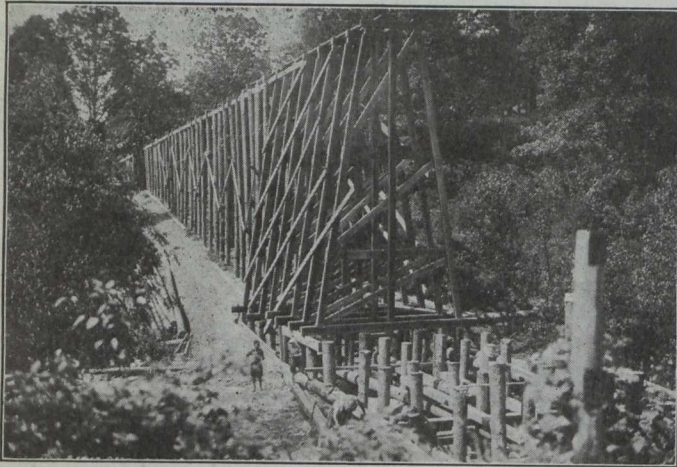


cross and side braces and 3-in. x 8-in. runners. These runners were let into the sides of the piles or timber bents at the top $1\frac{1}{2}$ ins. and were spiked to them. These caps



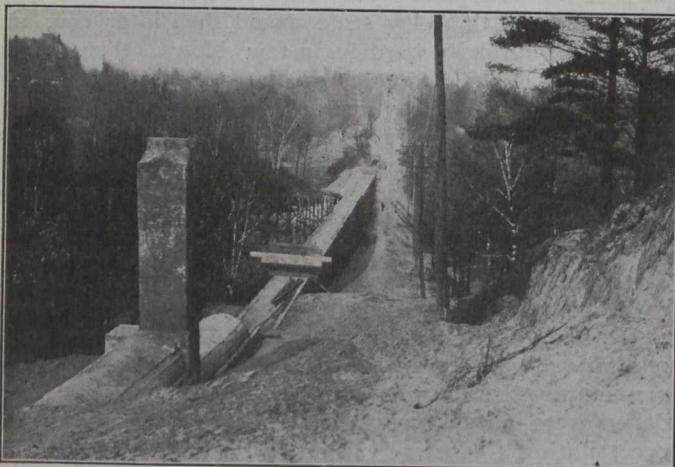
Piles Driven to Ground Level and Erection of Timber Bents Under Way

were bolted to the piles or timber bents by 1-in. x 15-in. bolts. Where sills were necessary they were attached to the tops of the piles by $\frac{7}{8}$ -in. x 24-in. drift bolts for which holes were bored to prevent splitting. The piles which came to grade and the timber bents were held in place by sway or side-braces.

When the piles were all driven and the bents erected, the filling, which will be described in detail later, was commenced, and was carried on till the tops of the bents were reached. A floor of 2-in. plank was then built on top of the bents and piles to serve as a temporary platform for the green concrete of the proposed sewer. The bents had been left 2 ins. low to allow for this, and care had been taken to leave the caps exposed so they would be embedded in the concrete.

Construction of the Sewers

The sewer on Bloor Street was built of concrete and was of the culvert type size, 5 ft. x 6 ft. 6 ins. The invert and crown were of 1 : 2 : 4 concrete, the former 15 ins.



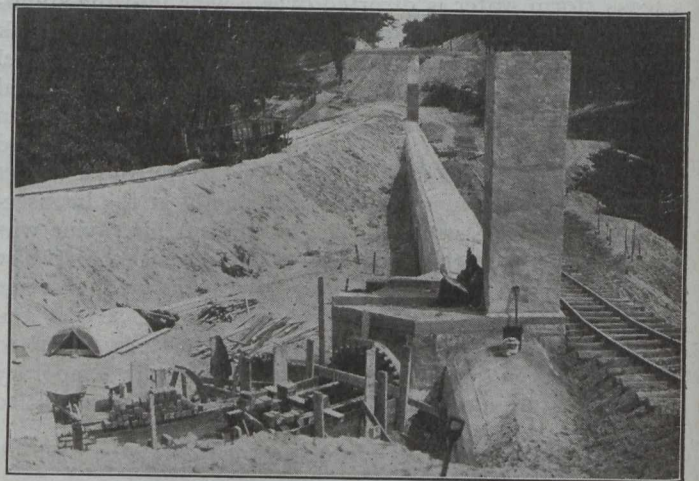
Showing Completed Pile and Timber Bents; Fill Partly Made and Manhole Built to Future Grade

and the latter 10 ins. thick, while the sides were of 1 : 3 : 5 concrete and 11 ins. thick. It was reinforced on the invert with $\frac{5}{8}$ -in. round steel rods 10-in centres and on

the crown with .75 sq. in. per square foot mesh which was laid so that it would be $1\frac{1}{2}$ ins. above the inside surface at the crown and gradually come to a similar position with regard to the outside surface 15 ins. below the springing line of the arch. The invert was dished and was lined with one thickness of paving brick for a wearing surface. The material for constructing this sewer was brought in over the new fill.

The Clendenan Avenue sewer, or that part of it which was on piles, was 4-ft. circular with two rings of brick for a crown and with a concrete invert which was made square outside to set properly on the caps. The concrete was 8 ins. thick, reinforced with $\frac{5}{8}$ -in. round steel rods 12-in. centres and a ring of paving brick was built inside for a wearing surface. The filling had progressed to such an advanced stage before the sewer was completed that it was finished in a trench (Fig. 2). This, of course, led to an alteration in the method of handling material which, instead of being raised by donkey engine and skip as had been planned, was dumped over the banks of the new fill.

Care was taken when building these sewers, to provide for the future shrinkage of the fill which, of course, would leave a considerable space under the sewer. With



Showing Cut at Top of Slope. Manhole Built to Grade. Fill Partly Made

this in view, a 3-in. tile pipe was placed through the bottom of the sewer every 5 ft. or between the bents. The space left by the shrinkage was afterwards filled from the inside of the sewer with sand through these pipes, and the pipes were then sealed up with concrete.

At the time of the construction of the sewer, the manholes were built up to the future grade of the street and looked rather odd projecting into the air 20 ft. above the exposed sewer.

Filling the Ravine

As we have mentioned, the filling of the ravine was advisable for two reasons. In the first place, it would improve the grade on the street, and secondly, it would not only provide a covering for the sewers but, what was more important, it would provide a foundation for them when the piles and timbering would have decayed. It was accordingly proceeded with as early as the sewer construction would allow. A large bank of sand about one-quarter mile away had been secured and the necessary 215,000 cubic yards of earth to make the filling were taken from it. Two steam shovels were located at the borrow bank and small construction engines with trains of cars were used to haul the material which was deposited as uniformly as possible on either side of the sewers.