

into the execution of all important works, especially the bay and port fortifications. The clearness of his judgment in harbour works is borne witness to by the fact that his proposals, with but slight modifications, were approved of by Sir John Coode, President Inst. C.E. Appointed in January 1878 as Inspector-general of Public Works and Chief Engineer of the Melbourne water-supply, he for some years acted as Chief Engineer of Victorian water-supply, until a separate department was formed. Among the important public works he designed or superintended are the Alfred Graving Dock, Prince's Bridge, Falls Bridge, Parliament House, the new Gippsland Lakes Entrance, the Belfast Harbour Improvements, the Warrnambool Breakwater, the Portland Breakwater. The defence works he took a great pride in, and the skilled military experts who have from time to time reported on them have been lavish in their compliments on the marvellously cheap and yet thoroughly effective methods he had adopted, particularly at the Heads and the South Channel Fort. The new cut at Fishermen's Bend, and other harbour works were carried out under his auspices. Mr. Steel during his busy life—busy in the public interest—found time to act as a member of the board on whose recommendation the recent extensions of the Melbourne water-supply system were resolved upon—the Wallaby and Silvery Creeks and the Watts River Aqueduct. He also undertook the guidance of the deliberations of the Swamp Board appointed under the Land Act, 1884, to reclaim the Kowee-rup, Moe, and Condah swamps, which cover an area of 90,000 acres. As far as Condah Swamp is concerned the work is pretty well completed, and the others are being proceeded with on the lines suggested by Mr. Steel. He had collections of documents and newspaper cuttings in relation to the initiation of all the public works of the colony covering a period of the last twenty-five years. These documents were all carefully indexed and arranged, and were thus readily accessible. In the public service he was deservedly beloved, and the blank caused by his premature death will not be easily filled.

Mr. Steel was elected an Associate of the Institution on the 5th of December, 1871, and was transferred to the class of members on the 12th of January, 1886. He died on Christmas Day 1889.

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HUTTON VIGNOLES, second son of Mr. Charles Blacker Vignoles, F.R.S., Past President Inst. C.E., was born on the 18th of November, 1824, just after his father had returned from

America, and had taken up the work of a civil engineer in England. In 1836 he was sent to school at the village of Menars, near Blois, France. Here he remained till 1841, in which year he became apprentice for six years to Mr. (afterwards Sir) William Fairbairn, of Manchester. In 1843 he was with his father, surveying for the Würtemberg Railway. In 1845 he was associated with his father in the plans for the North Kent Line, and about thirteen other railways. At this period the race against time for depositing plans for session 1846 was at its height. For nearly a week not one of Mr. Vignoles' staff went to bed!

Early in 1847 Mr. Hutton Vignoles undertook his first journey to Russia, and, after his father had secured the concession for the great suspension-bridge over the Dnieper, at Kieff, he was appointed its Resident Engineer. The work was of great difficulty; the floods were most violent, and the foundation nothing but sand; and in 1849 the foundations of the bridge were swept away. This trouble was ultimately overcome by the use of fascine mattresses. The difficulty of obtaining men was very great, and material had to go by sea to Odessa, and thence over rough roads 300 miles to Kieff; and, in addition to all this, in 1848 cholera appeared and caused great havoc among men and staff. However, all difficulties were finally surmounted, and in 1853 the bridge was opened, with great pomp and ceremony, by the Russian authorities. This suspension-bridge was, at the time, the largest in the world, and still remains among the most handsome; and it withstands, though founded on nothing but shifting sand, the shock of the wild and tumultuous floods that beat against it every spring when the ice breaks up.

From 1853-55, Mr. Hutton Vignoles was Resident Engineer on the Frankfort-Wiesbaden-Cologne Railway, and in 1856 left Europe for Brazil. Here he was engaged at first in making roads in the interior of the province of Bahia, a wild and totally uncivilized country. Then he made the surveys for the Bahia and São Francisco Railway, which he finally constructed. These works kept him in Bahia till 1864, in which year he returned to England, and became Engineer in England for the Warsaw and Terespol Railway. From 1869 to 1872 he was occupied in designing and constructing the Leipzig tramways, for which he was sole Engineer.

Mr. Vignoles' work led him into varied scenes, and his life was full of interest; but no doubt all his exposures and hardships told on his health. He left England in 1884 for the country-house in France, where he passed the closing years of his life. For many

years his strength had been on the wane, and on his return to England in 1889 he was taken ill, and, after more than six months' decline, died on December 14th, 1889, with twelve of his children around him.

He was of a taciturn disposition, though his varied experience made him a mine of information; and his name will be remembered as that of one who was never associated with anything which was not above-board and straightforward—a man of steadfast honesty and integrity. He was elected a member of the Institution on the 20th of May, 1854.

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WILLIAM WILLCOX was born at Areley, Staffordshire, January 18th, 1830, and was educated at Park School, Bewdley. He studied engineering under Mr. Stephen Ballard and Mr. Samuel Willcox (his brother), who carried out important contracts for the late Mr. Brassey. From 1860 to 1863, Mr. William Willcox was engaged on the Melbourne and Castlemaine Railway, in Victoria, and was on his brother's staff in constructing railways in New South Wales. In 1863 he returned to England, and from that time until 1869 was in charge of works for Messrs. Brassey and Ballard, upon the Evesham and Ashchurch Railway and on the London and Bedford portion of the Midland Railway. In 1870 and 1871, Mr. Willcox was District Engineer on the East Hungarian Railway for Messrs. Waring Brothers; and from 1872 to 1874 he was engaged in the survey of the Parana and Matto Grosso Railway, in Brazil. In 1874 Mr. Willcox went out to South Africa, and from that time to 1883 was engaged in carrying out surveys and railway works for the Government of Cape Colony. In 1885 he constructed the section of the Kimberley Line from Orange River to Modder River; on its completion, in consequence of the suspension of railway work in South Africa, Mr. Willcox turned his attention to gold-mining, but he did not meet with the success which he anticipated in his new enterprise, and when railways were recommenced he undertook the surveys in the Free State on the lines from Colesberg to Bloemfontein, and from Harrismith to the Natal border. It was while engaged upon the latter survey that he caught a cold, which he neglected in his anxiety to push on the surveys; pneumonia supervened, and he died at Harrismith, August 14th, 1889.

Mr. Willcox had a good practical knowledge of his profession, and possessed a remarkable faculty in the selection of country,