Volume 35.

"At about 1,000 feet above the Westbury Islands, the Brompton Pulp & Paper Co. has chosen a site for a dam and a hydro-electric power plant, which power would be transmitted to its mills at East Angus. Taking into consideration the development of the largest head possible between this point and the foot of the dam at East Angus, this site seems the most suitable.

"On the south shore the face of the rock may be seen for a distance of about ten feet, but I have been informed that borings were made to a great depth in the centre of the river and on the north shore, without finding the rock or impervious ground desired. The Brompton Pulp & Paper Co. have hauled to the site a large quantity of materials and construction plant, but it seems that construction has been postponed indefinitely. There is a fall of 40 feet in a distance of 25,300 feet, or 4.8 miles.

## Minimum Power, 3,272 H.P.

To use the maximum possible head of 40 feet by the construction of a dam which would back the waters to the tail race of the dam at East Angus, it would be necessary to provide in the dam sufficient openings to discharge the maximum flow and prevent the back water from decreasing the head at East Angus. Owing to the pervious nature of the ground, a considerable amount of protection work will have to be made on the north shore where the land, after reaching elevation 95.6 at the top of the bank, slopes down for a certain distance. The scheme may be realized, but precautionary measures will have to be taken.

"A dam could be built to raise the waters to less than 40 feet, and it would offer a larger measure of safety against infiltration. It would then be possible to discharge the water by a spillway, thereby rendering the construction much simpler. A development for a head of 35 feet would be more desirable.

"At the site of the proposed dam, the drainage area of the St. Francis River is 1,624 square miles. It was measured on a map prepared by the Hydraulic Service of Quebec.

"As in the case of the Westbury development, one must consider the regulation obtained from the storage dam at the outlet of Lake St. Francis, which will regulate the run-off from a drainage area of 472 square miles to a minimum uniform discharge of 600 cubic feet per second.

"The flow of the river at Westbury Islands will be 600 cubic feet per second plus the amount of water supplied by the drainage area between the lake and this point, that is: 1624-472=1152 square miles.

"Taking as a minimum, the run-off of 0.25 secondfoot per square mile, and for a maximum of run-off of 20 second-feet per square mile, the minimum discharge would be: $-600 + 1,152 \ge 0.25 = 888$  second-feet, say 900 second-feet.

"And for maximum discharge:  $-600 + 1,152 \ge 20 = 23,640$  second-feet, say 23,660 second-feet.

"In developing upon a total head of 40 feet, and assuming a wheel efficiency of **80**%, the minimum power available will be 3,272 h.p. A development with a head of 35 feet would give under the same conditions a minimum of 2,846 h.p. It will be necessary to provide in the dams, sufficient openings to allow the discharge of a maximum of 23,600 second-feet. It is said that the Brompton Pulp & Paper Co. has under option most of the land that would be affected by this development.

## Ulverton Rapid

"The Ulverton Rapid is located about seven miles below the town of Richmond and divides the townships of Durham and Kingsey, in the county of Drummond. It takes its name from the village of Ulverton located on the public highway about one mile west of the river.

"The rapid proper extends for a distance of 1,700 feet and has a total fall of 11 feet. The part of the river preceding the rapid has a good slope as far out as the mouth of the Black River,—part of which slope could be used to increase the head of a development. Above this point, the slope of the river is nearly uniform and at the rate of one and a half feet per mile.

"It was found on September 5th, 1917, that the water surface was 346.1 at the foot of Ulverton Rapid, 357.3 at the head of Ulverton Rapid, and 367.0 below the Grand Trunk Railway bridge.

"As to the possibility of development, the Ulverton Rapid offers one of the most suitable sites upon the whole course of the river. The shores are high and steep, and would permit the construction of a very high dam, if need be. The solid rock is exposed on both shores and no large amount of excavation would be required.

"It has appeared to us that the best site for a dam is in the rapid itself at the most important fall, and on a rock ledge extending almost completely across the river. The water surface was 348.20 and the current was so swift that we could not possibly take soundings.

## Maximum Discharge, 60,000 Second-Feet

"Should a dam be built at this point, it would be necessary to locate the power-house at the foot of the rapid and bring the water to the turbines by a penstock, by raising the water at the head race to elevation 365, the mills operating under a head of 20 feet. There is a possibility of increasing this head by three or four feet by the building of a tail race canal, which would lead the water to the foot of the swift current below the rapid. This particular side of the scheme deserves to be studied from its financial standpoint.

"Another site for a dam was also examined at the foot of the rapid, and soundings were made about 35 feet downstream, giving a full idea of the depth of the water in the river. In the channel we have noted a depth of over 25 feet. A dam built at this point would have to be at least 50 feet high to give a head of about 20 feet.

"The cost of the penstock, necessary in the case of the first dam, would certainly be compensated by the difference in the cost of the two dams.

"The drainage area of the St. Francis River, at Ulverton Rapid, is 3,456 square miles, measured on the Hydraulic Service map. Taking the figures obtained by The Quebec Streams Commission for a minimum run-off of 0.25 second-foot per square mile, and for the maximum run-off of 20 second-feet per square mile, the minimum run-off at Ulverton Rapid would be:—600 second-feet plus (3456—472) 0.25=1346 second-feet, say 1350 secondfeet.

"Or, assuming that the head of 20 feet is used and a wheel efficiency of 80%, the minimum power would be 2,454 h.p. The maximum discharge would be :—600 plus (3456-472) 20=60,380 second-feet."

## Rainfall

The amount of rain and snow which has fallen in the valley of the St. Francis River was measured at Lambton, Disraeli, Sherbrooke and Drummondville.

The station at Lambton was established in 1915; that at Disraeli was established in 1907. The Sherbrooke station was established in 1904, at the Seminary, and is under the direction of Rev. P. A. Begin, who has kindly

(Concluded on page 411)