

APPENDIX TO VOL. XXII.

MEMOIRS.

HIS ROYAL HIGHNESS ALBERT FRANCIS AUGUSTUS CHARLES EMMANUEL, DUKE OF SAXE COBOURG AND GOTHA, PRINCE CONSORT, K.G., K.T., K.P., G.C.B., K.S.I., G.C.M.G., &c., &c., was born August 26, 1819. He joined the Institution of Civil Engineers as an Honorary Member on the 7th of March, 1843. H.R.H. died December 14, 1861.

MR. PETER BARLOW was born in Norwich, in October, 1776, and was sent at an early age to a foundation school, where he acquired a good English education. He was then placed in a mercantile establishment in Norwich, and while in that position and still at an early age, he, together with some young friends of a similar turn of mind, formed a juvenile scientific society, where they discussed questions in mathematics and the physical sciences, for which young Barlow had a natural predilection, and eventually by his industry and perseverance he acquired considerable scientific knowledge.

The political excitement of the times broke up this little society, and the members of it became dispersed, some entering the Army and others the Navy, whilst Mr. Barlow, turning his attention to tuition, for which he had partially qualified himself by careful study, although without enjoying the advantage of good masters, obtained the mastership of a school. He soon became a regular correspondent of 'The Ladies' Diary,' then under the management of Dr. Hutton, Professor of Mathematics at Woolwich, under whose advice Mr. Barlow was induced, in 1801, to become a candidate for the post of additional Mathematical Master at the Royal Military Academy, a position which was only obtained after a severe competitive examination. There he became acquainted with Mr. Bonycastle, to whose judicious advice and assistance he always acknowledged himself to have been much indebted. Under the same advice he, in 1808, commenced writing for the 'Encyclopædia' conducted by Dr. Rees, and from the letter H to the end, he contributed the majority of the mathematical articles of that

work. In 1811 he published his first work on the 'Theory of Numbers,' and in 1814 appeared his 'Mathematical Dictionary,' and immediately afterwards his 'Mathematical Tables,' a work which has since been reproduced by the Society for the Diffusion of Useful Knowledge. In 1817 he published the first edition of an 'Essay on the strength of Timber and other Materials,' founded on experiments made in the Dockyard and the Arsenal at Woolwich, by permission of the Admiralty and of the Board of Ordnance. While thus engaged he became acquainted with the late Thomas Telford, and assisted him in experiments and calculations for his then proposed structure of the Menai Suspension Bridge, and also conducted for him a series of experiments on the tides in the Thames, in reference to the then projected erection of the new London Bridge. In the report upon the latter subject, the effects which the removal of the old London Bridge have since manifested upon the bridges of Westminster and Blackfriars were fully considered. About this time he also contributed many articles to the 'Encyclopædia Metropolitana.' In 1819 his attention was directed to the variation of the compass needle and the local attraction of ships, and he was induced to undertake a series of experiments, with a view to discover the laws of the reciprocal action subsisting between magnets and simple iron bodies, and to devise some means of correcting the errors of compasses on shipboard. The Government liberally allowed him the facilities which the Dockyard and Arsenal at Woolwich presented for prosecuting these experiments, and the laws of terrestrial magnetism which he, after much labour, discovered were subsequently confirmed by Captain Basil Hall, Captain Mudge, and other officers. These laws and their proposed application for correcting the local attractions of ships formed the subject of his 'Essay on Magnetic Attractions,' published in 1820. In a second edition of this work, in 1823, it was shown that all the laws which had, up to that time, rested on experimental deductions were consistent with a certain hypothesis of magnetic action, which theory was subsequently elaborated and confirmed in a more general investigation of the subject by M. Poisson, in a memoir read to the Institute of France in 1824. All doubt on the subject being now removed, Mr. Barlow received numerous gratifying marks of approbation. He was elected on the Council of the Royal Society, and received the Copley medal. He also received the reward for useful discoveries, provided by Parliament, in connexion with the then existing Board of Longitude. He further received a handsome personal present from the Emperor of Russia, and was elected a member of the Imperial Academy of Brussels, a corresponding member of the Institute of France, and received many other similar distinctions.

On the 31st of January, 1825, he presented to the Institution of

Civil Engineers a communication 'On the Force exerted by Hydraulic Pressure in a Bramah Press; the resisting power of the cylinder, and rules for computing the thickness of metal for presses of various powers and dimensions.'¹

Mr. Barlow next turned his attention to electro-magnetism, and was the author of a work on that subject. While engaged in the experiments he conceived the idea of making electric signals by deflecting a magnetic needle with a current of electricity, generated by a galvanic battery, and passed along a conducting wire. With this object he caused an experiment to be made upon a mile of copper wire, arranged upon posts in his garden, at Rushgrove Cottage, Woolwich. The battery employed consisted of about twenty pairs of plates 15 inches square. No insulation was given to the wires, and no coil was employed to multiply the action upon the needle. In this experiment, which contained the germ of an invention destined afterwards to become of such important public utility, although a certain amount of deflection was obtained, yet from imperfect insulation increased length of wire was found to produce great loss of power, and as other subjects of great interest occupied his mind at this time, he discontinued his experiments upon the electric telegraph.

Although engaged at this time in contributing articles to several scientific works, he applied himself to the improvement of achromatic object-glasses, on which subject he communicated a paper to the Royal Society.² Pursuing this subject, he was led to try the effect of substituting a fluid contained between two sheets of plate, or crown glass, instead of using the concave flint glass lens, generally employed, and he constructed two telescopes on this principle. Subsequently the Council of the Royal Society engaged Mr. Dollond to construct a fluid lens telescope under his superintendence, the result of which was satisfactorily reported upon by Sir J. Herschel, Professor Airy, and Admiral Smyth.

Between the years 1833 and 1835 he was engaged in the prosecution of an extensive series of mechanical and other experiments, and in the production of a volume containing a description of 'The Manufactures and Machinery of Great Britain.'

The railway system was at this time in its infancy, and before Engineers had established practical data, Mr. Barlow was much occupied in experiments, and in testing the strength and best form of section of railway bars, the effect of gradients and curves, and in determining other questions.

In 1836 he was appointed one of the Royal Commissioners for determining the best system of railways for Ireland, the report on this subject being presented to Parliament in 1838.

¹ *Vide* Trans. Inst. C. E., vol i. p. 133.

² *Vide* Phil. Trans., 1827, p. 231.

In 1839 he was appointed on a similar commission for determining the best route to Scotland and Wales, and the most convenient port for steam communication with Ireland.

On the 5th of March, 1839, a Paper of his was read at the Institution of Civil Engineers, intitled 'An Investigation into the Power of Locomotive Engines, and the effect produced by that power at different Velocities.'¹

In 1842 he was similarly employed upon an inquiry into the general merits of the atmospheric system, and in 1845 he was appointed one of the Gauge Commissioners, in which he was associated with Sir Frederick Smith and Professor Airy.

In 1847, being then seventy-one years of age, he retired from his duties at the Royal Military Academy, and in consideration of his eminent public services, the Government awarded him his full pay on his retirement.

From this time, although he ceased to engage in active professional duties, he continued to take a lively interest in all the leading scientific questions of the day.

So late as the year 1857, although he was eighty-one years of age, he wrote a postscript to a Paper communicated to the Royal Society by his son, Mr. W. H. Barlow, M. Inst. C. E., on the 'Resistance of Flexure,' which postscript contained a mathematical investigation of considerable difficulty.

Mr. Barlow was elected a Fellow of the Royal Society in May, 1823, and he was a member of most of the other scientific societies of this and other countries. He joined the Institution of Civil Engineers as an Honorary Member in 1820, and always took much interest in the proceedings. Of a kindly and cheerful disposition, he retained his full powers of mind until his death, which took place on the 1st of March, 1862, deeply regretted by his numerous friends, and especially by those Officers, his former pupils, who, whilst under his guidance at the Royal Military Academy, had ever found him as valued a friend as a conscientious and talented tutor.

MR. JAMES JOHN BERKLEY was born at Holloway, on the 21st of October, 1819, and completed his education at King's College, London, under Dr. Major. He was articled to Mr. Wicksteed (M. Inst. C. E.), then Engineer of the East London Water Works, in the year 1836; but very soon left him, and entered the office of Mr. G. P. Bidder (M. Inst. C. E.), and in 1839 he may be said to have commenced his real pupilage under Mr. Robert Stephenson (M. Inst. C. E.), by whom he was very actively

¹ *Vide Minutes of Proceedings, Inst. C. E., vol. i. (1839) p. 46, and Trans. Inst. C. E., vol. iii. p. 183.*