

piers were founded directly upon the rock, the others might safely be put upon piles, the care taken to protect the pile foundations increasing with their nearness to the channel. This arrangement was believed to have the farther advantage of making it practicable to begin work on the sand-bar piers at an earlier date than would otherwise have been possible. It was accordingly determined that Piers Nos. 1, 2, and 3, should rest directly upon the rock, while the four more northerly piers should have pile foundations; the piles were to be driven in excavated pits, cut off in every instance at a considerable depth below the usual bed of the river, and further secured by an ample protection of riprap; those under Pier No. 4 were to be driven home to the rock, and cut off at least 25 feet below extreme low-water. The experience acquired during the progress of the works led to subsequent changes in the plan; Pier No. 4 was treated as a channel pier, and founded on the bed rock, and the piles under Pier No. 5 were driven home to the rock, thus reducing the number of pile foundations to three, only two of which depend upon the frictional surface of the piles for their support. Piers Nos. 5 and 6 are on the dry land of the sand bar for nine months in every year, and Pier No. 7, situated within the line of the wooded shore, is exposed to the action of the water only on rare occasions. During the progress of the works no current strong enough to produce scour was noticed about any one of these piers.

All the foundations were put in of a sufficient length for a double-track bridge.

Although the foundations may properly be grouped in the two classes of channel and sand-bar foundations, as above mentioned, the characteristics of several pier sites were so different that it became necessary to treat each by itself, and to prepare as many sets of plans as there were piers. The south abutments and the two small pillars on the bank were built on the rock which was found a few feet below the surface of the ground, their foundations presenting no greater difficulties than are common to every cellar wall. They were built in the fall and early winter of 1867-68, the work upon them being executed at such intervals as the masons were not employed upon the river piers. The other foundations were taken up in the order of convenience; the dates at which the work in the river was begun in each instance, and the dates