would not make their own hole under the watershafts. In all other parts of the caisson the material could be properly broken up and prepared for the dredges, but the space under the shafts was inaccessible, being under water and out of sight.

When this became evident there was but one course left to overcome it. This consisted in bolting a wrought iron cap on top of the shaft and allowing the compressed air to rush into the upper part, forcing the water column down into the caisson until the shaft was empty. The pool below was then pumped out. As fast as the compressed air rushed into the shaft a quantity of stone was gradually piled up on top of the cap to prevent it from being blown off.

A large pit, with regular sloping sides, from six to eight feet in depth, was then dug out under the shaft, all boulders being lifted out and removed. This pit was dug in the dry, the surface river water being kept back by a temporary dam built around the excavation. The dirt as it is dug out was wheeled over to the other shaft. When the pit was complete it was filled with water, and the air above being gradually allowed to escape, the water would rise in the shaft until the column of balance was re-established. The stone and caps were then removed. This operation was performed quite frequently. Sometimes the shaft would run for three or four weeks without blowing out, then again only one week; but in no case could we pass below the point where it had been dug out. From one to two days were always lost in this operation. During this time the other shaft did all the work. There were in fact so many repairs to the buckets and so many other drawbacks that most of the time only one shaft was running.

The action of the bucket when it dropped on the material in the bottom of the shaft was that of puddling it into a compact hard pan, harder even than the original soil. To avoid this it was necessary for four men to be constantly stirring pool to keep the stuff alive, and even then the bottom kept rising.

A mixture of stone and clay was sure to fill up the hole in a few hours. The stone, moreover, or as apt to become so