The labor in itself is very fatiguing, making frequent resting spells necessary; more hands are required to throw the sand to the pipes than to feed them, and a large proportion of labor is expended in digging out under the frames and edges.

The most economical mode of working these pipes was made the subject of many trials by Col. Paine and Mr. Collingwood, the engineers in charge in the caisson. Trials were first made with flexible pieces of hose provided with strainers at the end. These became choked too easily both in the holes of the strainer and in the hose. The strainer was then removed and a shorter piece of vertical hose used, in connection with a piece of iron pipe. This, in turn, was discarded for a stationary iron pipe, extending within a foot of the ground and provided with a stop-cock below the roof.

Around the lower end of this pipe the sand and earth were heaped up in shape of a cone, while another workman attended to the opening or shutting of the air cock.

As the pressure increased, the lower orifices of the pipes were reduced to three inches and finally two inches, the same quantity being discharged with a smaller loss of air.

The material, of course, passes out with tremendous velocity, stones and gravel being often projected at least four hundred feet high. When the feeding below was too slow or irregular, the sand would be thrown very high, but, by practice, the discharge became more uniform.

In order to deflect the sand at the top of the pipe at right angles, both wrought and cast iron elbows were used at first. The sand blast would generally cut through these in an hour or two, sometimes in a few minutes, the thickness of iron being one and a half inches. That portion of the elbow struck by the sand was then made open and provided with a thick cap of chilled Franklinite iron, capable of being reversed when worn on one spot. These would at most last two days. Finally all elbows were taken off, heavy granite blocks placed over the mouth of the pipes,