

Mr. Black was elected a Member of the Institution of Civil Engineers on the 2nd of May, 1865, but his residence abroad prevented him from taking any personal part in its proceedings.

MR. JOHN D'URBAN HUGHES was born on the 11th of June, 1807. His father was a doctor in the army, and he was destined to follow the same profession; but showing a great distaste to this, it was decided he should enter as a combatant officer. Accordingly, in 1821 he joined the Royal Military Academy, Sandhurst, where he pursued his studies with untiring perseverance, displaying a decided aptitude for mathematics and scientific subjects. He passed the highest examinations at the college, and subsequently received a commission as Ensign in H.M. 91st Regiment of Highlanders. In 1825 he became Adjutant of the 92nd Gordon Highlanders, and continued in the regiment for three years, leaving the army in order to prepare himself for the more congenial profession of a civil engineer.

In 1838, having had previous experience on the Ottawa and Rideau canals, and on extensive Government surveys in Canada, Mr. Hughes was appointed to take charge as Resident Engineer of the construction of 26 miles of the Birmingham and Gloucester railway, including a cast-iron bridge over the Avon, near Tewkesbury, of three arches on cast-iron caisson foundations.¹ On completing this portion, the remaining length of 14 miles was placed under his management, including the Lickey incline, some heavy earthworks, and a tunnel $\frac{1}{4}$ mile in length. In 1844-5 he was employed as principal Engineer by the Birmingham and Gloucester Railway Company to make the surveys for an extension of their line. In 1845-6 he was occupied chiefly with Parliamentary business, and with the surveys for two new lines of railway. Afterwards he was during many years engaged for Messrs. Fox and Henderson, and for that firm had charge of the execution of several important works. Among others may be named the large iron roofs, timber sheds, and hammer shops, and the smitheries in H.M. dockyard, Pembroke; the water stations, engines, machinery, and iron roofs at terminal and intermediate stations, with the switches, crossings, turntables, &c., on the Lancaster and Carlisle, Caledonian, Scottish Central, and Scottish Midland railways; in 1849 of a cast-iron bridge on screw piles, on the Great Northern railway, and in the same year he was employed to report on the progress of the electric telegraph in England, for the information

¹ *Vide* Minutes of Proceedings Inst. C.E., vol. iii., p. 60.

of the Danish Government; in 1850-2 of the iron bridges on the Great Northern railway between London and Peterborough, including one of three arches over the Ouse at Huntingdon on cylinder foundations, and another of like dimensions over the Nene at Peterborough on cast-iron caissons—sunk in both cases by Dr. Potts's vacuum method; and later, in 1851-2, of the foundations of Rochester Bridge, where it was intended to use Dr. Potts's method for sinking the cylinders. The nature of the ground, however, and other obstacles made it impossible to use the vacuum process. In order to overcome these difficulties, Mr. Hughes invented the compressed air or "plenum" process of sinking cylinders. This was completely successful, and the works at Rochester were visited by numbers of professional men, foreign as well as English; but although the plenum process, or modifications of it, has come into general use, Mr. Hughes never received any pecuniary advantages from his invention. In many cases even his name has been ignored, and, as frequently happens, the credit claimed by other people. Mr. Hughes presented a paper descriptive of this invention to the Institution;¹ and in the Annual Report of the Council it was stated that the accounts of works by Messrs. Hawkshaw, Bruce, Swinburne, and Hughes "were full of information on the methods of construction employed, and the precautions adopted, in cases where the magnitude of the works, the inroads of the sea, and the failure of a newly-invented system, demanded the prompt exercise of those energetic measures, which are the distinguishing characteristic of the English Engineer, and by which the word impossibility has been almost erased from his vocabulary."²

In 1853 Mr. Hughes was engaged in designing iron cylinder foundations for six bridges in Russia. In 1854 he surveyed and prepared the Parliamentary plans and estimates for a railway between Dover and Canterbury, now forming part of the main line of the London, Chatham, and Dover Railway Company. He was then employed by the late Mr. Brunel, Vice-President Inst. C.E., in surveying and estimating for a railway in Sardinia. He also advised and made the drawings, specifications, and contracts for the apparatus requisite for effecting alterations in the foundations of the railway bridge at Benah, on the Nile, as well as the drawings and designs for an iron bridge over the Saône, at Lyons, to replace a stone bridge which had fallen down just as it was completed. Mr. Hughes's designs for the new bridge included the foundations,

¹ *Vide* Minutes of Proceedings Inst. C.E., vol. x., p. 353.

² *Ibid.*, vol. xi., p. 88.

and were adopted. For another bridge over the same river, at Mâcon, he prepared the designs alike of the superstructure and the foundations. At this time (1854-60) Mr. Hughes had his hands full of work, mostly relating to bridge-building and hydraulic engineering in different parts of Europe. He was also employed by the Defence Committee of the War Office to make plans, reports, and estimates for the foundations of the forts at Spithead, and took part in the notable operations at Saltash, under Mr. Brunel.

In 1860 he took charge, under Mr. (now Sir John) Hawkshaw, for the Londonderry Bridge Commissioners, of the new iron bridge at Londonderry, and afterwards of the new quays adjacent to it, and the bridge approaches, which occupied him until 1866.

Mr. Hughes's last professional appointment was under the Chilian Government, whose service he entered, in 1871, as Engineer-in-Chief of the Fiscal Works. Shortly after his arrival in that country a mole was designed, to be built at Valparaiso, of a total length of 750 feet by 50 feet wide, supported on wrought-iron cylinders of 11 feet diameter, at a distance of 300 feet from the shore in a depth of 46 feet of water, with the general direction parallel to that of the northerly winds, which blow with great violence during the winter months. The mole was to be connected with the shore by a bridge starting from its centre, built also on cylinders, so that the general plan was in the form of the letter T. In 1874 Mr. Hughes visited England for the purpose of making contracts for the ironwork, materials, &c., and to engage foremen and workmen. He returned to Chilé in the same year, taking with him his family. Immediately on his arrival the works of the mole were put in hand, and he was occupied with them up to the time of his death. Mr. Hughes introduced various improvements in pneumatic apparatus for this work, rendering it only necessary for the men engaged in actual excavation to be under pressure, and using buckets lifting $\frac{1}{2}$ ton of material at a time. He also repaired and strengthened the sea wall at Valparaiso, for which purpose he devised a system of making and depositing concrete blocks, by forming the block on a platform supported on the slope of the sea wall by two wooden posts, which, in their turn, rested on cylindrical boxes filled with sand. When the block was to be launched the sand was run out by a valve in the bottom of the cylinder, the platform tilted up, and the block, weighing from 25 to 30 tons, was thus thrown from a height of over 15 feet into the sea. The system answered admirably, and has been in use at Valparaiso up to the present time. Mr. Hughes likewise revised
[1874-75. n.s.]

the drawings for the new Custom Houses at Valparaiso, but resigned all charge of these works before the contracts were let. His death took place on the 2nd of September, 1874. He was strong and vigorous up to the time he was taken ill, and lingered afterwards for three months, when he died from atrophy, at the age of sixty-seven.

During his professional life Mr. Hughes worked under the direction of the most eminent engineers of the day, including Sir John Hawkshaw, Mr. Brunel, Mr. Cubitt, &c., in large and difficult undertakings in all parts of the world, and had great experience in many branches of civil engineering. He was elected an Associate of the Institution of Civil Engineers on the 9th of February, 1841, and was transferred to the class of Member on the 21st of April, 1857.

He was a most affectionate and indulgent husband and father; painstaking and persevering at his work, but retiring and unassuming in his public character; and it is probably owing in some measure to this that he did not rise to greater prominence in the profession. His early military training made him well suited to govern large bodies of men and for the direction of important undertakings.

Mr. WILLIAM BLAKE LAMBERT, son of Mr. Peter Lambert, was born at Berwick-upon-Tweed on the 16th of June, 1816, and was educated at the Grammar School in that town, and at the University of Aberdeen. He removed to London in 1836, and entered the employment of Messrs. Maudslay, Field, and Co., with whom he remained till the year 1848, when, on account of the part he took in converting the Government paddle-wheel steamers into screw-propellers, he was invited to enter the Government service, and was posted to Portsmouth dockyard as Assistant Chief Engineer. He resigned in 1853, to become Manager of the General Screw Navigation Company at Southampton, and subsequently superintended the winding-up of that company's affairs. In the year 1859 he was asked by the Russian Government to enter their service, and he went to St. Petersburg, where he was immediately appointed Engineer-in-Chief to the Russian fleet, which appointment he held till the year 1866, when he returned to England.

Mr. Lambert died, after a few days' illness, on the 18th of February, 1874, at St. Petersburg, whither he had gone for a few weeks on private business. He was elected an Associate of the