tinuing, section by section, as the filling of the form progressed, until the last section was put in place. Pouring was continued until the 8" hole was completely filled to the surface of the ground. After the concrete was set, and the bulkhead removed, it was found that the weight of green concrete, pressing towards the form had filled every space. Perhaps in a future age, some antiquarian, in the course of his excavations, may come across these 8" columns of concrete extending from the crown of the sewer to the roadway and may come to the conclusion that they were intended as some sort of support for the pavement.

The mining for each section was completed in one operation, but the pouring of the concrete for the sides and walls was not done at the same time as that for the bottom. Usually, the bottom was placed after the remainder of the section of sewer between two shafts was completed, in which case the concrete was poured down chutes in the shafts into waiting cars which conveyed it to its appointed place. A key 2" deep, formed by a 4" x 4" scantling cut diagonally, was left near the bottom of the walls so that the concrete of the bottom would key into the walls. It will be observed that the costs of this part of the work are given separately in tables 9, 10 and 11. It will also be noted that, in the first table, the cost of the labor amounts to more than double what it does in the other two tables. This can be accounted

for by the fact that the work, referred to in the first table, was carried on in the middle of the winter, when all material required heating and rehandling and that, in the later stages of the work, during the spring, the men were more experienced and, consequently, more skilful.

For the concrete in this work, 1" stones, screened from gravel, was used exclusively —both it and the sand being kept warm by steam coils placed under the piles. The face

of the invert was worked to a smooth finish. This was so well done that the co-efficient of friction may be expected to be very low, possibly not more than n = 0.012. On the ramp and in the junction chamber, the inverts were coated with a 2" facing mixture, consisting of one part cement to two parts %" crushed granite. All slabs and beams were built of class A mix, one part cement to two parts sand to four Parts 1" stone.

The intention is that this contract will complete the



sewer to Summerhill Ave. and Glen Rd., where a junction chamber was constructed with branches east and west for future extensions, for the construction of which the contract is now nearing completion. Meanwhile, the ends of the branches were temporarily sealed by 3" timber bulkheads.

It will be noted that in the calculations of costs, 11.68 cu. ft. of concrete per lineal ft. of sewer is assumed. In the



actual construction, however, allowance has to be made for overbreak in mining, for shaling, small slides, and spaces between supports etc. According, it is estimated that 13½ cu. ft. of concrete per lin. ft. of sewer must be allowed. 10½ cu. ft. for the crown and sides and 3 cu. ft. for the invert. Similarly, the excavation per lin. ft. amounted to somewhat over 1 cu. yd. or, approximately, 30 cu. ft. The shafts, which were timbered from top to bottom, were about 25 ft. deep and were 8 ft. by 10 ft. in area. The shafts for manholes were seven in number, but, owing to the difficulty of keeping the costs separately, costs are given for the sinking of only two of them. Only costs are given here which are known to be absolutely accurate.

The contractor was A. W. Godson Contracting Co. Ltd., and the resident engineer for the city was R. W. Dickie.

Following is the key to letters used in the cost tables: A, excavation; B, timbering; C, backfilling; D, moving surplus; E, forms; F, concrete; G, pipe-laying; P, rehandling material; Q, moving plant; Z, miscellaneous.

TABLE NO. 1—COST OF SINKING SHAFTS AND MINING, STA. 3+01 to 12+79—(Shafts 3 and 4)

Canal Contraction and	anianik Lannaasi	(internet)	Unit Cost in Hour's Labor,	Unit Cost in Hour's Labor,
Class of Labor.	Hrs.	Length.	per lin. ft.	per cu. yd.
Foreman	577	978'	0.59	0.59
Miners	2,183	978'	2.23	2.23
Muckers	1,270.5	978'	1.29	1.29
Engineers	553	978'	1.57	1.57
Signalmen	710.5	978'	0.73	0.73
Teams	1,107	978'	1.13	1.13
Laborers "A"	1,189	978'	1.22	1.22
Laborers "B"	254	978'	0.26	0.26
Laborers "P"	389	978'	0.39	0.39
Laborers "Z"	494	978'	0.51	0.51