whom he was about to serve, on the other; and the Lord Advocate, (now the Lord Justice Clerk,) who was final umpire in the arbitration, awarded him the highest praise. When the old company meditated the introduction of water by gravitation, Mr. Mackain explored every glen and rill, and tested the capacity of every loch in the West Highlands, and the result of his observations was the Loch Lubnaig scheme. This was not carried out, on account of the difficulty of raising the capital, but there is little doubt, that it would have answered the purpose intended; and it must be looked upon with respect, as the parent of the great Loch Katrine operations now rapidly drawing to a close. About two years ago, Mr. Mackain was invited to proceed to Portugal, which he did with the concurrence of his Directors, to assist in bringing water to the city of Oporto, and the scheme which he recommended is now being carried out.

One of his most prominent characteristics was a conscientious devotion to the interests of his employers and the public, sparing neither bodily fatigue, nor mental exertion, in the fulfilment of his duties. Naturally of a modest and retiring disposition, he was not much known beyond the circle of those with whom his situation brought him in contact; but he had a few friends who knew his genuine worth, admired his talents, his kind and truly unselfish nature, and who will ever revere his memory.

He joined the Institution, as a Member, in 1840, and his death took place at Dalmarnock, on the 8th of February, 1859.

Mr. ROBERT STEPHENSON, the inventor and first constructor of tubular plate-iron bridges, was the only Son of George Stephenson, the 'Father of the Railway System.' He was born on the 16th of October, 1803, at Willington Quay, near Newcastle-upon-Tyne, where his Father was breaksman of a ballast engine. Although Robert Stephenson was born at Willington, he had scarcely any association with the parish, until towards the close of his career, when he contributed a munificent donation to the fund for raising the Stephenson Memorial Schools, which now mark the spot on which stood the home of his Father, and the site of his own birth. Towards the close of 1804, the elder Stephenson removed to Killingworth, a township of Long Benton, and took up his residence at the West Moor Colliery, about five miles from Newcastle.

Having acquired, at the parish school of Long Benton, a rudimentary knowledge of the first elements of education, Robert Stephenson was sent, in 1815, to Mr. Bruce's academy at Newcastle, where he remained during four years, receiving instruction in the usual subjects and in mathematics. On leaving school,

at the midsummer vacation of 1819, he was apprenticed to Mr. Nicholas Wood, (M. Inst. C.E.,) with whom he remained nearly three years, to learn the business of a coal-viewer, and in the performance of his duties, had to inspect the Killingworth colliery, where his father had, several years previously, been the enginewright. He then assisted his Father in the survey for the Stockton and Darlington Railway; and at its completion he was sent, at the close of 1822, to the University of Edinburgh, where for one term, lasting nearly six months, he attended the lectures of the Professors of Mathematics, Chemistry, and Geology. Prizes there were none for him to gain; but he obtained the book which it was the custom of the Mathematical Professor to present, from time to time, to the most meritorious pupil of his class. It was at this period, that he first met, as a class fellow, Mr. George Parker Bidder, (V. P. Inst. C.E.,) with whom, in after years, he was so intimately associated, both professionally and in private life.

Leaving Edinburgh, Robert Stephenson, boy as he was, became the managing partner of the manufactory of engines and machinery of Robert Stephenson and Co., of Newcastle, established in 1823, to meet the demand for locomotive engines which George Stephenson rightly predicted would necessarily ensue, during the course of the next few years. Scarcely, however, was the factory at work, and Robert Stephenson settled in Newcastle, than his health failed, and he accepted an alluring offer, to superintend the working of the gold and silver mines of the Columbian Mining Association, and to report on various engineering works which were, at that time, projected in Columbia. Accordingly, in June, 1824, he left England for South America, where he remained three years, during which time he accomplished his mission with great credit, and he made some investigations and reports which exhibit great foresight and talent. On his way homewards, he visited the United States and Canada, experiencing the perils of shipwreck. It was on this journey that he met with Trevithick, whose splendid dreams of wealth, in Spanish America, had terminated in the stern reality of almost absolute want; and there is little doubt, that the discussions on the steam engine between these original geniuses of such different character, led in the mind of Stephenson, to a closer consideration of the locomotive.

On his arrival in England, in December, 1827, he found the Stockton and Darlington Line in full operation, and the Liverpool and Manchester Railway fast approaching completion. The question as to the best means of traction for the new road was already under discussion, and as the time for opening the line drew near, the controversy amounted to acrimony. Mr. James Walker, (Past-President Inst. C.E.,) and Mr. J. U. Rastrick,

(M. Inst. C.E.), who were employed by the company to investigate the subject, reported, at first, against the adoption of the locomotive so strenuously advocated by Stephenson, and they recommended the use of stationary engines. The Directors, however, determined on giving the locomotive a fair trial, and offered a premium of £500 for that engine which should best fulfil the required conditions. The offer led to the memorable Rainhill contests, at which the 'Rocket,' built by Robert Stephenson, with a boiler on the multitubular principle, suggested by Mr. Henry Booth, and under the guidance of George Stephenson, obtained an easy victory over the other competitors. The success of the 'Rocket' decided the question of locomotive traction. Not content, however, with what he had already achieved, he resolved on effecting further improvements, and the 'Planet,' which virtually gave the type to all succeeding locomotives, was the result of his renewed exertions. From the period of the construction of the 'Rocket,' he still, for several years, persevered in his "endeavours to improve," and such was the success of those efforts, that, as has been justly said by Mr. Nicholas Wood, "to Mr. Robert Stephenson, almost, if not quite, universal assent will be accorded, as having the merit of raising the locomotive engine from what it was in 1829, to what it is in 1860."[1]

Between the close of 1827 and 1833, Robert Stephenson was occupied in railway construction, assisting his Father on the Liverpool and Manchester Railway, and laying down some minor lines. The first great work, however, for the success of which he was solely responsible, was the London and Birmingham Railway, an undertaking of high historic interest, both on account of the gigantic difficulties which were encountered in its construction, and of its being the first public iron road into London. The London and Birmingham Line was opened in 1838, and from that time till the close of his life, Robert Stephenson was engaged in a series of achievements which will hand him down to posterity, as occupying the front rank among Engineers, in an era abounding in men conspicuous for mechanical genius. Important works directed by his counsel, or carried on under his personal superintendence, are to be found in every quarter of the globe. Belgium, Switzerland, Norway, Denmark, Tuscany, Canada, Egypt, and India have lines of railway, formed under his direction.

The works by which he will, probably, be best known to posterity are his bridges;—among them may be mentioned the High Level Bridge at Newcastle-upon-Tyne, the Victoria Bridge at Berwick, the Conway and the Britannia Tubular Bridges on the

[1] *Vide* "Transactions of the North of England Institute of Mining Engineers," vol. viii., p. 66.

Chester and Holyhead Line, the Victoria Tubular Bridge over the St. Lawrence River at Montreal, and the tubular bridges over the Nile at Benha and at Berket-el-Saba, the precursors of that at Kaffre Azzayat, on the Egyptian Railway from Alexandria to Suez. Such are a few of the principal monuments of his genius. But his Parliamentary services, as a witness in the committee-rooms of the two Houses, were, at the time they were rendered, neither less valuable, nor less distinguished, though, at the present date, they may be less generally known. In the two memorable contests of the Battle of the Gauges, and the Battle of the Atmospheric System, he fought, as he had previously fought in the Battle of the Locomotive,—strenuously, indefatigably, and temperately,—opposing the invincible strength of a calm judgment and lofty intellect, to the brilliant subtleties and splendid daring of a worthy opponent.

Throughout his career, Robert Stephenson was as popular as he was successful. Never ambitious of self-aggrandisement at the expense of his colleagues, he had the rare faculty, inestimable in those who occupy places of chief command, of selecting capable coadjutors and subordinates; and he united to this faculty a generous anxiety, that his assistants should receive the full share of fame and of remuneration due to their exertions. He was consequently, from first to last, an object of affection, not less than of admiration, with the members of his own profession, the contractors, and the men of business with whom he acted. In December, 1837, as the labours of constructing the London and Birmingham Line were being brought to a close, the members of the engineering staff under his command, entertained him at a public dinner at Dunchurch, and presented him with a piece of plate of the value of one hundred and thirty guineas. In the same manner he was, in November, 1839, presented with a service of plate, of the value of twelve hundred and fifty pounds, by the "gentlemen who had been engaged as contractors for the construction of railways, or the supplying of permanent materials." As the subscription of each contributor was limited to five pounds, this demonstration was, in no respect, a mere party movement, but the expression of a general and wide-spread sentiment. On the occasion of the presentation of this testimonial, he was entertained at a very numerously attended public dinner at the Albion Hotel. Besides these and many similar expressions of good-will, unsought honours were poured in upon him. In 1841, he was decorated by the King of the Belgians, with the Order of Leopold; and in 1848, he was presented with the Grand Cross of St. Olaff of Norway. In 1855, the Council of Presidents and Vice-Presidents of the Great French Exhibition awarded to him the Great Gold Medal of Honour, for the invention and introduction of the system

of tubular plate-iron bridges,—First Class Silver Medals being at the same time awarded to Messrs. William Fairbairn, (M. Inst. C.E.,) Eaton Hodgkinson, (Hon. Mem. Inst. C.E.,) and Edwin Clark, (M. Inst. C.E.,) for their respective labours of co-operation,—and he was, at the same time, decorated by the Emperor, with the Order of the Legion of Honour. In 1857, the University of Oxford conferred upon him the Degree of D.C.L. He had also, for several years, been a Fellow of the Royal Society, and he was a Member of most of the other scientific and learned societies of the Metropolis.

His connection with the Institution of Civil Engineers began in 1830, when he became a Member. He was elected a Member of Council in 1845, soon after the first radical change in the constitution of the society, to which he mainly contributed, and he continued in that position till 1848, when he was placed among the Vice-Presidents. At the Annual General Meeting in December, 1855, he was elected President of the Institution, in which capacity he acted during the two ensuing years, 1856 and 1857. It is needless to dilate upon the warm interest he took in everything that concerned the Institution, his assiduous attendance, not only at the Council, but at the Meetings where he so frequently took a prominent part in the discussions, of which the volumes of the Minutes of Proceedings give such instructive evidence. The interest he felt may be said to have continued after his death, for amongst his legacies, he bequeathed the munificent sum of Two Thousand Pounds to that Institution, of which he was so distinguished an ornament.

Entering Parliament in 1847, as Member for Whitby, Robert Stephenson continued to represent that important constituency in the House of Commons, until the period of his decease. A staunch conservative, he voted steadily with his party, but his political conduct was marked by the same generosity that adorned his professional struggles, and the same amiability which endeared him to so many private friends. With the members of all parties he was alike popular, and one of his last acts was to insist on being permitted to subscribe to the testimonial, presented by the liberal members of the House to Sir William Hayter, on his relinquishing the office of 'whip' to their party. In the debates, his voice was not frequently heard; but on the few occasions of his addressing the Speaker, on professional questions, such as that of the Canal of the Isthmus of Suez, and that of the building in Hyde Park for the Great Exhibition of 1851, he was listened to with attention, and acquitted himself with dignity and effect.

A life of severe mental and bodily exertion,—such as that led by Robert Stephenson from early boyhood to the close of his career,—makes decay anticipate old age. For the last eight years

of his existence, his health had, occasionally, manifested symptoms which were calculated to cause great anxiety to his friends. At no time did his mind sustain any loss of vigour; but chronic derangement of the digestive organs indicated the existence of mischief, destined to lay him in the grave, ere he should accomplish the full term of human life. At the beginning of 1859, those symptoms became greatly aggravated, and he was advised to try the effects of change of scene, combined with mental repose. To Robert Stephenson, such a prescription was an impossibility; quiet he could not command. A mind, habituated for nearly half a century to continual action amidst interests, vast, numerous, and diverse, cannot, by an effort of the will, create tranquillity for itself. Moreover, the world would not allow the Engineer that slight amount of rest which he could have commanded, had he been left to shape his own course. Wherever he went, he was followed by those who were anxious for his professional guidance. In September, 1859, however, he broke away from the numerous claimants on his attention, and in his yacht, "that house," as he feelingly described it to a friend, "which has no knockers," made his last voyage to Norway. Yachting was, indeed, the only recreation which he permitted himself, but even then, he combined business with pleasure, performing in that manner his professional visit to several places on the Continent, and to Egypt. At first, he seemed to rally under the refreshing influences of repose and of the sea breezes; but soon the overpowering sense of debility and of depression returned, and the attached friends by whom he was accompanied, justly entertained apprehensions of the worst results. Hastening home from Norway, where he had suffered much, he landed from his yacht at Lowestoft, and was conveyed to London, where he expired at his residence in Gloucester Square, on the 12th of October, 1859, within a few days of completing his fifty-sixth year.

When it is remembered, that Robert Stephenson was a man of varied information, fond of winning others to his opinions, and capable, when he was pleased to make the effort, of writing with singular force and perspicuity, it is a matter of surprise, that he has left behind him very few distinct literary productions. His published Reports on matters connected with his profession are numerous, and well deserving of preservation; but his admirable article on "Iron Bridges," in the *Encyclopædia Britannica*, is, perhaps, his most important contribution to scientific literature.

On the death of Robert Stephenson, it was felt, that Westminster Abbey was his proper resting-place. An application was made to the authorities for permission to place him in that temple, where the greatest of Britain's chiefs have for centuries been gathered, and the permission was promptly accorded. On the

22nd of October, the funeral was conducted with fitting solemnity, his remains being deposited by the side of Thomas Telford, the first President of the Institution, in the presence of several thousand persons, amongst whom were not only his professional and private friends, but also the most distinguished representatives of the literature, science, and art of Great Britain in the nineteenth century; and among them not an eye was dry, when the last remains of their dear friend and coadjutor disappeared. Shortly afterwards, a public meeting, presided over by Lord Llanover, and attended by a numerous body of noblemen and gentlemen, was held for the purpose of taking into consideration the most appropriate mode of testifying the general respect; when it was resolved, that a statue should be erected to his memory in St. Margaret's Gardens, near the Abbey, where the place of his repose is marked by a monumental brass and a window.

The benevolence which had, in early life, formed a prominent feature of Robert Stephenson's character, manifested itself in his later years, in a series of munificent acts towards the inhabitants of Newcastle and the surrounding district, amongst which may be mentioned, his donation of Twelve Hundred Pounds to the Memorial Schools at Willington Quay, Three Thousand Pounds to the Literary and Philosophical Society, and Ten Thousand Pounds to the General Infirmary of Newcastle. The same spirit of enlightened humanity pervaded his final disposition of the great wealth, which a prudent but liberal management of his private affairs had gathered to his keeping, the provisions of his last will, made a short time previous to his last visit to Norway, conferring upwards of Twenty-five Thousand Pounds on charitable societies and scientific institutions. Few professional men have attained such well-deserved celebrity as Robert Stephenson, and his works will remain to attest his well-earned reputation. His memory will long live in the hearts of those who appreciated and loved him for his manly qualities in private, as they admired him for his public acts and high professional attainments.

MR. THOMAS STOREY, Son of an agriculturist, at Makemerich, near Ponteland, in the County of Northumberland, was born at that place, on the 7th of December, 1789. He received his education at Stamfordham, and served an apprenticeship under Mr. Watson, of Willington, whence he removed into Lancashire, and was employed by Messrs. Clark, Roscoe, and Co., as their Mining Engineer in that county, in Wales, and in Shropshire. In 1822, at the request of Mr. George Stephenson, with whom he was connected by marriage, he was released from his engagement under Messrs. Clark and Co., and was employed in