the surface of the water in that section 3 feet at mean stage.

A cross-section of the weir is shown in "A" of Fig. 3. This form was adopted after experiment with various types of weir made under as nearly as possible true river conditions. The experiments were made at the hydraulic laboratory of the college of civil engineering at Cornell University, which was generously placed at the disposal of the commission for the purpose.

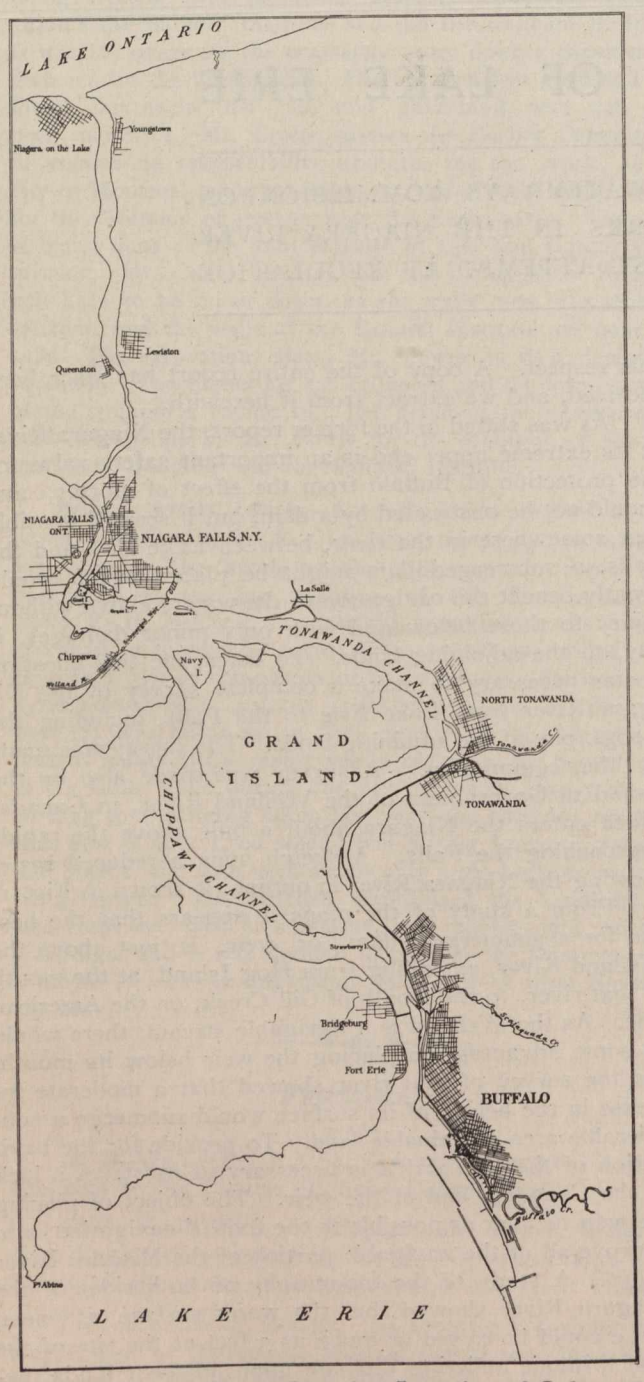

Fig. 1.—Niagara River, Showing Location of Submerged Weir.

The form of weir which was subsequently adopted fills the desired condition of high efficiency at high stages of the river and correspondingly the flow efficiency at low stages. The weir would raise the level of Lake Erie 0.51 ft. at extreme low stage, 0.39 ft. at mean stage, and 0.11 ft. at extreme flood stage. At low-water the surface of the Niagara would be raised 1.08 ft. at the Buffalo waterworks, 1.16 ft. at Strawberry Island, about 5½ miles from the lake, increasing to 3.05 ft. at Schossler's Dock, the foot of navigation. At flood stage these numbers are: For Buffalo waterworks, 0.19 ft.; for Strawberry Island, 0.12 ft.; and for Schossler's Dock, 0.91 ft.

The effect of raising the mean level of Lake Erie 0.39 ft. would be to raise Lake St. Clair's mean level about 0.23 ft., and that of Lake Huron about 0.09 ft.

To change the level of a great inland sea like Lake Erie, upon the shores of which are many populous cities, is a matter to be approached with caution. Any important increase in the height of the high-water level may cause serious damage to the wharves and low-lying lands. Care must be taken to avoid injury to vested rights. In this case, the ordinary high-water level is increased only 0.38 ft., or 4½ inches, and the extreme flood stage at Buffalo is increased only 0.11 ft., or 1⅓ ins.

The construction of the weir recommended in this report will affect to some extent the levels in the first reach of the Barge Canal from Tonawanda to Lockport. The level of the Niagara River at Tonawanda would be raised by 1.71 ft. at mean stage, and by 0.55 ft. at flood stage, so that inasmuch as no provision has been made at the entrance of the canal against the rise which the construction of the weir will cause, it is in our opinion necessary to provide for the construction of a guard lock, the cost of which is included in our general estimate.

The capacity of the lock to enter the Welland River is a domestic question to be decided by the Canadian government. An item of $500,000 in the estimates provides for the construction of that lock, but its dimensions should conform to the capacity which the Canadian government shall determine to give to the connecting waterways, and this estimate can be regarded only as a rough approximation.

The weir is to be constructed of concrete and its cost is estimated as follows:

Rock excavation, 36,300 cubic yards, at $4 per yard	$145,200
Concrete, superstructure, 44,000 cubic yards, at $12 per yard	528,000
Concrete substructure, 48,500 cubic yards, at $10 per yard	485,000
Cofferdam, 105,500 cubic yards, at $3.50 per yard	369,250
Pumping and maintenance, lump sum	210,000
Lock into Welland River	500,000
Guard Lock at Tonawanda	500,000
Excavation for retaining walls along Niagara River, 16,000 cubic yards, at $3 per yard	48,000
Concrete for retaining walls, 12,500 cubic yards, at $10	125,000
	2,910,450
Add for engineering and contingencies about 20 per cent.	589,550
Total	3,500,000

The great value to the navigation interest of an increase of 6 inches in the low-water depth of Lake Erie has already been pointed out. The improvement of Niagara River to be effected by the proposed weir is important. An incidental advantage in its construction is that it would eliminate the possibility of the power companies at the Falls having any injurious effect upon the level of Lake Erie. The Niagara River below the weir and the conditions upon Lake Ontario and the St. Lawrence River would remain without appreciable change. The weir has small regulating effect upon the levels of Lake Erie, the range of the oscillations of the lake being reduced about 4½ per cent. The average natural low stage, 571.3, is raised 0.45 ft., and the average natural high stage is raised 0.38 ft., a difference of 0.07 ft. The storage in Lake Erie is reduced only by that amount, which is not sufficient to affect the level of Lake Ontario seriously.

It is possible that the Canadian government may prefer to assume the damages from overflow in the valley of