In case B (Scheme 3), to develop power, the banks of the canal are sloped in straight lines and regular curves to ease off the flow, and the tailrace is enlarged to accommodate the discharge through the headrace.

The cost of case A was found to be $5,895,000 and the amount of interest charged amounts to $1,072,948.

This amount of $5,895,000 has, therefore, to be added to the cost of pumping by steam or by electric current.

If the work is proceeded with, we had again to consider two cases; Case C, connecting the pumps directly to some of the turbines in the power house, and case D, using all the power from the power house to produce electric current, and then using part of the current to operate motor-driven pumps.

The question of connecting the pumps direct to the water-wheels was considered, but on account of the low available head and the resultant slow speed of the turbines, it was found advantageous to operate direct-connected generators in the power house, using the electric power so generated to operate motor-driven pumps. This scheme not only simplifies the design of the pumping units and their connections, but provides a most flexible plant. For example, every turbine unit is available at all times, that it is possible to operate, for either furnishing power for pumping purposes, or any other electric power service required. In the case where the turbine is direct connected to the pump, then that turbine can be used for pumping purposes only.

As the power house at times will not be in operation on account of frazil, high water, etc., and as there is a large difference between summer and winter power, it was also necessary to consider the case of providing an auxiliary steam plant.

We, therefore, calculated the capital cost, cost of maintenance, and cost of operation of the following:—

Canal and tailrace; hydro-electric power house; auxiliary steam electric plant; pump house, operated electrically; stand-by steam pumping plant.

As will be seen, it was found cheaper to discard entirely the old steam pumping plant and build a new one, and finally it was found advantageous to discard this new plant altogether, and enlarge the auxiliary steam electric plant for all requirements.

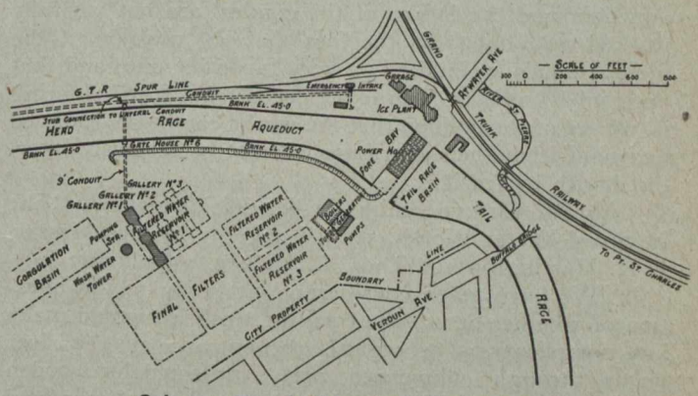
We first calculated the cost of the canal and tailrace as projected (Scheme 1) and the results of our studies, owing to uncertainty due to the nature of the bottom of the canal to resist scouring and the tendency of the retaining walls to slide, led us to calculate the cost of the maximum possible development of power from the canal with paved bottom and maximum enlargement of the tailrace (Scheme 2).

**Filtration Works.**—The filtration works were built for a capacity of 50 million Imperial gallons per day but are not yet in operation. The average daily quantity of water pumped last year was 54½ million Imperial gallons, running for some periods of three hours, at a maximum rate of 73 million Imperial gallons. The filtration plant as built would, therefore, be insufficient for the present requirements of the city, and either it would have to be worked much above its normal capacity or a mixture of filtered and unfiltered water would have to be used. Both conditions are undesirable, and such a situation should be avoided.

**Bridges.**—Under the present plans it is contemplated to build eleven bridges over the tailrace and canal, *viz.*:—

| | Name. | Location. | | Name. | Location. |
|---|---|---|---|---|---|
| 1. | Wellington | Tailrace | 7. | Asylum | Sta. 124.75 |
| 2. | Buffalo | Tailrace | 8. | Crawford | Sta. 135.50 |
| 3. | Filtration | Sta. 14.00 | 9. | Knox | Sta. 190.10 |
| 4. | Church | Sta. 41.80 | 10. | Latour | Sta. 231.60 |
| 5. | Woodland | Sta. 81.30 | 11. | Lasalle | Sta. 269.39 |
| 6. | Location not decided. | | | | |

The cost would be the same in all cases, except for Scheme 2, when the Wellington and Buffalo bridges would have to be longer owing to the widening of the tailrace.



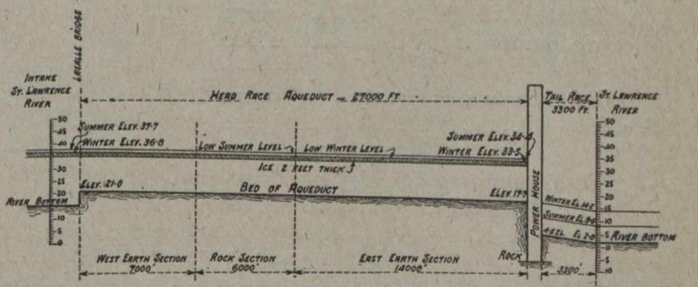

**Scheme No. 2, Aqueduct Enlargement.**

Gallery No. 1, Filtration Plant as it is built. Gallery No. 2, proposed extension for 100 M. I. G. Gallery No. 3, proposed extension for 150 M. I. G.

The head-gates of the canal are a part of the Lasalle bridge.

We have therefore left out the cost of 10 bridges in Schemes 1, 3, 4 and 5, but have included the cost of Lasalle bridge in all schemes. We have also added to Scheme 2 the cost of the Wellington and Buffalo bridges. Riprapping at other bridges than Lasalle may possibly be needed for all schemes, but its cost has been added to Scheme 2.

The riprapping we have figured upon, around the bridge piers in the canal, extends down stream for 100 feet from the head of the piers and for the whole width of the aqueduct. The bottom of the canal, where it is in earth, is excavated for a depth of 6 feet or to rock, if the rock is




**Scheme No. 2, Aqueduct Enlargement.**

less than 6 feet from the bottom of the canal. Five feet in depth is filled up with large and small stones and clay puddle, over which is laid one foot of good concrete.

**Boulevards.**—The cost of land for boulevards has been included only in Schemes 1 and 2. Owing to the grading of slopes in Schemes 3, 4 and 5, part of the land needed for boulevards is used for the banks, and the balance, becoming useless, has been omitted.

We cannot estimate in dollars and cents the value of the boulevards. Whatever value the boulevards may have to the city is beyond the scope of this report.