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PROBLEM OF BACKWATER

Some Observations on Subject Based Upon Development on St. Maurice River—Comparisons Between Poirée Formula and that of Mead

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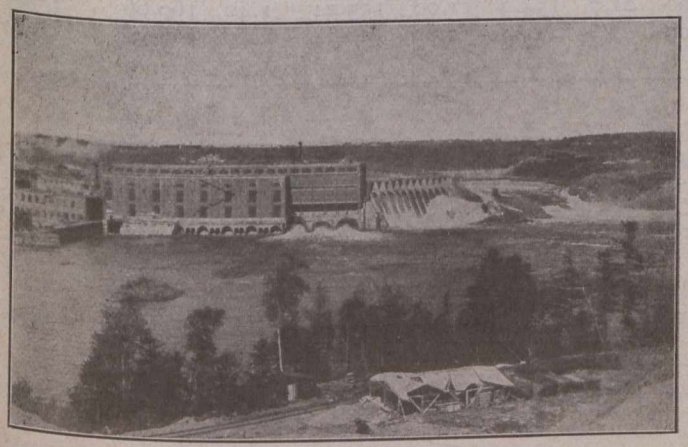
THE problem of backwater above dams is taking every day a larger part in engineering activities on account of the increasing development of water powers on large streams and the construction of important dams in connection therewith.

It brings to the engineer a realizing knowledge that riparian and other rights above falls have to be established by the determination of the highest contour attainable by the water surface under conditions encountered by such damming.

The writer in his leisure moments has studied the question, and the purpose of this paper is mainly to point out by using actual records observed on the River St. Maurice, to what extent the formulas ordinarily employed can be accepted.

In 1913, the Laurentide Company, Limited, undertook the construction of a spillway dam. It was at first designed with the crest fixed at elevation 150, referred to the company datum. Later, during the construction, experience suggested the installation of a gate-controlled spillway under Canadian winter conditions, based on the result obtained at Shawinigan Falls by the Shawinigan Water and Power Company, Limited.

A change to a gate spillway having a crest at elevation 140, estimated to raise the normal water level to elevation 160 was then decided on. The flow of the river other than that required for operation of the turbines is controlled by a number of gates which can be raised at any



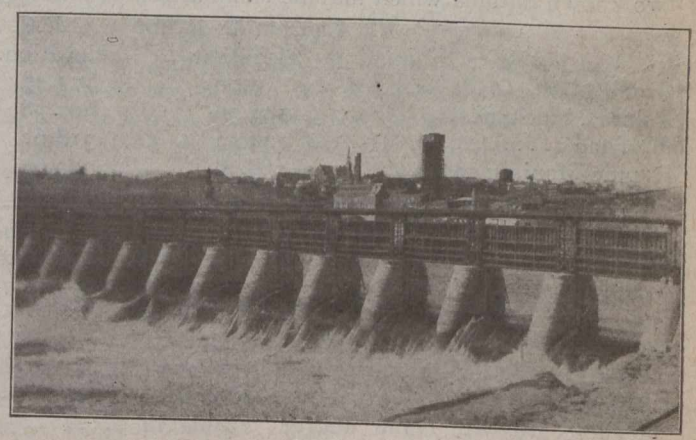
General View of Dam and Power House of the Laurentide Company, Grand'Mere, Que.

moment, eighteen in number, 40 feet in width and the bottom sill of all the gates resting at elevation 140.

Provided the gates were totally opened, different discharges would reach the following elevations:—

10,800	cubic feet	per	second	.....	Elevation		142.90
78,200	"	"	"	.....	"		150.40
170,000	"	"	"	.....	"		157.30

But efforts have continuously been made during the last season to keep the water level at nearly a constant elevation independent of the fluctuating flow of the river.



Dam from East Side of River St. Maurice

As the river discharge increased, the number of gates opened was increased proportionately.

The power project called for the installation of eight main power units; and space for two more units, should they be decided on in the future; six of these units requiring a flow of 9,500 cubic feet of water a second under a head of 76½ feet.

The work is now completed and the power development of the Laurentide Power Company, Limited, is at its designed capacity.

The Department of Public Works of Canada has recorded, at different points along the shores above the dam, the fluctuations of the river, and with the aid of the levelling performed by the Quebec Streams Commission (C.E.C. datum), which has kept records of the elevation of each of these gauges, the water levels have been plotted for different discharges of the river.

The River St. Maurice is a series of cascades and falls which are expected to be used for an extensive power development in the future. Being so near one to the other in certain portions of the stream, and leases being granted one at a time in order that each may be utilized to its full value, it is necessary for the government to be very careful in the acceptance of plans for these future developments.

This last year some engineers were of the opinion that in the development of the Les Forges Rapids contemplated by the St. Maurice Lumber Company, the rights of the