] Minutes of Proceedings Inst. C.E., vol. xvi, p. 449.

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rise to long and animated discussions at The Institution in 1873. He was strongly opposed to the introduction of a gauge other than the standard of 5 feet 6 inches which then existed, and although in later years he had to do with both the broad and the narrow gauges, he always maintained that a grave error had been made in introducing the latter.

On his return from India in 1856, he established a consulting practice in Westminster, and shortly afterwards he proceeded to Canada to inspect the Victoria Bridge which carries the Grand Trunk Railway over the St. Lawrence River at Montreal. Robert Stephenson, who had designed this bridge, did not live to see it completed, and Sir George Bruce undertook its final inspection in deference to a request which had been left by his old master.

In the early sixties, Sir George Bruce was much occupied with the construction of railways in Germany, and was Chief Engineer of the Tilsit and Insterburg line, the East Prussian Railway from Pillau to the Russian frontier, and the Berlin-Gorlitz Railway, all of which have since become State railways. During the same period he was engaged in the construction of railways in England, being Engineer to the Kettering, Thrapston and Huntingdon, the Peterboro', Wisbech and Sutton, the Whitehaven, Cleator and Egremont, and the Stonehouse and Nailsworth Railways, which have since been absorbed in the London and North Western and Midland systems.

Between 1873 and 1876 he constructed a railway for the shipment of ore at the Port of Huelva from the Rio Tinto Copper Mines in the South of Spain, together with a pier and shipping facilities at Huelva. This pier, which is a work of considerable magnitude embodying some novel features of construction, was the subject of a Paper read at The Institution in 1878.[1] He also acted as Engineer of the East Argentine Railway, the Buenos Ayres Grand National Tramways and other works in South America, and the Beira Railway in South Africa.

During his later years Sir George Bruce's services were much in request as an arbitrator, and he was a member of the Royal Commissions of 1893 and 1899 on the Water Supply of London, of which Lord Balfour of Burleigh and Lord Llandaff were respectively Chairmen. In 1883 he visited America to be present at the inauguration of the Northern Pacific Railway, and after his return he gave to The Institution an interesting account of his reception and experience. During the last 20 years of his life Sir George was associated in partnership with Mr. Robert White.

[1] Minutes of Proceedings Inst. C.E., vol. liii, p. 130.

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He was elected a Member of The Institution in 1850, became a member of Council in 1871, a Vice-President in 1882, and President in the Royal Jubilee year of 1887, and again in 1888. During his second year of office the Queen conferred upon him the honour of knighthood, and in 1889 he was created an Officer of the Legion of Honour by the President of the French Republic.

The foregoing is a brief record of the principal engineering achievements of Sir George Bruce during a long and busy career, but apart from professional work, he found time and energy to devote to many private interests. He was deeply interested in the question of public education, and for some years was an active member of the late School Board for London. His chief interest, however, lay in the welfare of the Presbyterian Church, of which he was a leading member. He was for 30 years Convener of the Church Extension Committee, and rendered yeoman service in the building of churches, and in liberally contributing to them. He was also one of the foremost in promoting the union, effected in 1876, of Presbyterians in England.

Sir George married in 1847 Helen Norah, daughter of Mr. Alex. H. Simpson, of Paisley, by whom he had one son and four daughters. He passed away peacefully at his London residence, 64 Boundary Road, St. John's Wood, on the 25th August, 1908, at the advanced age of 87 years. The Institution being in recess, the President, on its behalf, conveyed to the family of Sir George Bruce an expression of condolence and of regret at the loss sustained by The Institution, the terms of the President's letter being subsequently adopted by the Council.

RICHARD VICARS BOYLE, C.S.I., formerly of the Public Works Department of India, and well known for his memorable defence of the Engineer's house at Arrah during the Mutiny, died at his residence in London on the 3rd January, 1908, at the age of 85.

The third son of the late Mr. Vicars Armstrong Boyle, of Dublin, the subject of this memoir was born in that city in 1822. After being privately educated, he was for 2 years attached to the trigonometrical survey of Ireland, and subsequently served a pupilage to the late Mr. C. B. Vignoles, Past-President, on railway works in England. Returning to Ireland on completing his apprenticeship, he was employed for several years as contractor's engineer

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