

that side. Had it not been for this the most of the tunnel might have been driven without taking out any material through the tube at all. Of course this ^{method} would only apply to loose silt deposits which could be forced out of the way and would be impossible in sand or clay like that encountered in the East River work. Even with such favorable conditions the hydraulic jacks had to be worked under a pressure of from 25000 to 4000 per sq. inch.

The cast-iron rings are put in place by an erecting crane which is fastened to the back of the shield and is operated by the hydraulic pressure used also for the jack. This crane is shown in the accompanying sketch and seems to have been designed especially for the North River work.

In erecting a ring the bottom segment is placed in position first and bolted to the last completed ring; after which the segments are placed alternately on either side and the key placed in last, near the top. Only a few of the bolts are placed in while erecting. The remainder are placed and tightened during the next shove.

The average time for a shove and ring in place was 1 hr. 20 min. The record, 28 rings in 24 hrs.

All the materials of construction are handled on little mine wagons and steel box cars are used for handling muck. The cars are drawn by a cable passed over the drums of ordinary hoisting engine which is located at the foot of the shaft.