meet all demands and not to limit the use of the water by the fire department to one or two hydrants when five or six are needed.

The Fire Hydrants.—The location of fire hydrants is a mooted question and should receive careful consideration. The general haphazard manner of locating a hydrant on each corner is like all the other hit-and-miss plans used. The best practice is to so lay out the hydrants that there will be one hydrant within a predetermined distance of any building that is to be protected. The writer believes in locating hydrants at least every 300 feet on all streets, and closer in the congested districts. In congested districts where there are great fire risks, hydrants should be not over 100 feet apart and located on alternate sides of the street. This will allow for one entire sidewalk to be blocked by falling buildings, and still have a hydrant every 200 feet on the other side of the street.

In normal times the cost of a good hydrant and branch line valve set up is not over $50 and the hydrant is good for at least twenty years, but with proper attention it will last as long as the mains last. Fire hose costs from 80 cents to $1.10 per foot and lasts about five years where not very much use is made of it, and proportionately less where it is used regularly. So the location of hydrants at closely spaced intervals will eliminate almost all long lines of fire hose and will materially reduce the fire department's expense for fire hose, to say nothing of being able to get the full benefit of the hydrant pressure on the hose.

In case the mains carry sufficient pressure for fire-fighting, the hydrants should have 6-inch or 8-inch connection to the mains and three or four regular 2½-inch openings or nozzles. Where the pressure is so low that the fire department has to repump the water, the hydrant should have not less than an 8-inch connection to the main and two or three 4-inch openings or nozzles. These conditions will allow the fire department to concentrate several streams on one fire and have no very long lines of hose on any of them.

The Eureka Fire Hose Company has published a chart showing that for 250 gallons of water per minute from one 1⅛-inch nozzle with 200 feet of hose it requires only 55 pounds hydrant pressure, whereas with 600 feet of hose it requires 95 pounds hydrant pressure, and with 1,500 feet of hose it requires 195 pounds hydrant pressure for the same amount of water. This shows that the closer spaced hydrants are the most advantageous as well as the most economical.

In selecting the type of fire hydrant, first cost should be the last consideration. Ease of operation, delivery capacity, accessibility of parts for repairs, low liability of breakage, and rugged construction should be the main features in any type. All types, however, should open against the pressure where it is possible. In case there is liability of heavy increase of pressure, this is an important factor in the hydrant, as small leaks under normal pressure become dangerous leaks under increased pressure when the hydrant valve opens with the flow of water. In any case, a gate valve should be placed on the branch line to the hydrant so that there may be no need of cutting out a whole block or section to make repairs to one hydrant.

Laying the Service Lines.—In the service layout of the plant great care should be taken to see that the pipe lines are properly laid and that there are no chances for them to be broken off at the main by the settlement of either the main or the branch line. Also, a good and strong curb cock or cut-off should be placed at the curb line, so that there will be a place at which the service can be controlled. In selecting the material for the service lines, it must be borne in mind that the line is put there for a permanent improvement and not as a temporary fixture. Too many engineers and superintendents reason that there is small chance for the use of the curb cut-off and that therefore it may be of a cheap design. This is wrong, especially in view of the very fact that it may lie idle for such a long time. After a long time out of use, unless it be of the very best, it will invariably give trouble when put in use again.

No service on any water plant should be without the proper measuring device where it enters the property, no matter if the supply of water be unlimited and there be no apparent chance of ever using all of it. Water should be sold for use and not for waste, and the only way to sell it for use is to make those that get it pay for it. Then if they want to waste it they can waste it, but they will pay for it just the same. With no meters and with flat rates for consumers, there is great danger that the service fixtures may leak badly and put such a drain on the mains that there will be small capacity for the fighting of fires. Ellis says that a circular orifice one-sixteenth of an inch in diameter working under 50 pounds pressure per square inch will deliver 1,180 gallons of water per day. So in case there be 1,000 consumers who have no meters and only one one-sixteenth-inch leak each, it will require 1,180,000 gallons of water per day for that waste.

SUGGESTED NEW DOCK SITE FOR ST. JOHN, NEW BRUNSWICK.

Mr. William Murdock, city engineer of St. John, N.B., in his annual report just issued, makes some very important suggestions in connection with improvements to the docking facilities of the harbor there. He suggests that a new dock site be built at Rodney Slip and extend 2,000 feet, reaching the upper end of Navy Island.

He refers to it as "a dock site which commends itself highly among the possibilities of St. John harbor, as being well in from storms, entirely free from ice and strong currents, would give 3,800 lineal feet of wharf front, and be centrally situated on the line of the proposed harbor bridge. Borings have shown that such a wharf could have thirty-five feet in depth of water, along the entire front named, without excavating rock. The greater part or all of the material removed could be deposited by suction dredges on the land between Navy Island and the northern end of the wharf. Two thousand feet of continuous frontage would be available on the eastern side, 1,500 feet on the western side, and 300 feet across the southern end. The northern end would be exposed to the strong river currents and, perhaps, not be desirable. The railway track on Union Street West, could be extended northward, eastward and southward via Middle and Nelson Streets and the ledge which connects the island with Carleton at low water. Here a trestle would be advisable that the tide could flow west of Navy Island as it does at present.

"Such a wharf would require removal of the ferry dock, which could be changed at a minimum expense to the head of Rodney Slip, as shown on the plan. The tramway down South Rodney Wharf would be discontinued and the wharf restored for shipping as of yore, thus liberating to the small craft a frontage of about 1,000 feet, whilst Nelson, Wellington and King Street slips would be available as now."