

and sewage works, both for Mr. Hemans and for Sir Charles Fox, Mr. Hassard, Messrs. Wilkinson, and others. For three and a half years, from 1870 to 1873, he was Resident Engineer of the Whitchurch and Tattenhall Railway, under Mr. W. Clarke, M. Inst. C.E. He afterwards engaged in independent practice, and designed and executed amongst many other matters, new waterworks for the town of Conway, railways in South Wales, and Parliamentary surveys.

Previously to his appointment to the Ennis and Athenry Railway in 1867, he had passed a most successful examination for India; Colonel Chesney pressed upon him an important appointment, but he was warned that India would be prejudicial to his health. An appointment in Honduras was similarly offered, and ultimately declined on the same account. His marriage in 1873 brought with it a large accession of fortune, but he always retained his keen interest in his profession, nor did he in any way remit his really hard work in preparation of designs, estimates, and drawings, and of Parliamentary work.

Of late years his health, never strong, gave way, but with characteristic reserve he kept the illness a complete secret, even from his nearest friends. He was elected a Member of the Institution on the 10th of April, 1877, and died at Torquay on the 23rd of January, 1882, aged thirty-seven, after what seemed only a sudden attack. Mr. Orlebar's natural reticence was equalled by his fine sense of honour, his kindness of heart, and his aiming at perfection in all he undertook to accomplish. The charm of his character drew round him many friends, who have keenly felt his loss.

MR. THOMAS ORMISTON, C.I.E., was born in Edinburgh on the 28th of July, 1826; a few years subsequently his parents removed to Glasgow, where he received the rudiments of his education. He left school early, and, evincing an inclination and talent for engineering, he entered the service of his father and his uncle, who were then engaged in extensive building operations at the west end of Glasgow. Here he acquired a practical knowledge of carpentry, masonry, and surveying.

In the year 1846 he entered the service of the trustees of the River Clyde Navigation in the engineer's department, and shortly after became chief assistant to the then Engineer, Mr. David Bremner, M. Inst. C.E., and during the long illness, and for some time after the death, of Mr. Bremner in 1852, he had the entire

charge of the works. After the appointment of Mr. John F. Ure, M. Inst. C.E., to succeed Mr. Bremner, Mr. Ormiston continued as chief assistant until the beginning of 1855, when Mr. James Walker, Past-President Inst. C.E., then the Consulting Engineer to the River Clyde Trustees, having had frequent opportunity of observing Mr. Ormiston's energy and ability, appointed him principal assistant in the office of Messrs. Walker, Burges, and Cooper, in London.

During Mr. Ormiston's engagement on the River Clyde he acquired a large and varied experience, as the great works of improvement, which have made that river famous in the annals of river-engineering, were then in full operation, and afforded scope for his abilities, which were highly appreciated by the Trustees and the Chief Engineer. He devoted much attention to the improvement of the dredging-plant, and in 1854 he furnished the designs for a dredger for the Ayr Harbour Trustees, which is still at work.

Mr. Ormiston continued in the service of Messrs. Walker, Burges, and Cooper, for about seven years, until the beginning of 1862, and during this period he frequently accompanied the late Mr. Walker to the many important works upon which he was engaged to report, amongst others the improvement of the harbours in the Isle of Man, the River Mersey, the extension of the Bute Docks, Cardiff, and many of the lighthouses for the Honourable Corporation of Trinity House. He was also entrusted with the entire charge of the erection of the lighthouse on the Needles Rock during 1856-7. No contractor being employed, he designed the whole of the necessary plant, and carried out the works to the entire satisfaction of Mr. Walker and the Trinity Corporation, and received a testimonial from the latter on the completion of the works.

Having been engaged under Messrs. Walker, Burges, and Cooper, in the preparation of the designs and contract drawings for the foundation of the Plymouth Breakwater Fort, the contract for which was let to Messrs. Henry Lee and Son, Mr. Ormiston, whose energetic nature led him always to prefer the active direction of works, accepted from Messrs. Lee the appointment as their Engineer in sole charge of the execution of the Fort works. These he continued to direct until near their completion in October 1864, when he received the appointment of Chief Engineer to the Elphinstone Land and Press Company of Bombay, in which city he arrived in the following December.

The Elphinstone Land and Press Company was formed in 1858

for the purpose of reclaiming a large extent of land from the foreshore of the harbour of Bombay, the formation of a series of tidal basins for native craft and boats, the construction of warehouses, roads, &c.

The portion of foreshore to be reclaimed presented at low water an expanse of soft mud 1 mile long and $\frac{1}{2}$ mile wide, the effluvium from which was a constant source of danger to the adjoining densely populated native town, whilst from the boatmen frequenting this portion of the foreshore cholera was never absent.

Although the works had been commenced in 1859, only about 81 acres had been reclaimed when Mr. Ormiston took charge in January 1865. He immediately reorganised the establishment, appointed a proper staff, and reduced the number of workmen by two-thirds, and having got the works fairly in hand, operations proceeded much more rapidly and at considerably less cost than previously.

By the year 1870 this foreshore, 328 acres in extent, had been reclaimed and converted into a valuable estate, 10,000,000 tons of material having been absorbed, the average depth of filling being $16\frac{1}{2}$ feet; 9 miles of roads from 40 feet to 80 feet wide; 10 miles of drains and 2 miles of permanent sea walls had been constructed, affording basins for the native craft, with 70 acres of wharf space and extensive shed and warehouse accommodation. Of the reclaimed land, 84 acres were handed over to Government for a goods station for the Great Indian Peninsula Railway, and 100 acres were set apart as a land estate, the building-plots on which are at the present time rapidly being occupied. Space was also provided for the expansion of the overcrowded native town, and the medical authorities testify to the incalculable benefit of the works to the sanitary condition of Bombay, cholera being now stamped out at the Bunders, which have taken the place of the old foreshore landing-places.

The Government, being alive to the importance of these works, purchased the Elphinstone estate in April 1870, and took over the services of Mr. Ormiston as Engineer, transferring to his charge the reclamation works, which had for some time been in progress under Government in Mody Bay, and shortly afterwards the Government acquired the remaining foreshore properties.

This led up to and eventuated in the formation by Government of the Bombay Port Trust in 1873, which took over the administration of the entire harbour of Bombay, superseding the previously existing Harbour and Pilotage Board, Mr. Ormiston being appointed Chief Engineer.

After the constitution of the Port Trust, Mr. Ormiston having for some time previously become convinced of the necessity for improved appliances to meet the increasing trade, began persistently to advocate the construction of a wet-dock with the most modern hydraulic appliances. His proposal for a considerable time met with a cold reception, but his customary perseverance at length overcame all opposition, and he had the satisfaction of receiving the sanction of Government to his designs. In July 1875 orders were given to proceed with the works of this the first wet dock of any extent in India. The contract was let to Messrs. Glover and Company, and the first stone of the Princes Dock was laid by His Royal Highness the Prince of Wales on the 11th of November, 1875; the last stone was set, and the water admitted, on the 10th of April, 1879, and the dock was finally opened for traffic on the 1st of January, 1880.

The Princes Dock has an area of 30 acres of water space, with two entrances from the harbour, 66 feet and 55 feet wide respectively, having a depth of 28 feet of water on the sills at ordinary spring tides. Its construction involved the erection of $1\frac{1}{2}$ mile of dock-wall, 37 feet in height, a large extent of sheds and warehouses, and a complete equipment of hydraulic machinery for loading and discharging vessels of the largest class. There are forty-three portable hydraulic cranes on the quays for lifts of 30 cwt., and one crane capable of lifting 100 tons. In opening up the channels and approaches about 4 million tons of dredging were executed with plant designed by Mr. Ormiston.

The success of the dock is universally admitted, and already the question of an extension of dock accommodation is engaging the attention of the Port Trust, as it is acknowledged that but for facilities afforded by the Princes Dock it would have been impossible to have dealt with the very large trade which has passed through Bombay during the last two years. The dock was also recently found to be of very great advantage to Government in enabling the expeditionary force to be despatched to Egypt in the middle of the monsoon with promptness and economy.

The rents from the land estate are increasing rapidly, and ultimately, from this source alone, the whole cost of the dock estate and its management will be defrayed, and the trustees will be enabled to reduce the port dues, and so attract a still larger trade to Bombay. It was with this view that Mr. Ormiston strongly opposed the separation of the land estate from the dock estate, and the wisdom of his policy has been fully established.

The amount expended on works in Bombay under the direction

of Mr. Ormiston was about three millions sterling, and amongst many other works, in addition to the reclamation and dock works which he carried out, may be mentioned the Prongs Lighthouse, a tower 150 feet high on a dangerous reef, at the entrance of the harbour of Bombay. He designed the lighthouse in course of erection on the Sunk Rock near the harbour, and erected numerous beacons and landmarks in the harbour, also the overbridges for the road traffic between the native town and the reclamations, in lieu of the dangerous level crossings on the Great Indian Peninsula Railway.

Mr. Ormiston was for many years a justice of the peace for Bombay, and as a member of the corporation he took a keen interest in all municipal matters; he was consulted on all the drainage and waterworks projects, to the consideration of which he devoted much labour and time, for the most part gratuitously. He was entrusted with many arbitration cases for Government and individuals, and frequently sat as an assessor on engineering questions before the courts. He was consulted on harbour and other works in different parts of India, and designed the Albert Edward breakwater now in course of construction, under native engineers, to form a harbour for the town of Mandvi, on the coast of Kattywar; he also designed a breakwater for Verawal, on the same coast, and was consulted by Government with regard to Kurrachee harbour, reported on the water power of the River Nerbudda at Bhosawal, and made many reports concerning the development of the internal resources of the country. In 1879 he visited Cyprus at the request of the Foreign Office, and prepared a report and design for a harbour at Famagusta.

Mr. Ormiston relinquished the post of chief Resident Engineer in 1877 to his brother Mr. George E. Ormiston, M. Inst. C.E., and became Consulting Engineer to the Bombay Port Trust in London, involving a yearly visit to Bombay. His last visit to India was to attend the opening of the Princes Dock in January 1880, on which occasion he received the decoration of Companion of the Indian Empire, in recognition of his public services.

He was a Fellow of the University of Bombay, and was elected Dean of Faculty of Engineering in 1879; he was also President of the Sassoon Mechanics' Institution, into which he infused much new vigour.

In 1880 his health began to give way, but in spite of much bodily weakness he continued his work almost to the end, and as late as February 1881 he visited Venezuela in South America, in his capacity as Chairman of the Bolivar Railway Company; and,

with that thoroughness which characterised him, he minutely inspected the whole of the line and introduced such changes in the management as he considered desirable. He was, however, obliged to give up all work early in 1882, and proceeded to the Isle of Wight in the hope of regaining strength; but, unfortunately, his weakness increased, and he died at Freshwater on the 9th July, 1882, at the comparatively early age of fifty-six.

He was elected a Member of the Institution on the 28th of May, 1861, and at all times took an active interest in its affairs. He was zealous for the honour of his profession, and was much respected by all classes for his frank and honest character, while his indomitable energy and perseverance, professional ability and sterling integrity inspired confidence in all works he undertook. He was always ready to assist a junior member of the profession by his advice, and his generosity of heart and just and kind treatment of the large number of workmen at various times under his control, gave him an unusual influence over the native workmen of Bombay. The announcement of his death was received with universal regret in Bombay, and an influential committee was appointed at a public meeting, largely attended by native gentlemen, to take steps to commemorate the services he rendered to that city.

MR. WILLIAM POWELL was born at the village of Hoyland, near Barnsley, in 1824. When little more than a boy he was placed under Mr. John Hawthorn, engineer and manager of the Milton Ironworks, near Sheffield, where he is said to have been first employed at one of the rolling-mills, but was afterwards promoted to the drawing-office. Leaving Milton in 1846, he removed to Rotherham, and was employed on the staff of the late Mr. Charles Bartholomew, engineer to the South Yorkshire Railway, and in the service of that gentleman ample scope was afforded him of acquiring practical knowledge of the profession, which he availed himself of to the utmost extent. In 1854 he left Rotherham to occupy a position of great responsibility as engineering assistant to Mr. John Towlerton Leather, contractor, upon the great Breakwater works at Portland. In the construction of this important national undertaking he was engaged about a dozen years. During the conduct of the work he came much into contact with Mr. (now Sir John) Coode, M. Inst. C.E., who so appreciated his services that he offered him the appointment of Resident, or Superintending Engineer, on the works then about to be com-