

short, compactly-built figure and keen, intelligent features were well known there. Of a somewhat masterful and self-assertive disposition, he was, nevertheless, kind and genial to those able to penetrate the hard crust of his outer man.

During the latter years of his life he held the post of District Surveyor for North-east Deptford, to which he was appointed by the late Metropolitan Board of Works on the recommendation of his old friend and fellow pupil, Sir Joseph Bazalgette. He was confirmed in this office when the London County Council was formed, and, in order to be able better to perform his duties, resided in the New Cross Road. Full of energy to the last, he worked until within a month or two of his death, in order that he might meet some fancied obligations which would never have been advanced against him.

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Professor CALLCOTT REILLY, who from 1871 to 1897 held the important chair of Engineering Construction at the Royal Indian Engineering College, Coopers Hill, died at the Clergy House, Englefield Green, on the 21st May, 1900.

Born in 1829, his early life was one of adventure. When still a lad, bitten by a longing for the sea, he ran away from Chester, made his way to the Liverpool Docks, and was about to sail on board a small coasting-vessel as cabin boy when he was found by his father and brought home again. About a year later he ran away a second time, and was again found on a ship in the Liverpool Docks by his father, who this time did not bring him back, but bound him apprentice to a shipowner. He made two voyages to the East Indies and one to North America on a timber ship, but, although he always strove to be first in the performance of duty, the hard life of an ordinary seaman in the merchant service of that day cured him of his longing for the sea, and, as soon as he could get free, he turned his attention to engineering, and became an apprentice of Messrs. Edward and Bryan Johnson, millwrights, of Chester.

After the expiration of his engineering apprenticeship, Callcott Reilly was for two years (1852-54) foreman of pattern-makers at the works of Messrs. Knight and Woods, of Bolton, and was subsequently for twelve months chief foreman at the works of Mr. Joseph Clayton, millwright and engineer, of Preston. His next employment was as draughtsman in the office of Mr. James Hodgson, of Liverpool, one of the pioneers of iron-shipbuilding.

There he remained until 1857, when he came to London and entered the service of Mr. Edward Woods, Past-President, as Principal Assistant in charge of office work.

During the fourteen years Callcott Reilly was with Mr. Edward Woods he was engaged on investigations and designs demanding high proficiency in the science and practice of engineering construction. Every spare moment he devoted to the study of mechanics and the higher mathematics. After the day's work at the office he would reach his chambers in King's Bench Walk, Temple, about 6 o'clock, and, first dining, would go to bed, getting up about midnight when all was quiet and working until 5 in the morning, when he would take out the remainder of his sleep. It was thus by dauntless energy and sheer hard work that the man, who had begun life as an apprentice in the merchant service, gradually made himself a name as a designer of bridges and as a practical engineer imbued with scientific principles.

As a result of his investigations Callcott Reilly presented to the Institution in 1865 a careful and elaborate Paper entitled "On Uniform Stress in Girder Work, illustrated by reference to two Bridges recently built."<sup>1</sup> The bridges in question were that carrying the line of the Central Argentine Railway over the River Desmochado, or Carcarañal, about 30 miles west of the town of Rosario, and the Horsham and Guildford Railway Bridge over the Wey and Arun Canal, about 5 miles south of Guildford. The conclusions he sought to establish were that a comparatively small deviation of the centre of stress upon the cross section of any bar, of any piece of framework, from the centre of gravity of that section, produced, within the limits of elasticity, a comparatively great inequality in the distribution of the stress upon that section; that the existence of this unequal distribution of the stress must be detrimental to the strength of any structure in which it existed; that there was no practical or theoretical difficulty in designing a truss, or girder, in which the stress upon every cross section—of all the important members at all events—should be absolutely uniform; and that the condition of uniform stress was perfectly consistent with the utmost economy of material.<sup>2</sup> For this Paper, which combined elaborate theoretical investigation with good practical results, the Author was awarded a Telford medal and premium.

In 1870 Callcott Reilly submitted a second Paper, entitled

<sup>1</sup> Minutes of Proceedings Inst. C.E., vol. xxiv. p. 391.

<sup>2</sup> *Ibid*, vol. xxiv. p. 422.

"Studies of Iron Girder Bridges, recently executed, illustrating some Applications of the Modern Theory of the Elastic Resistance of Materials."<sup>1</sup> In this communication he sought to bring to the notice of engineers systems of construction embodying an attempt at accurate conformity to scientific principles, with practical efficiency and economy. His aim also was to afford to students some examples—of very different types—of systematic computation and minute study of proportion, illustrating the modern theory of the elastic resistance of materials and the practical application of some of the simpler branches of that theory in a way which it was hoped might be useful.

He took a very prominent part in the movement which led to the establishment, by the Institution, of the Student class in 1867, and continued throughout his life to promote in every way the interest of that class. He also proposed the systematic inquiry into the state of the professional education of engineers on the Continent and in the United States, the result of which was the publication by the Institution in 1870 of the pamphlet entitled, "The Education and Status of Civil Engineers in the United Kingdom and in foreign countries."

Callcott Reilly's name and work were now well known in the engineering world, and in 1871 he was selected by the late Sir George Chesney for the specially important professorship of Engineering Construction in the Royal Indian Engineering College, then being established at Coopers Hill for the education of candidates for the service of the Government of India in the Department of Public Works. Very diffident as to accepting this appointment, demanding not only knowledge, but the power of imparting knowledge to others, as to which he was wholly inexperienced, he decided finally to put the matter before his friend, Professor Rankine, who expressed the opinion that he was "the very man for the post." This opinion was fully justified. Sir George Chesney's selection proved most happy and satisfactory, and Professor Reilly discharged the duties of the post for a period of twenty-six years. He brought to the work a firm determination to succeed in the duties he had undertaken, and he succeeded. Perhaps his most valuable quality was that as to which he had been most diffident—a marked power of making the way plain to students, and of leading them forward step by step in such a manner as to free the problem from many of its difficulties. No amount of trouble was too great for him; he devoted himself

<sup>1</sup> Minutes of Proceedings Inst. C.E., vol. xxix. p. 403.

without stint to the interests of the College; his house was the centre of hospitality and of kindness; and he was popular with all, as such a man could not fail to be. A marked characteristic was his love of books, his "friends" as he often called them, and he brought together a library, by no means restricted to engineering works, and containing many rare editions and choice bindings. In his retirement he devoted himself to general literature, Norse legends and sagas having special charm for him, for he had a romantic side to his character and loved poetry and romance. A few months before his death he met with a severe tricycle accident, being badly cut and bruised by a fall caused by an effort to save a child from danger. The injury thus sustained and the anxiety caused by the illness of one of his sons, were largely instrumental in causing his death.

Callcott Reilly was elected an Associate of the Institution on the 6th December, 1864, and was transferred to the class of Members on the 10th May, 1870.

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ROBERT ANDREW ROBERTSON was born in Islington on the 23rd April, 1843. After serving his apprenticeship with Messrs. James Simpson & Co., of Pimlico, he went in 1864 to Lichfield, where, as Assistant to the late Mr. David Thomson, he carried out some extensive tunnelling operations for the South Staffordshire Waterworks. From 1866 to 1872 he was Manager, for Mr. James Duncan, of the Clyde Wharf Sugar Refinery, where he laid the foundation of the extensive and intimate knowledge of the handling of sugar for which he was well known in later years. In 1872 he went to Glasgow, and ultimately became a partner in the firm of Mirrlees Watson & Co., a name known in all sugar producing countries, most of which Mr. Robertson visited in the course of business. His private correspondence was extensive and his advice much sought, but his great modesty of character prevented him from seeking the public recognition which his capacities and labour might have obtained. He died suddenly of apoplexy on the 2nd June, 1900, while on a voyage to the Argentine Republic, and was buried in the English cemetery at Corunna.

Mr. Robertson was elected an Associate of the Institution on the 2nd March, 1869, and was transferred to the class of Members on the 14th May, 1878.

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