

PHILIP HENRY MACADAM was the second son of the late Mr. Philip MacAdam, of Blackwater House, co. Clare, Ireland, where he was born on the 13th of February, 1831. When only eighteen years of age he migrated to the United States and entered the office of Mr. Silas Seymour, who was then New York State Engineer. After the usual routine of engineering pupillage as practised in America, during which he served on the Niagara Falls Railway survey and on the construction of the Buffalo branch of the New York and Erie line, young MacAdam was appointed an Assistant Engineer on the Attica and Allegheny Valley Railroad. At the close of 1853 he left the United States for a better appointment in Canada as an Assistant Engineer on the Port Hope and Lindsay Railway. After being engaged on survey work he was placed in charge of the construction of a division of 25 miles, on the completion of which, in 1855, he returned to Ireland. For a short period he was engaged on some land drainage schemes, but at the beginning of 1857 he again went to Canada as Resident Engineer on the Hamilton and Port Dover Railway. In the following year, however, Mr. MacAdam resigned that appointment and tendered for the construction of a portion of the line. His tender was accepted, and in 1859 he had completed the work, with the exception of laying the rails, when the Company failed. He then took an office at Hamilton and for the next three years practised on his own account in Canada. During that time he acted for Messrs. Macdonald & Co., the contractors, in the matter of a claim against the Great Western Railway Company of Canada; and made surveys and estimates for Mr. T. Brown, contractor, in connection with the Montreal Harbour improvements. In 1863, however, he again returned to Ireland, where he was once more occupied on land drainage schemes.

Mr. MacAdam's Indian career commenced in 1865, when he was appointed a second class Resident Engineer on the East Indian Railway. He was posted to the Jubbulpore branch and had charge of 30 miles of heavy construction. On the completion of that work he joined, in May, 1868, the Oudh and Rohilkund Railway as a first class Resident Engineer. The main line was then about to be commenced and Mr. MacAdam was placed in charge of a division of 60 miles. He made the surveys for this division and superintended the execution of the works thereon, retaining charge of the district after it was opened for traffic. It was in 1869, while engaged on these works, that Mr. MacAdam met with severe injuries, due to the collapse of the arched roof of an empty brick-kiln. This mishap confined him to his bed for

over two months, and necessitated the use of a crutch for eight years; and as it gradually led to a breakdown of his health, he was ultimately compelled to avail himself of a period of eighteen months' rest on furlough in Europe. In due course he returned to duty; but, although apparently restored to his former strength, the accident never failed to tell against him, and a few years ago greatly exhausted him.

In 1878-79, during the absence of his chief on twelve months' furlough, Mr. MacAdam was selected as the senior executive engineer to act in place of that officer, and later on, during his chief's second absence (this time on special duty in London connected with the erection of a bridge over the River Ganges at Benares) he was again placed in charge. During this second term his trust, for a period of eight months in 1880, was one of no light responsibility, as excessive floods did considerable damage to the line, of which about 560 miles were open, and interrupted traffic in many places. About this time the board of the Company consented to a scheme for the amelioration of the condition and prospects of the staff, Mr. MacAdam being highly spoken of and advanced as far as was then practicable. On the portion of the line actually executed by him, there were no works of special magnitude or difficulty, and he therefore had no opportunity of a display of ability; but on the railway generally, for which he was for a time twice responsible, there were many works which called for much careful thought and attention, and it may be said that wherever obstacles presented themselves, his resource was sufficient to overcome them. While firm in his control, Mr. MacAdam was ever just and considerate; and his good sense and well-merited reputation as a peace-maker led, on not a few occasions, to his being appealed to for friendly advice by juniors who fancied themselves aggrieved, and throughout his Indian career his manly and straightforward nature secured him many friends.

At the close of 1888 the Oudh and Rohilkund Railway, a "guaranteed" line, was purchased by the Secretary of State for India, and the Company's staff was disbanded. Mr. MacAdam was therefore once more free; but as by this time his health had been much impaired owing to the injury sustained in 1869, he returned to England, where he lived in retirement. The rest so gained did not, however, materially help him. His strength gradually declined; for the last eighteen months of his life he was very feeble, and finally, after a sharp short illness from ulcer of the stomach, he passed away peacefully on the 6th of July, 1895, at Southsea.

On being deprived of his appointment by the purchase of the Oudh and Rohilkund Railway, Mr. MacAdam made an appeal to the Government of India, as the successors of the Company, for a solatium for the injury sustained by him in 1869 while in the execution of his duty. He based his appeal on the fact that the accident had deprived him of that activity which would be required of him in any future appointment, and had consequently debarred him from adding to his income in the interests of his family. After much consideration, the Government of India, admitting that he was deserving of special consideration, made him a gratuity.

Mr. MacAdam was elected a Member on the 4th of February, 1873.

RALPH HART TWEDDELL, whose name is associated with the application of hydraulic pressure to the working of machine tools, was born on the 25th of May, 1843, at South Shields, where his father, Mr. Marshall Tweddell, was at that time engaged in business as a shipowner. Ralph was educated at Cheltenham College, where he was specially prepared for the Royal Military Academy at Woolwich, it being intended that he should enter the Army. The proposed military career was, however, abandoned, and in 1861 he was articled to Messrs. R. and W. Hawthorn, of Newcastle-on-Tyne. There he had ample opportunity of obtaining a practical insight into machinery of various kinds, and the encouragement he received from the firm was largely instrumental in inducing him to devote his attention to that branch of engineering with which he was subsequently so closely identified.

It was during his apprenticeship, and when only twenty years of age, that Mr. Tweddell took out a patent for a small portable hydraulic apparatus for fixing the ends of boiler-tubes in tube-plates. The pressure of water employed varied from 1 ton to $1\frac{1}{2}$ ton per square inch. When the force-pump did not form part of the tool itself, the necessary connection was made by a small copper pipe, which proved sufficiently flexible and durable to allow of the free movement of the machine. The results were sufficiently encouraging to suggest the further employment of hydraulic power for machines used in boiler-construction.¹

Owing to the introduction of high steam-pressures, the scantlings of marine boilers had to be considerably increased, and the

¹ Minutes of Proceedings Inst. C.E., vol. lxxiii. p. 65.