the beacon erected in place by Mr. Benjamin Pomeroy, of Stonington, Connecticut, under a contract made with him for that purpose. The entire cost of the iron work and foundation was about 4,600 dollars, and the time consumed in the construction was three months.

I had it in contemplation at one time to coat the iron work with zinc, by means of electro-galvanism, but I found that too much time would be required for preparing the necessary tanks and apparatus. I venture to hope, however, that another occasion may present itself, and that in the more important structure of the "screw pile light," which I trust I shall one day see executed upon our own shores, that the galvanizing process may be successfully applied.

In conclusion, I beg to call attention to one or two of the more important advantages which this application of one of the principles of Mitchell's Screw-pile, (see *Civil Engineer & Architect's Journal*, p. 182, vol. 3, 1840,) to the construction of light houses and beacons, presents.

In a very exposed situation, a light, or a beacon, if built of masonry, can only stand when the best description of work is introduced; this, of course, involves great expense, and much time. The mode of construction for such situations must, in principle, be similar to that adopted for the Eddystone and Bell Rock lights, and this, as all know who understand the subject, would, in the case of our own coast, present *an insuperable objection*: for example, the Bell Rock Light, on the coast of Scotland, cost £360,000, and four years were required to build it, this too in a situation where the rock upon which it is placed is bare at low water. The Eddystone was neither so costly, nor did it require so much time to complete it, still the amount would, with us, justly be considered out of the question for a single light.[2] There are many places upon our coast at which the screw pile light could be erected at a very moderate cost, far less, indeed, than that of a light ship; notwithstanding this, there are at this time several floating lights in Pamlico Sound, on the coast of North Carolina. The Middle Ground, in Long Island Sound, upon which there are only 3 feet at low water, and at which a light boat is now maintained, is, of all others, the most suitable point to make the first experiment upon with this description of light.

In reference to the *durability of wrought iron* exposed to the action of sea water, I have not a great deal of information to impart, still I have some which bears upon this question. Upon many of the reefs in Long Island Sound, and more particularly in Fisher's Island Sound, it has been the practice for many years to erect wrought iron spindles of about 4 in. diameter, and from 15 to 25 ft. in height; such spindles last from 15 to 20 years, unless carried away by ice. The contractor who placed several of these spindles, informed me that one upon a reef in Fisher's Island Sound had been up 20 years without being renewed; the wasting takes place principally between high and low water, and in this particular case, the size of the spindle is reduced from 4 to 2 inches in diameter. If, however, the zincing process, or if a precipitate of copper be resorted to, there is every reason for believing that the iron thus protected would last twice, or three times, 20 years. In short, economy in cost and in time, and the application of the principle of the screw pile in situations where masonry could not be resorted to without inordinate expense, would seem to be advantages in themselves sufficient to justify extensive experiments in a branch of the public service of such importance as that of our light-house system.

2 The Car Rock Beacon, on the coast of Scotland, cost £5,000; six years were required for the construction; it was intended to build it entirely of stone, but when half finished the upper part was constructed of cast iron. The cast iron beacon on York Ledge Maine, is an exact copy of the Car Rock Beacon; it cost £2,000.

PATENT SCREW-PILE BATTERY AND LIGHT-HOUSE.

Mr. Mitchell, the Patentee of the Screw-pile, previously described in our *Journal*, proposes to adapt them for the purposes of forming foundations for the erecting of batteries in the open sea, in such situations as the Goodwin Sands, and other sub-marine sand-banks.

The principle of such foundations has already been well tested both on the east and west coast of England—off the shores of which have been erected, screw-pile light-houses, that have now withstood the storms of several winters, without exhibiting the slightest symptom of insecurity or decay. The stability of such structures depends on two causes:—First, the firm hold which the broad screw takes of the ground, by being forced far beneath its surface. And, secondly, the solid part of the building being placed above the reach of the highest sea—no broad surface is opposed to the free passage of the waves—consequently, the structure is not affected by them.

The first foundation of this description was fixed in the Maplin Sands, by Mr. Mitchell in 1838, by order of the Trinity House, at the recommendation of their engineer, Mr. James Walker, for the Maplin Light-house; and, though it stands upon a bank of loose sand, many miles from the nearest coast, and exposed to the swell from the German Ocean, yet it is as stable and likely to endure, as if based upon a rock. But the first light-house of this description was erected by Mr. Mitchell in 1839, at the entrance of the sea reach, leading to the town of Fleetwood-on-Wyre; both these light-houses have been previously noticed in the 3rd & 5th volumes of the *Journal*. The stability of both these light-houses shows with what perfect security many descriptions of work may be placed on sub-marine sand-banks, by means of screw-piles; especially as Mr. Mitchell proposed for batteries, in consequence of some observations which fell incidentally from the Duke of Wellington, when giving evidence before the Shipwreck Committee of the House of Commons.

His Grace, while speaking on the subject of harbours of refuge, took occasion to observe, that the extensive application of steam, to maritime purposes, would effect an important change in naval warfare. That persons on the French coast, the sun being at their back, could see more distinctly what was passing in the channel, than could persons on the English side; which, by enabling steam cruisers to seize upon our merchant ships, at the most defenceless points, would, in times of war, seriously affect the trade of London itself; and, on this subject, his Grace concluded by alluding to the possibility of constructing places of defence on the Goodwin Sands, and other banks upon this coast, for the protection of our trade. For the necessity of such works, we have thus the highest military authority. For the purpose of a battery, Mr. Mitchell proposes to render his screw-piles available in the following manner, for a battery of 28 guns:—It is proposed to support it on forty-one malleable iron piles, placed in five parallel rows, the three interior ranges consisting of nine, and the two exterior, of seven piles each,—on the top of these piles an oblong platform is constructed, upon which the battery is formed, with a barrack and a light-house in the centre.

Among the many advantages to be derived from such places of defence, it may be mentioned the perfect practicability of placing them on sub-marine banks, adjacent to wide harbours, roadsteads, or estuaries of rivers, such as the Thames, where, from the absence of high and commanding positions, or even dry ground in their neighbourhood, ships of war constitute the only means of defending our trade, in time of war; the difficulty of which will now be much increased, in consequence of the introduction of steam in the navy. As compared with ships, the risk to such batteries, from hostile attacks, appears trifling; the narrow surface and rounded form of the piles, and each part of the frame-work, rendering it nearly ball proof; for, unless struck in the direct line of the centre, shot would glance off from their curved surface; and, even bar or chain shot could have no effect on the main supports of the building, owing to their great strength and weight.

OBITUARY OF MEMBERS OF THE INSTITUTITION OF CIVIL ENGINEERS.[1]

Professor Wallace.

William Wallace, LL.D., Hon. M. Inst. C. E., late Professor of Mathematics in the University of Edinburgh, was born at Dysart, in the county of Fife, in 1768. From birth, fortune, or education, he derived no advantages whatever, and the eminent station he eventually occupied as a mathematician, was achieved solely by his own industry and love of scientific knowledge, aided by natural talents of a high order. He was appointed, at the age of twenty-six, assistant teacher of mathematics in the academy of Perth. In 1803 he obtained a professorship in the Royal Military College at Great Marlow (afterwards removed to Sandhurst); and in 1819, upon the death of Mr. Playfair, and the removal of Mr. Leslie to the chair of Natural Philosophy, he was elected professor of mathematics in the University of Edinburgh. His pursuits and studies were chiefly connected with abstract mathematics, but some of the subjects to which he directed his attention may be here noticed, as having more immediate reference to the objects of this Institution.

The Eidograph, an instrument for making reduced copies of drawings, which he invented about the year 1821, and exhibited at a meeting of the Institution in 1839, is considered superior in many respects to the Pentograph. It possesses greater smoothness and flexibility of motion, and while the copies may be reduced or enlarged in any proportion, their similarity to the original is preserved with geometrical precision. By a particular modification, the instrument is made not only to reduce, but to reverse the copies, whereby it is rendered peculiarly applicable to the purposes of the engraver.

Among the papers which he contributed to the "Transactions of the Royal Society of Edinburgh," there is one on the subject of curves of equilibration, which is interesting to us on account of its connexion with the theory of suspension bridges. From the development of a certain functional equation, he deduces series for computing the co-ordinates of the catenary, and gives tables of the corresponding values of the co-ordinates so computed; thus furnishing engineers with a ready means of constructing arches having the forms of equilibrated curves.

Professor Wallace obtained a high reputation, as a mathematician, at an early age, and during his whole life he laboured assiduously to extend and facilitate the study of his favourite science. Besides his contributions to the

1 From the Annual Report of the Institute.