of the citizens as to the real situation, and the Commissioners are at present proceeding to advise the public in detail regarding the condition of the work.

The Greater Winnipeg Water District is a corporation comprising, in addition to the city of Winnipeg, the city of St. Boniface, the town of Transcona, the rural municipality of St. Vital and portions of the rural municipalities of Fort Garry, Assiniboia and Kildonan, all of which adjoin the larger city. The system of water supply which the District is constructing is designed for a gravity flow of about 85,000,000 Imperial gallons of water per day from Shoal Lake, over a distance of about 95 miles, with a difference of elevation of approximately 300 feet. Since the first official announcement of the scheme, in September, 1913, many articles have appeared in *The Canadian Engineer* relating to the unique features of its design and the progress of construction of the portions already under contract. The part of the works to which the above-mentioned charges refer is a concrete aqueduct extending from Shoal Lake to within ten miles of the city of Winnipeg, a distance of 84.73 miles. The lengths, slopes, elevations and dimensions of its various sections will be found in an illustrated article which appeared in the issue of this journal for October 23rd, 1913.

The line of the aqueduct is through a practically unsettled country with large areas of swamps, marshes and muskegs. Throughout the greater part of the work so far completed an excellent foundation for the aqueduct has been secured at convenient depth, the subsoil for practically the entire distance being a sandy clay impervious to water. The deepest muskeg encountered by the aqueduct trench has been 15 feet. The foundation for the aqueduct along this section has been prepared by placing a gravel bottom protected by piling along the sides. The aqueduct over this portion is reinforced on account of the soft yielding sub-surface stratum. This is practically the only instance, we understand, where aqueduct foundations have as yet been required.

The sections which have occasioned the controversy are in a portion of the aqueduct extending through prairie where the cuts have been shallow and where the soil is of clay with no admixture of sand or grit and with varying moisture content. Difficulties in maintaining rigid and unyielding foundations in this region had been expected, but in order to build an aqueduct through this country that would have been proof against settlement and against cracks, concrete pile foundation would have been necessary, greatly increasing the cost of the work. It has been officially stated that before the specifications were written it was known that there were places in this section where settlement might occur after the work was constructed; but it was also known that the percentage of the total length which would be apt to settle would be very small and that it would be more economical to repair or even reconstruct these portions than to design an aqueduct that would not admit of any settlement at any point.

The portion in which settlement has actually occurred is where, in shallow cut, 4 feet of backfill had been placed over the arch. When the cracks appeared experiments were commenced to determine where the full amount of backfill, *viz.*, 4 feet, could be placed without injury to the concrete, in order to avoid a repetition of the condition under consideration. The engineers feel that no anxiety should exist, for the reason that settlement was expected, that the cracking is not of serious consequence and can be repaired at small cost, and that the behavior of these portions will be a guide in the construction of the remaining work. Of the 12 miles of the aqueduct completed, it is stated that considerably less than one-half mile has shown defects on account of settlement. On January 25th the Commissioners submitted a tabulated statement, from which the following percentages have been derived:

Percentage of whole aqueduct having cracks in invert ¼ in. in width	.27
Percentage of whole aqueduct having cracks in invert 1/16 in. to ¼ in. in width	.37
Percentage of whole aqueduct having hair line cracks	8.17
Total percentage of aqueduct having any crack	10.81
Percentage of whole aqueduct having no cracks that eye can perceive	89.19
Total	100.00

The statement is also made that only 2.64 per cent. of the completed work is sufficiently affected to require attention.

This is an official reply to the statements that were circulated on January 22nd to the effect that 8 or 10 miles of the aqueduct were absolutely useless and would have to be reconstructed at a cost of upwards of $2,000,000. These and other statements and allegations received such publicity in the Winnipeg press that the stability of the work completed to date was a matter of doubt in the public mind. The statement submitted to the District did not lay specific charges regarding construction, but had to do simply with the question of design. Mr. Cantell's own summary of his contentions are as follows:

"(1) That a sum of money in excess of $25,000 was paid by the commission for absolutely useless plans.

"(2) That the plans which were submitted by me would have fulfilled their requirements completely, and had one of them been accepted it would have cost approximately $1,125,000 less than the plans originally submitted.

"(3) That the designs at the present time being followed were prepared to be used only in rock, and they are being used in all kinds of soil, including clay and muskeg, and if used throughout the line, failure and very heavy additional cost are inevitable."

With respect to the expenditure of $25,000 "for absolutely useless plans," remembering Winnipeg's long and laborious search for a suitable water supply, little need be said. The scheme at present under way, estimated to cost over $13,000,000, is the result of many years' investigation of suitable sources and of thorough preliminary engineering study and design. Regarding the second contention, it is only necessary to observe that the plans submitted by Mr. Cantell no doubt received the consideration of the authorities. Mr. Cantell was in the employ of the District at the time when the adopted plans were under consideration. The validity of the third contention is inconceivable. The personnel of the engineering staff of the District, and the thorough preliminary investigation of the line of the aqueduct are known to our readers.

GARRISON CREEK STORM OVERFLOW SEWER, TORONTO.

The article in *The Canadian Engineer* for January 27th, 1916, relating to the construction of the main Garrison Creek storm overflow sewer and extensions, Toronto, presented some figures of labor and material costs. For a better understanding of the information given in this important section of the article, we have received from the author the following figures, upon which the labor costs were based: Engineers, 50c. per hour; foremen, $4 per day; bricklayers, 70c. per hour; signalmen, 30c. per hour; laborers, 25c. per hour (average; teams, $6 per day.