

office as draughtsman. Thence, in 1860, he went to Pernambuco, Brazil, for Mr. (now Sir) Charles Hutton Gregory, and was engaged on bridgework for the Recife and São Francisco Railway Company. Mr. Brown spent nearly two years in Brazil, and on his return to England, he in 1862 entered the service of the London, Chatham and Dover Railway under Mr. William Mills, the Engineer to the Company. Mr. Brown served first as draughtsman, and subsequently as Chief Office Assistant. He continued in that position until the early part of 1879, when he was appointed Inspecting Engineer for the permanent-way materials for the same line, which post he held until his death. In 1863 Mr. Brown took out a patent for a train-speed indicator, and in the same year he, conjointly with the late Mr. Richard Lionel Jones, patented a single-handed signal-lamp. He was engaged on a patent for steel sleepers at the time of his death, which occurred on the 28th of August, 1888.

Mr. Brown was elected an Associate of the Institution on the 3rd of February, 1874, and was transferred to Member on the 15th of December, 1885.

HENRY CARR was born in Derby, on the 24th of November, 1817. On the death of his father, when he was only six weeks old, his mother with her two children, the subject of this memoir and his sister, went to Holbrook, near Derby, to reside with her father-in-law, the Rev. John Carr, and here Henry Carr remained sixteen years, until the death of his grandfather, when the family removed to Duffield. The intention was to educate him for Holy Orders. He was sent to Oakham Grammar School, as well as several other schools. He, however, evinced no inclination or taste for classical studies, but took the greatest interest and delight in carpentry, and indeed in any kind of mechanical work. Before he was nine years old he had saved up his money to buy a lathe, and all his spare time was spent at his lathe or carpenter's bench. It was then that the wise decision was come to of allowing him to choose a profession in accordance with his own inclinations and taste, and in January 1837 he was articled as a civil engineer to Mr. (afterwards Sir William) Cubitt, and started work in Mr. Cubitt's London office.

Mr. Carr's first expedition was with Mr. Cubitt to the North of Ireland, a trip he always looked back upon with the greatest pleasure as having afforded him the advantage of close contact with Mr. Cubitt during the time the latter was examining various

engineering works and projects ; a note-book, still preserved, evinces the interest Mr. Carr took in all these engineering works. He then went to Tunbridge for three months, at the time the South Eastern Railway was under construction, and had his first railway experience ; but so little work was doing there that Mr. Cubitt placed him under Mr. John Wright, then Resident Engineer on the line from Folkestone to Dover, and he had almost the entire supervision during the construction of the Shakespear Tunnel. While at Folkestone he devised an instrument for setting out the slopes of cuttings. He was about eighteen months at Dover, when a very severe attack of typhoid fever necessitated his return to Derbyshire, and left him an invalid during the remainder of his pupilage. In the spring of 1841, three months after his articles had expired, his health was so far recovered that Mr. Cubitt recommended him to Mr. George Turnbull, then Engineer in charge of the important works at Middlesbrough Docks. The following extract from a letter to Mr. Turnbull shows the high opinion Mr. Cubitt had formed of him :—"He is highly talented, and if his health gets re-established will make a very good engineer, his inventive talent being great and his judgment good." He remained at the Middlesbrough Docks about two years, and while there made a survey of the town and docks for the late Mr. Pease, for which he received his first pay.

His next work was building a weir across the River Trent, near Trent Junction, of which he had sole charge under the late Mr. Peter Barlow, during the spring and summer of 1843. He was at Folkestone for a short time the year following on harbour work, and afterwards on the London and Croydon Railway, then under construction as an atmospheric railway. He was next appointed Resident Engineer on the extension to Epsom, and as all road-crossings had to be by over-or under-bridges, he had great scope for his love of bridge-designing in the thirty-two bridges between Croydon and Epsom. Before this extension was completed, the difficulties experienced in working the atmospheric system from Croydon towards London decided the Directors to abandon it, and the Croydon and Epsom line was laid for the ordinary locomotive. While at Epsom Mr. Carr prepared plans, working-drawings, &c., for the bridges on the proposed extension to Dorking.

On the completion of the work at Epsom, Mr. Carr removed to London to prepare drawings for the Great Northern Railway, and to Doncaster in September 1847, on being appointed Resident Engineer on the section of that railway between Askern and Retford. While at Doncaster he designed and superintended

the building of two bridges at Sprotbro', over the River Don and canal, for the late Sir Joseph Copley, Bart. On their completion he furnished a Paper on the work to The Institution of Civil Engineers, for which he received a Council premium. In September 1850 Mr. Carr went to Retford as Resident Engineer on the 18 miles from Retford to Newark, which included two bridges over the River Trent and the Newark Dyke. He also superintended the building of the extensive machine- and locomotive-shops at Doncaster. In August 1853 Mr. Carr moved to Peterborough, when for some time he had charge, as Resident Engineer, of the whole of the Great Northern main line from London to Doncaster. About this time he designed and built a bridge across the River Trent at Kelham for Mr. Manners-Sutton. Previous to going to Peterborough Mr. Carr had designed and patented a crossing to resist the crushing of the rail-flange in the ordinary crossing. This brought him in contact with Mr. Wild, of points and crossing fame; and in 1855 he resigned his position on the Great Northern Railway, and took offices in Victoria Street, Westminster, commencing practice on his own account. During the first two years he was engaged on Mutford Sluice, near Lowestoft, and on several small engineering works, and from this time he also took great interest in architecture, preparing plans and specifications for several country residences, two being parsonages at Hartington and near Carlisle, as well as making additions and alterations to a number of large houses.

He had also business relations with Mr. Barrow, of the Staveley Ironworks, and in 1861 he commenced preparing the elaborate plans for the large engine-erecting and repairing-shops at Longhedge, Battersea, for the London, Chatham and Dover Railway, which occupied nearly three years in execution. At this time Mr. Carr, in conjunction with the late Mr. Joseph Cubitt, designed the new bridge over the Thames at Blackfriars, and although his name did not appear with Mr. Cubitt's as Joint Engineer, it is well known that the drawings were prepared in Mr. Carr's office under his immediate superintendence, and that all the calculations and a great deal of the drawing were done by Mr. Carr himself. The temporary timber bridge, which carried the traffic during the building of the new bridge, and which was very favourably noticed at the time, was entirely the work of Mr. Carr. Blackfriars Bridge was in hand for the seven years 1862-69, and during this time Mr. Carr, under Mr. Cubitt's directions, prepared the drawings for the bridge which carries the London, Chatham and Dover Railway over the River Thames,

making all the calculations of strains and scantlings himself. In 1869 Mr. Carr reported to the Bridge House Estates Committee of the City of London on the Metropolitan communications between the north and south sides of the River Thames. He prepared schemes for improving the gradients of Southwark Bridge (it was mainly by his efforts the bridge was eventually thrown open to the public), and also for widening the footpaths of London Bridge. In 1872 Mr. Carr read a Paper at the Royal Institute of British Architects on "The Bridges of London."

Not having good health, Mr. Carr was obliged in later years to decline undertaking work which would involve much exposure. Having no family, and being possessed of some private means, he was able to a certain extent to choose his work. His great forte was designing, and the rapidity with which he worked was astonishing to those with whom he came in contact. It was his habit to get all his drawings out in pencil, passing them over to others to "ink in," colour and finish, and it was wonderful to note the accuracy and care with which they were drawn; there was seldom a line to alter, and they were neatness itself. It has been said of some engineers that they were made by their staff; of Mr. Carr it may be said that he made his staff.

Soon after the completion of Blackfriars Bridge Mr. Carr retired from the active duties of his profession, but he was never idle; his carpenter's shop and lathe kept him much occupied, as many of his friends can testify by the number of useful as well as ornamental things he made and presented to them. Occasional tables for the drawing-room, in walnut and oak, he was fond of making, and the work and finish was so good that no cabinet-maker need have been ashamed of them. He also interested himself in several other matters. Amongst the first was the subject of canvassing for admission to charitable institutions; some specially distressing cases that came under his notice first drew his attention to the subject. As a result of his efforts the Charity Voting Reform Association was formed under the presidency of the Duke of Northumberland, with many influential noblemen, clergymen and others as vice-presidents, the Rev. R. J. Simpson of St. Clement's Danes, and Mr. Carr being honorary secretaries.

During the last ten years of his life Mr. Carr took up the subject of the use of arsenic in domestic fabrics, more especially in wall-papers. He wrote a pamphlet, "Our Domestic Poisons," which had a very wide circulation; also a Paper read before the Society of Arts, and he delivered a lecture on the subject at the Health Exhibition in 1884. He was supported by many of the leading

medical men in London, some amongst them having themselves and their families suffered from the effect of arsenic in wall-papers, &c. He tested hundreds of papers for manufacturers and private individuals, using both the Reinsch and the Marsh processes, and largely in consequence of his efforts the use of arsenic has been to a great extent abandoned. Mr. Carr, as an engineer, had great courage in the pursuit of his profession, amounting at times to what would almost appear rashness. He was rapid in judgment, and accepted responsibility without hesitation, not only for his own work, but for the actions of his trusted assistants, to whom he was very loyal when satisfied they were doing their best, never forgetting any one who had worked faithfully for him, and it always gave him great pleasure to be of any help or assistance to his old hands by advice, encouragement, or even in a pecuniary way. In private life Mr. Carr was known for his scrupulously high tone of honour, combined with extreme kindness and sympathy with trouble and misfortune; no one with any claim upon him ever sought his assistance in vain, and many without any claim have benefited largely by his generosity and goodness, and now mourn the loss of a true friend and liberal benefactor.

Mr. Carr's name was borne on the roll of this Institution for more than half a century. He was elected a Graduate on the 6th of February, 1838, transferred to Associate on the 15th of June, 1847, and to full Member on the 2nd of March, 1852. He died on the 21st of August, 1888. He was assiduous in his attendance at the meetings, and took great interest in the proceedings, as will be seen by the following list of Papers, &c., contributed by him to the Minutes of Proceedings.

- "Description of an Instrument for setting out the width of Cuttings and Embankments of Railways, Canals, or Roads, as particularly applicable to falling or side-lying ground." Vol. i., 1839, p. 52.
- "Description of a Dynamometer, or an Instrument for Measuring the Friction on Roads, Railways, Canals, etc." Vol. i., 1840, p. 52.
- "Description of an Instrument for describing the Profile of Roads." Vol. i., 1840, p. 56.
- "Description of two Bridges over the River Don and the Canal, with the Lodge and Approaches, on the Estate of Sir Joseph Copley, Bart., at Sprotbro', near Doncaster." Vol. x., pp. 302-306.

A model of Carr's Railway-Crossing was exhibited after the meeting of the 2nd of May, 1854.

Mr. Carr also frequently took part in discussions, especially on questions referring to railways, in which branch of the profession he was an expert.

The following works by him are in the Library of the Institution :—

- Cubitt, J., and Carr, H.—“Blackfriars Bridge. Contract for removal of existing bridge and for building the proposed new bridge, and other work connected therewith.” Folio. Atlas of drawings. 1864. (Reprinted in 1869.)
- “Metropolitan Street Traffic. Suggested improvements.” Tract 8vo. Vol. 234. Plate. London, 1871.
- “The Bridges of London.” Tract 4to. Vol. 68. Plates. London, 1871. Excerpt Transactions of the Royal Institute of British Architects.
- “Our Domestic Poisons; or, the Poisonous Effects of certain Dyes and Colours used in Domestic Fabrics.” 2nd and 3rd editions. Paper read before the Society of Arts. 8vo. London, 1879–80–83.

ROBERT DENNY, the fifth son of the late Rev. Henry Denny, Rector of Churchill, Diocese of Ardport, of Churchill, in the County of Kerry, was born on the 5th of June, 1843. He was educated at Beaumont College, co. Cork, and in 1862 was articled for three years to Mr. W. R. Le Fanu, by whom he was employed on part of the Nenagh extension of the Great Southern and Western Railway, as assistant in charge of the works, and afterwards on the same line, under Messrs. Cotton and Flemyng, when Mr. Le Fanu had retired from the engineering profession. From these gentlemen he received the most flattering testimonials. He subsequently worked with Mr. J. C. Burke, of Westminster, and in the year 1870 started engineering business independently in Tralee. Thenceforward, until a short time previous to his death, he was associated in all the principal works carried out in Kerry, his native county. These works were of a varied nature, and comprised: The Castlesland Railway (a branch of the Great Southern and Western); the Tralee Waterworks; the Limerick and Kerry Railway (in which work he was associated with Mr. W. Barrington; the Fenit Railway, and the Tralee and Fenit Pier and Harbour works, of which Mr. Benjamin Baker was Engineer-in-Chief. The last work which Mr. Denny carried out was a scheme for providing a water-supply to the town of Killarney. All these works were successfully completed, and their success was in a great measure due to the local supervision exercised by Mr. Denny.

His genial and sociable manner caused him to be a universal favourite, while his attention to business and his integrity gained him the respect and esteem of his professional brethren. He died on the 25th of July, 1888, regretted by all who knew him.

Mr. Denny was elected a Member of the Institution on the 4th of December, 1883.