

the ground the solid rock was struck, lying with but a slight fall to the S. W. After the surface of the rock had been thoroughly cleaned off by a diver, it was covered by a bed of concrete about 5 ft. thick and about a foot larger each way than the bottom course of the masonry. The first stone of the bridge was laid in this pier on the 3rd of August.

Pier No. 3 was the most troublesome and expensive of the whole thirteen. It came between the old canal lock and the river, and the South wall of the former and the cribwork bank of the latter contributed to render its construction both tedious and costly.

The excavation was carried down to water-level in the ordinary manner without much trouble. To continue the excavation below this level it became necessary to remove some forty feet in length of the cribwork in the river front; permission to do this having been obtained from the Department of Railways and Canals. A dredge was then brought up and fixed in position in the river abreast of the pier site, the excavation being by means of it carried down very nearly to the solid rock. Owing, however, to the proximity of the wall of the lock, the dredge had to work with extreme care in order to avoid disturbing its foundations. As soon as the dredge had done as much of the excavation as could be safely and conveniently done by it, three divers were sent down to complete the cleaning of the bottom; and a bottomless rectangular caisson 34 ft. long and 13 ft. wide was framed in position of whole timbers 12 inches square. The object of this caisson was to prevent the sides of the excavation from filling in and covering the site of the pier, as well as to form a mould for the bed of concrete. By means of accurate soundings, the caisson was framed as nearly as possible to conform on the upper side to the irregularities of the rock and the projections of the lock wall. On the lower or river side there was a space beneath the lowest timber of some three or four feet. As soon as the caisson was finally and accurately fixed in position, this space, as well as the small cavities that still remained under the timbers on the upper side, was enclosed by driving 3 inch planks around the outside of the caisson and spiking it firmly to the timbers. Inside the caisson as now fixed and enclosed, three divers continued and completed the final cleaning of the bottom, about ten days being occupied by this work. When this was satisfactorily accomplished, a bed of concrete, varying from 5 to 9 ft. in thickness, was deposited within the caisson by means of a square box of $\frac{3}{8}$ inch boiler-plate holding a cubic yard, the bottom of which was hinged in two flaps and adapted for tripping, the screw carrying the derrick that raised and lowered it, and on the deck of which the concrete was mixed, being in the old lock immediately abreast of the pier. The top of the concrete was levelled up and finished to a height of about 6 inches above low water, and eleven days later the masonry was begun.

Pier No. 4 is the first river pier, the site being bare rock and the water about four feet deep at lowest level. The caisson for this pier was framed to half its height at a convenient spot on the river bank below the bridge, and then towed up stream by a tug, and lowered into position. On reaching the site of the pier it was rigidly held in place by anchors at bow and stern, and the remaining height of timber was added. A bed of concrete about $2\frac{1}{2}$ feet in depth was then deposited in it, and as soon as this had set sufficiently the water was pumped out and the masonry commenced. This pier, as well as No. 5, is built on a skew of $10^{\circ} . 30'$ i. e., the axis of the pier makes an angle of $79^{\circ} . 30'$ with the centre line of the bridge.

The 5th and 6th piers were built in a precisely similar manner; the water was of about the same depth, and the bottom also bare rock. At piers 7 and 8 the water being less than 2 ft. deep, caissons were not necessary, the water being excluded from the foundations by means of plain rectangular cofferdams of square timber built round the site. These were surrounded by a low wall or bank of puddle and then pumped out. All the excavation necessary consisted of the removal of about a foot of loose and shattered surface rock. At pier 7 no concrete was necessary, the masonry being laid directly on the rock. At No. 8 the rock after being stripped of the loose surface was covered or levelled up with a bed of about a foot in thickness.

Piers 9, 10 and 11 are situated on a low rocky island, the surface of which is from one to two ft. above low water level; none of them required either caisson or cofferdam. No. 9 has no concrete under the masonry, while at 10 and 11, after stripping the loose rock from the surface, the bottom was merely levelled up with it.

Piers 12 and 13 coming in a foot or two of water required cofferdams and a thin bed of concrete to level up with. At the West abutment,