is one that has to be determined for each special case as it arises by preparing actual estimates and not by a priori reasoning.

In respect to the economics of cantilever bridges the following may be stated:

The economic length of the suspended span is about three-eighths of the length of the main opening, but a considerable increase or decrease of this proportion does not greatly change the total weight of the metal.

The most economic length of anchor arms, where the total length between centres of anchorages is given, and when the main piers can be placed wherever desired, is one-fifth of the said total length. By keeping the anchor arms short, the top chords may be built of eye-bars, provided that, with the usual allowance for impact, there is no reversion of chord stress; and this effects quite an economy of metal. But it is conceivable that cases might arise where, from danger of washout of falsework, eyebar top chords would be objectionable; hence this method of economizing must be used with caution.

In respect to the economic length of anchor-span in a succession of cantilever spans, it may be stated that within reasonable limits the shorter such anchor-spans are the greater will be the economy involved; but, generally, navigation interests will prevent their being built as short as might be desired. If permissible, they may be made so short that, as in the case of anchor-arms, eye-bars may be used for the top chords, thus effecting a decided economy of metal, although shortening the anchor-span increases proportionately the stresses on the web members and the weights thereof.

The question of what is the economic limit of length of simple-truss spans as compared with cantilevers is still a mooted one. Professors Merriman and Jacoby place it in the neighborhood of 600 ft., but the speaker has had occasion to compare simple-truss spans of 700 and 800 ft. with the corresponding cantilever structures, and has found the former more economic. The continuity of cantilever spans in resisting wind loads lowers the requirements for minimum width from one-twentieth to about one twenty-fifth of the greatest span-length, and hence, because of substructure considerations, gives an advantage to the cantilever type that in certain extreme cases will more than offset its disadvantages of greater weight of truss metal.

CONSULTING ENGINEERS RECOMMEND CON-CRETE FOR WINNIPEG AQUEDUCT PIPE LINE

The board of consulting engineers to the Greater Winnipeg Water District, comprising Messrs. Rudolph Hering, Frederic P. Stearns and James H. Fuertes, have recommended the use of reinforced concrete in place of cast iron for the pipe line between the Red River and McPhillips Street. The water board at the meeting last week received the report and deferred decision in regard to it till the next regular board meeting.

At a previous meeting of the water board a recommendation had been received from James H. Fuertes, consulting engineer, and W. G. Chace, engineer of works, to the effect that reinforced concrete should be used chiefly on the ground that it would be \$175,000 cheaper. The purchase price of cast-iron pipe and the cost of laying it was estimated at \$575,000, whereas the cost of material and the laying of the reinforced concrete was estimated at \$400,000. The board, acting on this recommendation, asked a report on the recommended change from the three consulting engineers.

Part of the consulting board's report is as follows:-"At the time we made our original report on August 20th, 1913, we recommended cast-iron pipe west of the Red River in connection with steel pipe from the Deacon reservoir to the Red River, having in view the future establishment of a pumping station near the Deacon reservoir to force the water to the district through these pipes under the full head required for supplying the inhabitants directly from the street mains.

"A subsequent report by Messrs. Hering and Stearns, dated January 25th, 1916, endorsing the change proposed by Messrs. Fuertes and Chace, by which a 5-foot 6-inch reinforced concrete pipe was substituted for the 5-foot steel pipe from the Deacon reservoir to the Red River, made a fundamental change in the plan under which water is to be supplied to the district from Deacon. This change of plan precluded the location of a future main pumping station near the Deacon reservoir, increased the capacity of the pipe, from Deacon to Red River, and indicated the desirability of locating a booster pump (and probably a future high-pressure pumping station) in the neighborhood of the Red River, all of these matters being fully dealt with in the last mentioned report. The change also provided for an increased capacity of the 48-inch pipe leading to the McPhillips Street reservoir, by gravity, and a still greater increase by the use of a booster pump; and made it of comparatively little importance for the 48inch pipe to be able to withstand more than the moderate pressure needed for discharging the water freely into the reservoir.

"Under the original plan it was essential that the pipe should be of cast iron, or some other material capable of withstanding a high pressure, but under the plans as changed in 1916, under which the work is now being constructed, there is no longer a necessity that the 48-inch pipe should withstand high pumping heads, and this makes it feasible to substitute reinforced concrete for the cast iron.

"The report of Messrs. Fuertes and Chace, dated August 10th, 1917, shows that the saving based on the substitution of the reinforced concrete for cast iron would amount to \$175,000.

"We understand that on September 6th, 1917, an informal offer was made to the administration of the Greater Winnipeg Water District by the Canadian Iron Foundries, Limited, to furnish cast-iron pipe and specials for this line for a sum which, if a contract were made at the price named, would reduce the saving due to the change to \$130,000.

"In our judgment a well-designed and constructed reinforced concrete pipe will be in line with good practice, efficient and safe under the comparatively low pressures which will occur with water discharging freely into the McPhillips Street reservoir; and furthermore, with the plans as modified in 1916 there is no other use to which this pipe may be put to warrant the additional expenditure of \$130,000 or any large fraction thereof."

The Alaskan Railway, now being built by the United States Government, is to be hurried forward, as its completion will hasten the development of its vast resources; will encourage the production of foodstuffs, thus reducing Alaska's dependence upon the United States for supplies; will furnish coal in unlimited quantity for the navy, obviating the necessity for the shipment of coal across the American continent to the Pacific, and, at the same time, release thousands of cars for the transportation of war materials and foodstuffs.