

Mr. BRERETON begged it might be clearly understood, that it was not intended to claim for the means employed, for the construction of the centre pier of the Saltash Bridge, any particular advantages, over any other system which might have been adopted for a similar purpose. Nor did he desire to provoke any discussion upon it, but would be happy to render the description of the work complete by any further information that might be asked for.

Mr. JOHN COCHRANE remarked, that the system which had been described in the Paper, although applied on a larger scale, was identical in principle with that which the late Mr. Brunel had previously used in the construction of the bridge across the Wye, at Chepstow, on the South Wales Railway. The plan employed was no doubt a good and efficient one, but in sinking cylinders of large diameter, it was not an easy task to apply the weight, which was required to assist the pressure of the air. He could not, however, understand, why there had been so much difficulty in keeping the cylinders free from water, unless the water proceeded from springs, having their source in the adjacent hills, and in consequence entered the cylinder at a greater pressure than that which was employed to keep it out.

Mr. FREDERICK LAWRENCE thought it probable, that a great portion of the difficulty of keeping the cylinder dry had arisen from the fact, of the bottom of the cylinder being formed to suit the irregular surface of the rock. One side being thus 6 feet higher than the other, it was very much like a diving-bell tilted on one side. It would be difficult otherwise to account for the unsuccessful application of the great pressure employed.

Mr. BRERETON, in reply, drew attention to the fact, that there was an extensive surface of riveted boiler plate to keep free from air-leakage. It was therefore not easy, in a cylinder of 37 feet diameter, to keep up a constant pressure of 40 lbs. to the inch, and to provide air for thirty men, or forty men inside, without much waste and leakage. There were double 12-inch air-pumps, but being kept constantly at work, they were frequently out of order. If a greater number of pumps, in relays, had been employed in the first instance, the trouble might have been diminished, but in consequence of the thinness of the boiler-plates of the air-jacket, there was great difficulty in keeping the caulking air-tight. The air escaped through the caulking, and round the rivet-heads, and penetrated through the hard-wood planking with the greatest ease, unless it was covered with clay, or slime as a preventive to leakage. The intermittent pressure against the cylinder, also interfered with the absolute tightness of the joints, and it no doubt contributed largely to the leakage. The air-pressure was equal to a height of 86 feet, or 88 feet of water, or about 40 lbs. to the square inch.

There was a difference in level of only 6 feet in the bottom of the cylinder, and almost all the water leakage came from the higher side of the bevelled edge. It was the water from that side which occasioned the most trouble.

At first some inconvenience was experienced by the men, in working under great pressure, and at the commencement of the work they stayed in too long at one time. He had remained seven hours at the bottom, with some of the men. After coming out they were slightly paralysed, but in two, or three days they quite recovered. With three-hour shifts, the men could remain at work for several months consecutively.

The weight of the cylinder, including the dome, intermediate cylinders, shelves, &c., was about 290 tons. The bottom was composed of double plates, $\frac{1}{2}$ -inch in thickness, and the top, of single plates $\frac{3}{8}$ -inch in thickness, with T irons outside, and shelves and angle-irons inside.

Mr. HAWKSHAW, President, said, that the Institution was under great obligations to the Author of the Paper, for the interesting details of a work of magnitude and difficulty. The system employed was of the greatest aid in engineering works, and was capable of very extended application. There was considerable difference in the relative ability of different men to sustain the labour under air-pressure. For instance, he had found Irish workmen less able to stand the pressure than Englishmen. He attributed that to the better mode of living and more robust frame of the English workman. He was sorry to say that, in the works under his charge at Londonderry, there had been some casualties. The men employed had to bear a pressure of 75 feet, or two atmospheres. One of the effects produced by that amount of air-pressure was, that the joints of some of the less robust men began to swell. He, however, knew one man, who although he had followed the occupation of a diver for about twelve years, seemed as comfortable under the water as he was upon land. But such cases were the exceptions.

If the Author would complete the Paper, by giving an account of the manner in which the superstructure of the Saltash Bridge had been erected, he would confer a further benefit upon the profession, and would contribute a valuable addition to the records of the Institution.