(see Figs. 3, 4 and 5), a heavy temporary timber centre bent was erected (the steel columns not being then ready), the old falsework removed and the steel I-beams erected. Fig. 5 shows the conditions when the east section of the abutment was completed and work started on the west, old pile bents not yet removed. Fig. 8 shows both abutment sections and footings completed, the temporary centre bent erected, the old falsework removed and the I-beams in place. Note the camber to the beams to allow of sliding in the steel columns later on. The main operation, breaking track, removal of falsework, erection of beams, and relaying of track, was completed for each track in less than one working day, traffic being maintained over the alternate line without hindrance. When the operation was complete, therefore, the five spans of the original falsework were replaced by two clear spans, which much facilitated the subsequent substructure work and excavation.

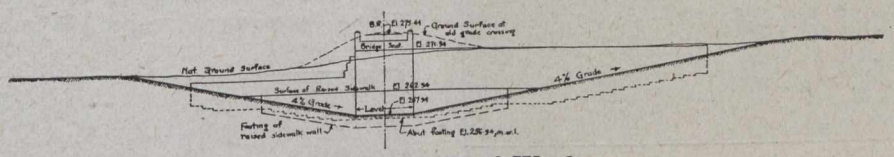

Fig. 5.—Profile of Work.

The latter, which, as before mentioned, was undertaken by the city, was commenced as soon as the falsework piling was driven and stringers placed. It was done by hand labor, the material removed by two-yard bottom dump wagons and teams, and wasted, where required, on neighboring property. Fig. 2 shows roughly the class of material encountered. At first it was loosened by plough, but when about 10 feet below base of rail the plough had little effect and small blasts were necessary. It was at this time that the trenches for abutments and centre footing were taken out, and once these sections were completed and the falsework removed (all of which was done in very short time) the excavation and teaming were much facilitated. In fact, it was figured that the gain thus obtained kept the extra cost of the falsework to much less than it would have been if underpinned, and the total cost of the excavation, after crediting the sale of the wasted material, only exceeded by 2½ cents the original estimate of 70 cents per cubic yard on a total of over 12,000 cubic yards.

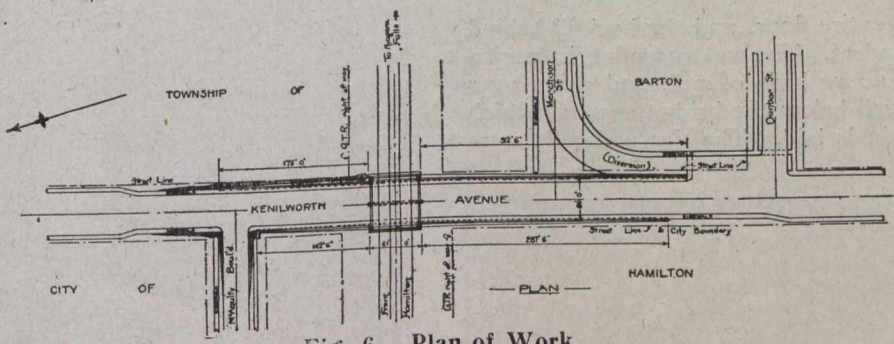

Fig. 6.—Plan of Work.

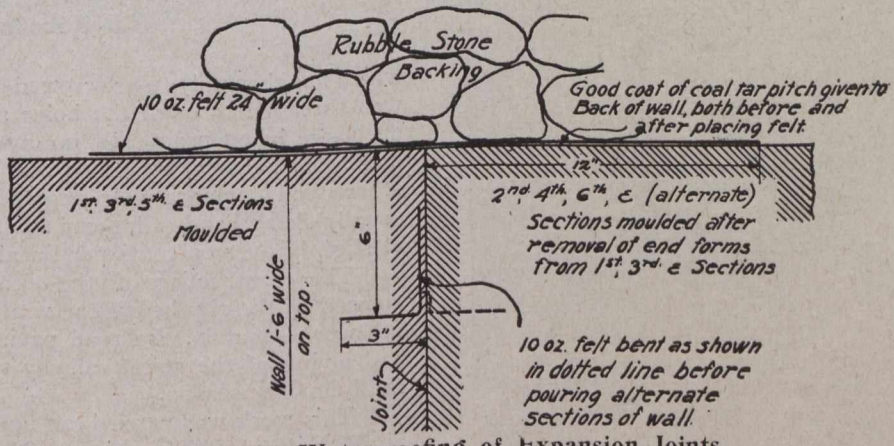

Fig. 7.—Waterproofing of Expansion Joints.

From this point downward the material gradually changed from a hard grey clay to soft shale and hard shale, so that for the deeper parts of the cut and foundation work, blasting was necessary throughout. The railway forces had very little material to remove, therefore, before obtaining firm, sound rock bottom for their concrete work.

Heavy rains at this period several times flooded the cut, necessitating considerable pumping, and it was the fact that the cut appeared to be a centre for the surface drainage of the immediate neighborhood that caused the engineers to take the precautions above mentioned for waterproofing the walls.

The concrete work was continued uninterruptedly, each abutment being extended in turn to four-track width, and the retaining walls then completed in succession. Fig. 9 shows the southeast wall when completed. In regard to the concreting, it may be noted that a 1 cubic yard steam mixer, mounted complete on a car, was used, being placed on a siding extended for that purpose. An elevator tower belonging to the plant was erected, it being intended to chute the concrete for the walls, but owing to the temporary difficulty of obtaining metal chutes, hand buggies were used, these being eventually retained throughout.

The cost of the concrete work as a whole was low. Accurate records of all costs were kept and in the final analysis to obtain unit costs, all possible charges were included. The average cost of some 1,530 cubic yards of concrete in the substructure was about $6.50 per cubic yard. This includes not only the bare material and labor of mixing and placing, but also the building and removal of forms, surface finishing and waterproofing of the joints.

In the same way the average cost of the superstructure concrete (about 200 cubic yards) ran slightly under $9.80 per cubic yard. These low unit costs were, in part, due to small freight charges (the material supply sources being close at hand), but mainly to the economical handling of the work generally.

As soon as the balance of the superstructure steel arrived, it was erected, and when riveted up, the solid concrete floor was poured. One track was completed at a time, the other track being gauntletted to maintain traffic. When the concrete had set, the surface was waterproofed with four plies of 10-ounce felt with a centre ply of burlap, each layer being well swabbed with hot coal tar pitch before laying the next. Between felt and concrete was placed a layer of rosin paper to keep a free