

of the C.P.R. tracks, an open cut 70 ft. long was made for locks and shaft. When the locks were built, a hollow wedge of timbers was forced over them into the solid earth at each end of the open cut. This wedge was filled with concrete and served to seal up the broken strata at and over the ends of the lot, and so help to prevent the escape of air. A shaft was timbered up midway between the two lots, and the remainder of the open cut back-filled. A head-frame was then built over the top of the shaft and a rough skip, with guides on two sides, was used for raising and lowering surplus and building material. The proximity of a C.P.R. siding was a convenience in handling material. Bricks, cement, timber, etc., were unloaded into the sheds there and carried to the shaft in small cars as required. Tunnelling was proceeded with in both directions simultaneously, but work had to be suspended in the north tunnel because it was found that all the air available at the time was needed in the south tunnel.

South Tunnel

Work in this direction went well for a time but was delayed on several occasions by the escape of the air into an old local sewer overhead. The joints in this sewer were very imperfectly made and in a number of cases the pipes were cracked. The escaping air carried the supporting earth into the old sewer in such quantities that it collapsed and had to be rebuilt before work could be carried on underneath. At Dundas Street the worst of these breaks occurred under the street railway tracks and for a few days the street cars had to turn back at this point instead of at Keele Street. Repairs were made by open cutting and supporting the tracks with heavy timbers. When this point was successfully passed, the work went smoothly for a time. However, the overhead cover of earth was now becoming less and it was increasingly difficult to contain enough pressure in the tunnel. When, added to this, defects in another old overhead sewer were encountered, tunnelling had to be abandoned and the old sewer had to be moved to one side and rebuilt. A test hole was made to prove the exact location of the end of the tunnel. The cableway was again set up and an open cut 360 ft. long was proceeded with. Here it was necessary to use heavier timber than was used in the other open cut since the sewer made a slight bend at this point, which brought it close to the houses on the street. Since the bottom of the trench here was very wet and the ground running sand, besides putting heavier timber in the work the contractors cut holes in the brick work foundations of the buildings and inserted under them heavy timbers which were held in place with jacks. Every day levels were taken and if the timbers showed any sign of settlement, the jacks were tightened. This work was given such good and close attention that when the open cut was complete and the back-fill made the buildings showed not the least sign of settlement. The holes were then filled up and everything left as formerly. The sewer was now complete as far north as the shaft at the tracks.

North Tunnel

When work was resumed on north tunnel all the air from the two pumps was turned into it. But very soon this was found to be insufficient, and it was at this point that the third and then the fourth pumps were added to the plant. The addition of a fifth was considered, but it was decided that the four pumps were supplying as great a pressure as the ground conditions would permit. Progress was very slow, averaging only two or three feet per day.

The worst difficulties were encountered under the C.P.R. tracks, where the natural strata of the earth had been broken up by the constant pounding and vibration caused by the heavy engines and trains. Work had to be suspended and the air turned off, sometimes every other day, to allow the ground to settle and consolidate. Every scheme that could be thought of was used to assist in this consolidation. The surface was soaked constantly with water, sand was brought and washed into the ground, sand bags were heaped up between the tracks to hold the ground down when the pressure was on in the tunnel, and grout was pumped into the earth from the surface and through the brick work of the sewer. At this time blow-holes could be seen all over the surface of the



Illustrating Open Cut and Method of Construction

ground above the tunnel. These were sometimes so large that the end of a pick handle could be shoved into them and the sand blown therefrom would rise six or seven inches from the mouth of the hole. At some distances from the centre line of the tunnel the surface of the ground looked as though it was covered with small ant-hills and the sand was constantly in motion. The greatest pressure that could be used was twenty-six pounds, which was often barely sufficient to dry the ground. The bottom foot or two of the excavation was frequently wet and sometimes took as long to prepare and remove as the ten or eleven feet above.

When the heading got so far away from the shaft that it was no longer economical to use man power on the construction cars, mules were introduced to do this work. Two cars were hitched together and one mule would draw them. The mules, however, did not like the compressed air any too well and when first introduced to it raised considerable objection.

After the Canadian Pacific Railway tracks were passed the work continued fairly regularly until Mulock Avenue was reached, where an old local sewer again gave trouble.