

superintend the work under Mr. Rouse, who, after Mr. Robert Stephenson's retirement, had taken service directly under the Viceroy.

On the completion of the bridge towards the end of 1859, Mr. Harrison returned to England, and soon afterwards obtained the appointment of Engineer-in-chief of the Scinde, Punjab and Delhi Railway, Mr. G. P. Bidder being Consulting Engineer. Mr. Harrison held that appointment for fifteen years, and during that time carried out works of great magnitude and difficulty. He was highly esteemed and thoroughly trusted by the company, and at a time when the office of General Agent became vacant they indicated their confidence by proposing that he should accept that important post. Thus for some years he carried on successfully the responsible work of General Manager of the railway in addition to the heavy duties of Engineer-in-chief. Finding his health failing after fifteen years of service in a trying climate he resigned his position in 1875, and returning to England retired from further practice of the profession. Privately Mr. Harrison was universally liked for his generous character and for his kind and genial disposition. He was a keen sportsman and an excellent shot, and nearly to the end of his life he had no greater enjoyments than those afforded by the shooting season. His death took place at the Hôtel des Anglais, Mentone, after a rather long illness arising from heart disease, on the 24th February, 1899, in his 74th year.

He was elected an Associate on the 7th April, 1857, and was transferred to the class of Members on the 12th April, 1864.

JEREMIAH HEAD, born in 1835 at Ipswich, was a son of the late Mr. Jeremiah Head, J.P., who belonged to a Quaker family well known in that neighbourhood. He received his first instruction at home, and subsequently went to a private school at Ipswich, and afterwards to the Friends' School at Tulketh Hall, Lancashire. At an early age he was articled to Robert Stephenson, and served his time at the well-known locomotive and marine engineering works at Newcastle-on-Tyne, subsequently being promoted to a position on the civil engineering staff. In 1856 he was entrusted with the design and superintendence of the construction of a large pair of condensing engines, for driving the Priestgate Woollen Mills at Darlington, belonging to the firm of Henry Pease and Co. These engines were fitted with a para-

bolic governor, controlled by an air cataract, and comprised several other details, specially designed by Mr. Head. In the following year he designed and superintended the building and erection of another pair of engines of somewhat similar character for the paper mills of Messrs. Anandale and Co., of Shotley Bridge, near Durham.

A little later he was appointed resident engineer for the re-building of the iron bridge over the Wear at Sunderland, which occupied two years, and was Stephenson's last public work of magnitude. He was then selected to co-operate with the late Mr. John Fowler in bringing to perfection the steam plough, with which that gentleman's name is associated, and in commencing the extensive works at Leeds, which became the principal seat of its manufacture. The set of steam ploughing apparatus, which succeeded in gaining the prize of £500, offered by the Royal Agricultural Society, and was exhibited at the Chester Show in 1858, was mainly constructed at the Newcastle Works, to the designs and under the supervision of Mr. Head. He also devised and patented a system of lamp signals, whereby steam ploughing operations might be carried on at night.

In the year 1863, in conjunction with Mr. Theodore Fox, J.P., Mr. Head built large ironworks at Middlesbrough, known as the Newport Rolling Mills, which he carried on until 1885. For several years an industrial partnership existed between the employers and the men at those works.

Mr. Head was one of those who advocated the establishment of the School Board system at Middlesbrough, and he sat on the first board, Middlesbrough being the first town in England to apply for a School Board on the passing of the Act. In 1864 he originated the Cleveland Institution of Engineers, which has contributed greatly to the success of the iron and steel industries at Middlesbrough. He occupied the position of Honorary Secretary for three years and of President for three years.

Since 1885, although still deeply interested in the Cleveland iron and steel industries, Mr. Head devoted his time and energies almost exclusively to consulting engineering. He designed and supervised the carrying out of several iron and steel works plants; made numerous investigations, sometimes under an order of court, sometimes at the instance of private owners, as to properties in litigation, or otherwise in difficulties.

Of late years he paid frequent visits to the United States, where he had much professional work. He made exhaustive reports on various properties, more especially iron, coal and manganese

mines, and iron and steel works, for English and foreign clients. He was frequently retained as technical expert in law and arbitration cases connected with mechanical engineering and metallurgy, and still more often as sole arbitrator. He was frequently agreed to on both sides as referee on wages questions between large employers and their workmen, and he always succeeded in arriving at decisions which secured the respect of both parties. As a valuer of technical and other properties, Mr. Head had large experience, the aggregate amount which passed through his hands in this way reaching several millions during the last few years.

Mr. Head contributed several Papers to the British Association, the Federated Institution of Mining Engineers, the Institution of Mechanical Engineers, the Iron and Steel Institute, the Cleveland Institution of Engineers, the Sheffield Technical School, and various other societies, as well as numerous articles to the current technical literature of the day. Among his more recent contributions may be mentioned: "English and American Methods of Manufacturing Steel Plates,"¹ before this Institution in May 1896, for which he was awarded a Watt Medal and a Telford Premium; his joint Paper with his son, Mr. A. P. Head, on "Lake Superior Iron Ore Mines," before the same body in February, 1899; "Cleveland Industries" before the Institution of Mechanical Engineers in August 1893; and "Mechanical Science as exemplified in Nature," being a presidential address before the British Association, Section G, September 1893.

In 1885, having long been a member of Council, he was elected to the Presidential Chair of the Institution of Mechanical Engineers, and held that position for two years. In 1894 at the Nottingham Meeting, he presided over Section G, Mechanical Science, of the British Association for the Advancement of Science. He was one of the original members of the Iron and Steel Institute, the Treasurer and a member of the Board of Management of the British Iron Trades Association, and a member of the Board of Conciliation and Arbitration of the North of England Manufactured Iron Trades. He was a member of Council of the Federated Institution of Mining Engineers.

Since January, 1894, Mr. Head had been practising in Victoria Street, Westminster, in partnership with his son, Mr. A. P. Head.

Mr. Head died at Hastings on the 10th March, 1899, in his sixty-fourth year. His career was distinguished by great energy

¹ Minutes of Proceedings Inst. C.E., vol. cxxvi. p. 132.

and untiring zeal, and he acquired valuable knowledge and extensive experience of mechanical engineering and metallurgical practice. The industrial partnership above referred to greatly assisted to introduce the system of co-operation into the Middlesbrough district, and the iron industry of Cleveland owes much to his example and influence. Mr. Head was elected a Member of this Institution on the 2nd March, 1875.

WILLIAM HENDERSON, son of the late Mr. James Henderson, of Glasgow, engineer and architect, was born on the 24th January, 1854. After serving a pupilage with his father he was articled to Messrs. Smith and Wharrie, engineers and surveyors, of Glasgow. He was then engaged for five years, from 1874 until 1879, as an assistant to Mr. James Wilson, who at that time was engineer to the Water Trust of Greenock.

In November, 1879, Mr. Henderson started in practice on his own account in Glasgow, and during the seven years following he designed and carried out waterworks for Dalbeattie, Annan, Stranraer, Maybole and Kilmarnock, and drainage works for Dalbeattie. He also assisted Mr. James M. Gale and Mr. James Wilson in connection with extensions of the Loch Katrine works for the water-supply of Glasgow, waterworks for Dumfries, Aberdeen, Ayr and Girvan, and other works.

Mr. Henderson's connection with the Colony of Victoria commenced in the year 1886, when he was engaged in making reports and estimates for irrigation projects under the instructions of the Royal Commission on Water-Supply. He was then appointed executive engineer to the Victorian Water-Supply Department, in which capacity he designed and superintended the construction of national irrigation works in the district of Goulburn. He was also engaged in preparing a report and estimates for a supply of water for domestic and stock purposes over about 17,000 square miles in the Mallee District. He retired from the service of the Victorian Water-Supply Department in 1895, and started to practise on his own account as a hydraulic engineer.

Mr. Henderson was an indefatigable worker, and to the unsparing energy he displayed in the performance of his duties may be attributed perhaps the early close of his career. About the end of 1897 he was stricken with paralysis, from which he made a partial recovery, but in the following autumn a relapse