

Mr. Miller was elected a Member of the Institution of Civil Engineers in June, 1844, after he had held the position of Resident Engineer of the London and Greenwich line for upwards of five years, and when about to proceed to Jamaica. When in London, he was a frequent visitor at the Institution, which he always regarded with great interest, and among the Members of which he deservedly had many warm and attached friends.

MR. RICHARD ROBERTS was born at Carrighova, in the parish of Llan-y-Mynech, North Wales, on the 22nd of April, 1789. The circumstances of his father, who was by trade a shoemaker—with which he combined the post of keeper of the “New Bridge” toll-gate of the Oswestry and Welshpool Tramway—were not such as to enable him to afford other than the smallest amount of education for his son Richard, who during his first residence in Manchester, was employed by a wood turner in Salford to turn the wheel. In his master's absence, he tried occasionally to work at the lathe, and thus taught himself wood turning, in which art he always thought he excelled any other man. About the year 1809, he was engaged as a pattern-maker at the iron works of the late Mr. John Wilkinson, at Bradley, and at Gospel Oak, near Bilston, Staffordshire. When the late Mr. Aaron Manby commenced the foundry trade, and the building of steam engines at the Horseley Iron Works, Tipton, he engaged Mr. Roberts as a leading hand in the pattern-shop; and the introduction of new tools in that rising manufactory most probably contributed to directing his attention to labour-saving machines. For the purpose of obtaining a greater insight into the construction of steam engines, he removed to London, where he worked, chiefly as an iron-turner, first at Mr. Holtzapffel's, and then at the engine factory of Messrs. Maudslay and Field, where, under such masters, he enjoyed ample opportunities of extending his mechanical knowledge, among which should be prominently mentioned the privilege of working at the block machinery of the late Sir Isambard Brunel, in which may be found the germ of all subsequent labour-saving machines. All this while he had striven hard to acquire some amount of education, facilities for which had been denied to him during early life. Feeling that Manchester afforded the widest field for an inventive genius, he returned to that place and commenced business on his own account in Deansgate, as a lathe and tool maker, and as a general turner, in which capacity he frequently afforded valuable counsel and assistance to mechanical inventors by whom he was employed. Here he made the first machine for planing iron, which is still preserved in the Museum of Patents, South Kensington, also the back-geared lathe head-stock, having

the cone pulley running loose upon the spindle, and likewise an improved screw-cutting lathe. His slotting machine, and wheel-cutting engine soon followed, and these, with his improvements in the slide lathe, may be regarded as among the most important of the aids which his inventive talents have given to construction. This series of inventions introduced a precision, celerity, and cheapness into the production of machinery never before known, the results extending not only to the largest engines of ocean steamships, and to the endless machinery of the great factories of Lancashire, but also down to the railway-ticket press and the sewing-machine. Up to the year 1823, Mr. Roberts carried on business under the firm of Hill, Roberts, and Co.; after 1824, it became Sharp, Roberts, and Co., for his great talents and practical abilities having become well known, Mr. Roberts was invited to enter into partnership with the late Mr. Thomas Sharp, in conjunction with whom the Atlas Works, still ranking among the largest and most productive mechanical engineering factories in the kingdom, were established. Here, in 1825, in consequence of the formidable strikes among the hand-mule spinners, Mr. Roberts was led to the production of perhaps the most ingenious, as it has been one of the most valuable machines in the whole range of textile manufactures. This is the self-acting spinning mule, requiring only the attention of a child in the production of a thousand threads; many millions of spindles are now worked upon that principle in all civilized countries. Shortly after the opening of the Liverpool and Manchester Railway, Mr. Roberts directed his attention to the improvement of the locomotive engine, and many of his original refinements in its structure and workmanship may still be traced in the railway engines of the present day. One of his most valuable improvements introduced into the manufacture of machinery, and originally applied by him in 1825 in the construction of his spinning mules, was the application of standard templates to the forms and dimensions of every part. This system permitted the exact repetition of every portion of a machine to an endless extent, and it is that whereby the Enfield rifle is now made under so perfect a division of labour, that any one of a hundred thousand like parts fits exactly any one of an equal number of corresponding parts. The connection with the Atlas Works was dissolved on the decease of the senior partner, the late Mr. Thomas Sharp, in 1843, and from that date Mr. Roberts carried on business at the Globe Works, where, for a short period, he had the assistance, as partners, of Mr. B. Fothergill, and Mr. J. Dobinson; those gentlemen, however, soon retired from the concern, which was wound up in 1852, from which time Mr. Roberts practised in London as a Consulting Engineer, having as a partner for some time Captain T. E. Symonds, R.N.

During his long and active career he had, in some way or other, been connected with most of the mechanical improvements of the period. Thus, in 1847, at the request of the contractor for the great tubes of the Conway Bridge, Mr. Roberts produced the "Jacquard Punching Machine," an automatic tool of great power, whereby the rivet-holes in a large plate are punched to any required pattern and pitch, without need of templates or marking, and with a precision which enables any two of a thousand plates to be riveted together without subsequent correction of the rivet-holes, as had always before been necessary. Without this invention the tubes of the Conway Bridge could not have been completed in time, while their strength was also increased, and their cost of construction was reduced. The same punching machinery was employed in the construction of the Boyne Viaduct, the Victoria Bridge over the St. Lawrence, at Montreal, and for the Jumna Bridge of the East Indian Railway.

In 1852, he designed and made widely known his improved plans for ocean steamships of large size, with the improved form of bow now adopted by our own and by the French naval authorities, and having besides double keels and twin screws, with independent engines, as applied with remarkable success in several steam-vessels of recent construction.² These plans were for some time urged upon the Admiralty, and in 1855, they were submitted by Mr. Roberts, in person, to the Emperor of the French, who examined them critically, and in whose navy some of their peculiarities have been already adopted. It is needless to say that neither for these, nor for any of the numerous inventions which have proved of such eminent utility to his country, did Mr. Roberts ever receive any recognition from the Government: not even "the little bit of ribbon," which foreign sovereigns are so well aware are efficient stimulants to exertion among all classes of men.

Mr. Roberts obtained nearly thirty patents in England, and his inventions were of the most useful and diversified kinds, including the following subjects:—Hand and power looms, machines for preparing and spinning fibrous substances, steam engines, locomotive carriages, apparatus for punching, perforating, and shearing metals, beetling and mangling machinery, clocks, watches, and other time-keepers, machines for hoisting weights, telegraphic communication, weaving and cutting plushes, velvets, carpets, &c., fluid meters, pumping apparatus, screw propellers, churns for agitating and evaporating fluids, turbines, hydraulic presses, steam-ships and other vessels, anchors, steam boilers, life-boats, war ships and their armaments, casks, machinery for cutting paper, leather, cloth, &c., for punching,

¹ *Vide Minutes of Proceedings Inst. C.E.*, vol. xvii., p. 191.

² *Ibid.*, vol. xiii., p. 39.

drilling, and riveting, omnibus and other carriages, folding fabrics, mechanism for engraving and otherwise copying paintings and other designs on flat and curved surfaces, &c. &c.

Mr. Roberts was a man of extraordinary energy of character and of singleness of view. Confidence in his own powers prevented his admitting any insuperable difficulties: disappointment never checked him, and his industry was unceasing. The elements of commercial success were, however, wanting in his character, and although at one period he had amassed some property, it was almost all expended in experiments, and in the later years of his life he was in straitened circumstances. Still he worked on without repining: he felt that he was blessed in a daughter, whose filial piety and affection made up for all the worldly crosses he experienced. That excellent lady, Miss Roberts, devoted her life to her duty to her father, and in her arms he expired on the 11th of March, 1864, in the 75th year of his age.

Mr. Roberts joined the Institution of Civil Engineers as a Member, on the 20th of March, 1838. His residence in the country prevented his frequent attendance at the meetings, but whenever he was in London he made a point of taking part in the discussions, when his opinions and his reminiscences of the origin of inventions were always listened to with attention.

The career of Mr. Roberts was remarkable, and it should be carefully written by some one who could investigate impartially the numerous inventions and improvements to which claim could justly be laid for him, and who, at the same time would, with equal justice, show where his inventions have been pirated.

MR. WILLIAM SIMPSON, the sixth son of the late Mr. Simpson, the well-known Engineer of the Chelsea and other Waterworks, was born at Chelsea on the 29th of July, 1809. He was brought up in the office and upon Engineering works under his brother, Mr. James Simpson (Past-President Inst. C.E.), and was by him placed at the head of the engine and machine manufactory in Pimlico, of which he was admitted as a partner. From these works proceeded several powerful and very good pumping engines, and a large quantity of other kinds of machinery. Ultimately Mr. William Simpson seceded from the Grosvenor Works and created for himself an establishment near Woolwich, for the construction of iron vessels, boilers, bridges, &c. It was on his return from these works on the evening of Saturday, May 7th, 1864, that the accident occurred by which he lost his life. He was observed to be sitting dozing on the rail of the steamer, and it is supposed that he lurched forward and, in endeavouring to