of air was forced into it by means of air pumps. The weight of the bell was about 70,000 lbs., and, to prevent floating, this weight was increased by means of ballast, iron and water being both used for this purpose. The ballast was contained in two annular chambers, one of which surrounded the lower part of the upper cylinder, while the other was carried on the roof of the lower cylinder. The iron ballast was placed in the upper of these two chambers, the lower one being filled with water, which could be pumped out whenever required. The water was taken into the lower chamber by means of pipes, which are seen on the left side of the bell. The pipe placed upon the highest part of the lower chamber was carried along the outer wall of the bell to a height of some feet above the level of the water, and was closed at the end by means of a cock. Another and shorter pipe was placed inside the chamber, being fixed to the interior wall, and bent downwards. Through this bent pipe the chamber was placed in direct communication with the water, which was prevented from entering the bell by the pressure of the air inside. On opening the cock, which was fixed on the upper end of the long pipe, the pressure of the inside air was reduced, and the water passed through the short bent pipe, and filled the chamber. To expel the water from the chamber it was only necessary to close the cock on the top of the pipe, and by means of a third pipe to place the chamber in communication with the interior of the bell. The pressure of the air in the bell then expelled the water through the bent tube.

In ballasting the bell about 220,000 lb. were placed in the upper chamber. This was sufficient to sink the bell so that the highest edge of the chamber was about level with the surface of the water. The lower chamber was then filled with water by opening the cock at the top of the rising pipe, as already explained. This gave an additional weight of about 57,000 lb. to the bell, which would have been sunk to the bottom of the water were it not for four strong chains by which it was kept suspended in its proper position. These chains were formed of links, each 5 ft. long, and arranged so that the chains could be lengthened or shortened according as the bell was lowered or raised. The whole apparatus was suspended by these four chains from a timber framing carried on the staging above. When the bell had been sunk sufficiently deep into the water, the compressed air inside it kept the water out, and the workmen could carry on operations without inconvenience from the water. As the height of the bell was 38 ft., whilst the depth of the water was generally only 23 ft., and the depth of the piers below the bed of the river from 6 ft. to 8 ft., the upper part of the bell was at all times above the surface of the water, by which means entrance and exit into and out of the bell were always freely maintained.

The mode of entering and leaving the bell was the subject of a special arrangement, in order to avoid the sudden and considerable reduction of pressure which would take place were a direct connexion established between the exterior and interior of the apparatus, which would also allow the water to rise in the bell and stop the work. In order to prevent this, the following plan was adopted. In the middle of the upper part of the bell was a square chamber, which was called the anti-room, and which was 10 ft. long and 3 ft. wide. In the sides of this chamber are doors, and in the floor there is a trap-door opening downwards. The entrance opening in the top of this chamber was closed by a heavy iron door, through which the descent took place in the following way: The iron door was opened, and the person descending went into the anti-room, the side doors of which were closed. The trap-door was then shut, and the room hermetically sealed, daylight being admitted by means of two bull's-eyes in the roof. A cock was then opened, through which the compressed air from the bell passed into the anti-room, the capacity of which was comparatively small, so that the original pressure was steadily maintained within the bell. When the pressure of air in both bell and chamber was balanced, the side doors and a trap-door communicating with the bell were opened, and the descent to the workings was effected by means of a ladder, as seen in the engraving. These arrangements will be clearly seen in Figs. 9, 10, and 11, Plate XLVIII, which show respectively sections on the line C, D, and A, B, Fig. 1, and a plan of the top of the bell. On the roof of the working chamber were placed two winches, which worked cranes in the upper part of the bell, on both sides of the anti-room. In the daytime the working chamber was lighted up by means of candles suspended from the roof. At night, however, gas lamps with reflecting glasses were used, and which were placed outside the bull's-eyes in the roof of the anti-room. In order to leave the bell, the workmen returned to the anti-room, closed the doors, opened a cock which placed the air in the room in connexion with that outside, and when the pressures were equalised the trap-door was opened and exit effected. During operations the bell was kept steady by means of four guides attached, as shown at Fig. 2. Figs. 3 and 4 represent respectively an end and a front elevation of the air pumps which were used for supplying air to the bell. The peculiarity in these pumps is that the working barrels are moved, the pistons being fixed. Another special feature is the method adopted to indicate a leakage in the pumps. This consisted in placing water on the upper side of the piston; directly any leakage occurred the water would be forced out and indicate danger, so that the men below were always working in safety as regards the supply of