or covered in a tunnel.

A rough estimate of the cost of the three plans is as follows:—

Plan No. 1.—For elevating the tracks.....	$760,000
Plan No. 2.—For depressing tracks	2,940,000
Plan No. 3.—For depressing tracks, city's plan	1,200,000

These figures do not include land damages. For plan 3 in which this item is larger than for the other plans, it is estimated that these would amount to $310,000, allowing for salvage on property owned by the Toronto, Hamilton and Buffalo Ry.

All these plans include extensive additions to the station platforms, tracks, etc., which are much needed at present, and the cost of which should not be included in the actual cost of grade separation.

Fig. 2 shows the profile of the track elevation plan as worked out by Westinghouse, Church, Kerr and Company. Beginning at the mouth of the present tunnel the track rises on a 1 per cent. grade to James Street, where the station platform begins. James Street is depressed about nine feet and John, Catharine, Walnut and Ferguson Avenues, are depressed from three to six feet. The maximum street grade is 5 per cent. The following streets are closed entirely; Charles Macnab, Hughson, Bailie and Liberty Streets, while Hunter Street would be diverted and only one side-walk left on the present street. This plan is probably the least expensive and most satisfactory way of eliminating grade crossings from a construction and operating point of view, but to the city it would mean the loss of Hunter Street, the closing of five other streets and the introduction of long heavy grades in some of the main business streets. A glance at Fig. 1 will show that every north and south street from James to Bay Streets,—a distance of a quarter of a mile, would be practically closed as the grade on Park Street, over the portal of the present tunnel, makes it useless except for very light traffic. The embankment through the city would do more to depreciate property than the present tracks, while the trouble from noise and smoke would be increased rather than diminished, on account of the heavy grades.

A profile of the alternative plan is shown in Fig. 3. This is a comprehensive plan from depressing the tracks not only under the main streets of the city but also under the Grand Trunk Railway tracks of the Port Dover Branch. The change in grade begins about 1,200 feet west of the east portal of the present tunnel, and would necessitate the rebuilding of part of the tunnel. Other expensive items would be the 275-foot skew-bridge for the Grand Trunk Railway and the bridge at Victoria Avenue. The presence of the transfer tracks east of this point makes a double cut necessary.

Plan number three of which a profile is shown in Fig. 4 was developed by the Hunter Street residents and adopted by the city. It is a much simpler proposition. It would require the rebuilding of 700 feet of the present tunnel and the extension of it eastward for a distance of 600 feet. But the main feature is the complete deviation of the line off Hunter Street. This would restore Hunter, Park, Charles and Macnab Streets to their original grade and free them from obstruction. On the east the present grade is reached at Victoria Avenue. East of this street the railroad is practically out of the city as there is no land of much value between it and the mountain.

There will probably be a joint meeting of the engineers of the parties interested early this fall to go over the plans and reduce the estimates to a common basis. The Railway Commission will then be in a position to consider the question.

REINFORCED CEMENT DRAIN TILE.

MR. CHARLES E. SIMS, writing in "The Iowa Engineer," refers to a contract which he secured in the spring of 1912, for the 30 to 42-inch cement drain tile for Rock County, Minn. The contract called for 3,700 feet of 42-inch tile, 1,500 feet of 34-inch, 1,300 feet of 32-inch and 2,200 feet of 30-inch. The 42's were to be laid at an average depth of 17 feet 9 inches and a maximum of 22 feet and 6 inches; the 34's at a maximum depth of 13 feet 6 inches, the 32's at a maximum of 11 feet 4 inches and the 30's at 9 feet 7 inches.

The earth pressure at the greatest depth of the 42's, figuring the trench 62 inches wide, was estimated at 5 tons per foot, or 15 tons on a tile 3 feet long. The engineer, in charge, specified a wall thickness of 4 inches and a system of reinforcing consisting of 6 wire hoops placed in pairs 8 inches apart in the length of the tile, and the hoops of two sizes, such that one set was to be 1 inch smaller than the outside diameter of the tile.

It might have been a saving of metal to have used a deformed steel bar in place of a pair of hoops, since the earth pressures may be assumed to be vertical, and theoretically, therefore, the need for reinforcement exists only at the inside of the tile wall at top and bottom of the tile and at the outside of the tile wall at the sides. To make this clear let us imagine a tile failing from the load upon it. As the tile fails, cracks open on the inside at top and bottom and on the outside at the sides, hence reinforcing is needed where the cracks can first be seen. It was a question, however, whether the earth pressures would always be vertical; for the banks of a trench of such depth may be expected to cave, in which event the single bar reinforcement might not come at the right place to be effective and the tile be no stronger than it would have been without reinforcement. The wire hoops were, therefore, considered the better type of reinforcement.

To avoid all risks the reinforcing was placed in the tile 6 inches centre to centre instead of 8 inches, and all tile for the deepest positions were made of alternately No. 6 and No. 3 wire hoops. Further, the wall thickness was increased from 4 inch as specified to 4½ inch and the wires purchased of such diameter as to cover them ¾ inch from the surface of the concrete.

To make sure that the hoops when dropped into the tile mold would come to the desired position in the concrete, the hoops were wired together in four or five places with No. 16 wire ties, each end wound around the hoop wires and made to project outward ⅝ to ¾ inch. This process is not expensive, one man being able to tie 250 pairs of hoops in ten hours.

The tile were made in 3 foot lengths. One part Portland cement to 3 parts of sand and gravel was used for the concrete, and as much water as possible, with the result that the tile made have watertight walls, and it is believed that the bond between the reinforcing and the concrete is all that is necessary for strength and preservation of the metal.