It was pointed out in the report that when any water mains are being laid in any part of the city they should conform as closely as possible to the sizes and directions shown on the plan attached to the report, so that whatever is done will ultimately constitute a part of the complete scheme.

Although engineers have no greater insight into the future than other persons, they can at any rate calculate the probable population in different sections of the city and design design works of adequate capacity, so that when any portion is being is being carried out from time to time, it will form a part of a satisfactory scheme of distribution.

In conclusion, there are doubtles many other problems which could with profit be dealt with in this paper, but time and and opportunity have not been sufficient, yet it is to be hoped that what is presented will furnish ample topics for criticism and discussion.

## SPEED OF DRAWBRIDGE OPERATION AND ITS VALUE.

## By Henry Grattan Tyrrell, C.E.

The required speed of operation depends upon the location and natural conditions. Where the river banks are high, so that nearly all river travel can pass under the bridge, the speed of operation for the few openings required for tallmasted ships is not so essential as when the deck is near water water, making it necessary to open the bridge for all kinds of craft, big and little. In remote places for only occasional service service, a slow movement, perhaps by hand-power, may be permissible, as in the Nyasaland vertical lift bridge in South Africa, which is operated by eight men in twenty-five



Sixth Street Bascule in Milwaukee; One of the Most **Recent Designs.** 

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minutes, or the Hooghly pontoon draw at Calcutta which re-quires fit Quires for the Hooghly pontoon draw at Calculation of the close it and as long to close it are to twenty minutes to open it and as long to close it again. On the other hand, in busy cities and especially at low-level crossings, it is important to economize every second of at second of time, and to install the most rapid operating machinery.

Swing bridges usually take from four to six minutes for a complete bridges usually take from four to six hind bridge so designed of this is facilitated by having the bridge can so designed that the ends are reversible, and the bridge can then follow then follow a boat around and continue moving in one direc-tion. More in boat around and continue moving in one heat tion. More time is needed if the bridge must open in one direction and direction and after coming to a stop and waiting for the boat to pass, store to pass, start up motion again in the reverse direction for the swing closing. By continuous moving in one direction the swing bridges on the continuous moving in one direction the swing bridges on the Tyne at Newcastle (1877) made a complete

circuit in 21/2 to 3 minutes. Bascules have the quickest movement, for the amount of lift can be suited to the size of boat, while a swing must perform a complete revolution for a craft of any kind, either large or small. The modern bascules in Rotterdam can be opened in 15 to 20 seconds in calm weather, and the experience with these structures in Holland cannot be surpassed, since that country is so extensively provided with canals and waterways. The speed is affected to some extent by the presence of snow and water on the floor, for these influence the balance and necessitate a little more power and time, and this provision becomes more serious in the colder districts, such as in lower Ouebec. or in Western Canada, where the winter is more severe.

The importance of rapid operation in cities, such as at Vancouver in British Columbia, can best be appreciated by an example. A bridge which has 100 openings per day, of five minutes each, will delay street travel for a total period of eight hours, or one-third of the time, five to six hours of which will be during the day, or nearly half the working hours.

The economic speed of operation, and the investment which is permissible to secure it, or to reduce delays for any particular case, can readily be determined. Observation must be made of the nature and amount of travel on both street and river, and the number of water craft that would require a bridge opening. The value of public time which can be saved by the introduction of more adequate machinery will represent the interest on the investment which is permissible. The matter is easily understood by an example. The saving to the public by placing the bridge high enough to avoid too frequent openings is illustrated by one of the openings bridges at New York. The old low bridge, only eight feet above the water, had been opened on an average of forty times per day, while the new one, with an under clearance of 24 feet, needed opening only twelve times per day, though the new and heavier bridge had a slightly slower movement than its predecessor.

The saving of public time by the higher bridge was \$4,000 per year, which is equivalent to 4 per cent. on \$100,000. It was therefore economical to spend \$100,000 additional on the new bridge to secure the greater under clearance and fewer openings.

These conditions apply wherever opening bridges are used, such as along the Canadian system of canals from lakes to the Atlantic, and on the proposed new canals from Georgian Bay eastward.

From forthcoming treatise entitled "Movable Bridges." By H. G. Tyrrell; 800 pages. Ready for press.

## CAPITAL CHANGES.

The following companies have increased their capital stock: Dunlop Tire and Rubber Goods Company, Limited. from \$993,000 to \$1.300,000, by the issue of 3,070 shares of new preference stock of \$100 each; the Walkerville Light and Power Company, Limited, from \$25,000 to \$100,000, by the issue of 750 shares of new stock of \$100 each; the Hercules Garment Company, Limited, from \$20,000 to \$50,-000, the increase consisting of 300 shares of \$100 each; the Security Lumber Company, Limited, from \$500,000 to \$750,-000, the increase consisting of 2,500 shares of \$100 each; the Maritime Nail Company, Limited, from \$250,000 to \$3,250,000, the increase consisting of 30,000 shares of \$100; the Carritte-Paterson Manufacturing Company, Limited, from \$50,000 to \$300,000, the increase to be divided into 2,500 shares of \$100 each.