It is to be expected, therefore, that a considerable re-collect the discharges from the Seneca, Park and Orchard outlets and to convey the sewage to a projected disposal plant, presumably near the Orchard Street outlet. This plant would consist of sludge beds, sedimentation tanks and chlorinating apparatus. The Bender Street outlet is too low to discharge its sewage into such an interceptor as the one suggested, and a small disposal plant may be required at its terminus. If the large intercepting sewer is recommended and constructed it will probably be a mile or more in length, with the large disposal plant in the vicinity of the Whirlpool Rapids. The interceptor will necessarily have a heavy gradient and may be not more than three feet in diameter.

Of course, no work of this nature will be undertaken before the Commission makes its report, but it is probable that the city will be required to go ahead with some such scheme as soon as the report has been made.

The Niagara River water pollution question involves also the towns of Fort Erie and Bridgeburg, on the Canadian side, as well as a number of towns and cities bordering the river in New York State. All of these municipalities will be effected by the recommendations of the Commission and in all probability adequate means to put an end to river pollution will be required in each case, similar to that described above.

ESTIMATES OF MATERIAL AND HAULAGE COSTS FOR GRAVEL ROADS.

Some useful tables relating to the matter of estimating both hauling cost and material quantities for gravel road construction appear below. The figures are derived from actual results recorded on many different projects and in different localities by the Iowa State Highway Commission. Some items of cost, as of the price of sand and gravel available, freight charges, expense of labor and teams, will vary to a certain extent in different localities, but nevertheless the tables will be of great help in striking a general average close enough for an intelligent estimate.

Table I.—Number of Linear Feet of 9-ft. Road a Load of a Given Size Should Cover for Various Loose Depths.

Weight of load Granite, lb.	Limestone, lb.	Size of load, cu. yd.	Length spread for loose depth in inches, 3-in.	4-in.	5-in.	6-in.
2,800	2,500	1	12 ft.	9 ft.	7.2 ft.	6 ft.
3,500	3,125	1¼	15 ft.	11.25 ft.	9 ft.	7.5 ft.
4,200	3,750	1½	18 ft.	13.5 ft.	10.8 ft.	9 ft.
4,900	4,375	1¾	21 ft.	15.75 ft.	12.6 ft.	10.5 ft.
5,600	5,000	2	24 ft.	18 ft.	14.4 ft.	12 ft.
6,300	5,625	2¼	27 ft.	20.25 ft.	16.2 ft.	13.5 ft.
7,000	6,250	2½	30 ft.	22.5 ft.	18 ft.	15 ft.
7,700	6,875	2¾	33 ft.	24.75 ft.	19.8 ft.	16.5 ft.
8,400	7,500	3	36 ft.	27 ft.	21.6 ft.	18 ft.

Table II.—Number of Cubic Yards of Material Per Mile to Make Given Loose Depth for Various Widths of Road.

Depth of loose material in inches.	Width of surfacing 9-ft. Cu. yd.	14-ft. Cu. yd.	15-ft. Cu. yd.	16-ft. Cu. yd.	18-ft. Cu. yd.
1¼-in. (screenings	180	280	300	325	367
3-in.	440	684	733	782	880
4-in.	587	913	979	1,043	1,174
5-in.	734	1,141	1,222	1,304	1,468
6-in.	880	1,369	1,466	1,565	1,760
Sq. yds. of surface per mile	5,280	8,213	8,800	9,387	10,560

Knowing the cost of gravel in any community, the cost of the material for the road can be easily determined.

The cost of hauling the gravel varies also between rather wide limits but the following may be considered as average prices where teams cost forty cents per hour and where ordinary earth roads are hauled over:

Table III.—Average Cost for Hauling Gravel Based on 40 Cents an Hour for Teams.

Length of average haul.	Cost per cu. yd.
One-quarter mile	21 cents
One-half mile	28 "
One mile	40 "
Two miles	63 "
Three miles	86 "

SYPHON LOCK ON BARGE CANAL.

The New York State Barge Canal is an interesting piece of engineering construction with many features that are noteworthy in a comparison with the Panama Canal, the Welland Ship Canal, and others of similar rank. On it there are 440 miles of constructed canals and 350 miles of intervening natural waterways. There are 57 locks, with one flight of five locks in a distance of 1½ miles near Waterford, N.Y., the latter providing a lift of 169 feet.

The works in their original state date back to 1817, when the original Erie Canal and the old Champlain Canal were both commenced. The Oswego Canal was begun in 1825 and the original Cayuga and Seneca Canal in the following year. Enlargements have been made from time to time in these canals until in 1905 the four were incorporated into the Barge Canal system, and since that time a canalization of numerous lakes and rivers has been

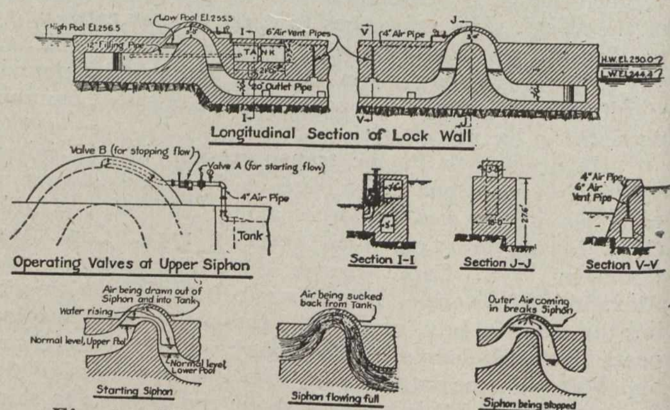

Fig. 1.—Diagram Showing Method of Operating Syphon Lock.

under way. The present design provides a channel 200 feet wide and 12 feet deep through rivers and lakes, and land lines of 75 feet bed width and 125 feet width at water line, and of 12 feet depth. There is a clearance of 15½ feet between water-line and bridges, etc.

Among the many interesting features throughout its length, there is, at Oswego, N.Y., a syphon lock of particularly notable design. It is the only lock on the system employing the syphon principle. Fig. 1, for which we are indebted to the General Electric Company, is a diagram illustrating the method of operating this syphon lock. The flow of water is started in the syphon by means of tanks. To perform an operation the tank is first filled with water, then the intake valve is closed and the outlet valve opened. There results a body of water suspended by its weight, but tending to escape into the lower pool, thus producing the necessary vacuum. On opening the air valve, air from the syphon rushes into the vacuum and water begins flowing over the crest.