

is an agreement of long standing by which at least 500 cubic feet per second must be passed when available.

In estimating the rainfall and run-off it was desirable to find a stream having its basin as near as possible to that of the Magog River and on which measurements of flow, rainfall and run-off have been made over a considerable period. That portion of the Connecticut River lying north of Oxford, New Hampshire, was found to serve the purpose very well. The centre of its basin is only about 50 miles south of that of the Magog; the soil is of very much the same nature, and although the country slopes a little less abruptly, this can be allowed for. A Government station has been established at Orford for eight years and measurements of flow, etc., have been taken during that time.

The following table gives the rainfall and run-off for the Connecticut River and the estimated run-off for the Magog, allowing for the fact that the Magog Basin is farther north

CONNECTICUT RIVER				MAGOG RIVER	
MONTH	INCHES RAIN	INCHES RUN-OFF	RUN-OFF IN % TOTAL RUN-OFF	RUN-OFF IN % TOTAL RUN-OFF	FLOW IN CU. FT. PER SEC.
Jan. ....	2.28	0.76	3.5	3.5	413
Feb. ....	1.60	0.54	2.5	2.5	295
Mar. ....	3.44	3.91	18.04	14.	1,662
Apr. ....	2.77	4.70	21.7	26.	3,060
May. ....	2.99	3.10	14.3	17.	2,000
June. ....	3.78	1.69	7.8	8.	944
July. ....	4.34	1.09	5.04	4.5	531
Aug. ....	3.88	1.09	5.04	4.5	531
Sep. ....	3.73	1.03	4.75	4.	472
Oct. ....	2.77	1.24	5.74	5.	590
Nov. ....	2.17	1.23	5.68	6.	708
Dec. ....	2.80	1.28	5.9	5.	590

and the streams somewhat more rapid. Allowance was also made for the fact that in a north-flowing stream the period of heavy flow in the spring is somewhat shorter and more excessive than in a south-flowing stream, because in the latter case the floods from the head waters do not come down until the southern portion has returned to a more or less normal condition. The calculated flow of the Magog in cubic feet per second for each month is also given. In making these calculations a total run-off of 21.5 inches was used instead of 21.66 as given for the Connecticut.

The flow of the river for a dry year is 580 cubic feet per second, and the flow estimated by the power users on its banks was 550 cubic feet per second, a difference of only about 5 per cent.

With the full 5 foot storage in Lake Memphremagog the flow would be nearly 800 cubic feet per second.

The purposes of the new development are, first, to replace the old plant mentioned above, and secondly, to supply about 2,500 H.P. of electrical energy to power consumers within a radius of 20 miles of Sherbrooke. The greater part of this power will be sold to concerns at least 8 miles from the city and will be transmitted at 20,000 volts. This energy is for the most part already contracted for, and the pole line has been erected as far as the Eustis Copper Mines.

The development consists essentially of:—

(1) A concrete dam with a northern bulkhead section 225 feet long and about 20 feet high, a central overflow section 70 feet long and 44 feet high, a stop-log section 14 feet long,—used during construction to pass water for the old Street Railway power house, and which can be used in future

as an adjunct to the overflow section, should this become necessary during spring freshets,—and a southern bulkhead section 42 feet long and 12 feet high. The dam contains about 3,400 yards of concrete.

(2) A steel penstock 660 feet long and 9 feet 6 inches in diameter with a standpipe 16 feet in diameter and 56 feet high.

(3) A brick and concrete power house 90 feet x 38 feet with hydraulic and electrical equipment for developing 3,000 H.P.

All concrete used on the work was mixed in the proportion of 1-3-5 except in beams and slabs where 1-2¼-4 was used. Suitable gravel was substituted for sand and broken stone.

**Dam.**—A 2-inch steel cableway was strung over the site of the dam and used both for excavating and for placing the concrete, bottom-dumping buckets of 1 cubic yard capacity being employed. A boiler and hoist shed was erected on the south bank. The location of the cable-way is shown by a dotted line on Plate III. and it will be seen that it lies just inside the upstream face, and nearly parallel to it, across the northern bulkhead section. At the overflow section it is about 20 feet back of the fact. This arrangement permitted the placing of 85 per cent. of the concrete without building runways.

The concrete mixer, a Ransome No. 28, was located just under the northern tower of the cableway with the gravel bin behind and above it and the cement shed above to the east. Steam for the mixer was obtained from the boilers of a factory on the north shore.

The new dam has been built 50 feet downstream from the crest of the old timber dam and is 10 feet higher. Plate III. shows its location relative to the old dam, headrace, etc.

The factories on the north shore had power rights which have not yet expired. They were equipped with electric motors and supplied with power from the city power house and the head gates on that side of the river closed, but it was desired to keep the Street Railway power house in full operation until the power from the new development was available, in order to avoid installing motor generator sets and purchasing power for them.

The course adopted was as follows. The northern bulkhead section was first constructed, the old head gates serving as a coffer-dam. The excavation in this section was not very heavy and, aside from blasting a 3 x 4 cut-off trench, consisted for the most part of earth. A great many pot-holes were found in the rock, which must have been worn in some quite remote period as the river has not been running in that portion of its channel since the country was settled.

The work was commenced at the north shore and run southward, expansion joints being made every 35 feet. An opening 14 feet wide was left in this section to provide a passage for the flow of the river while the overflow section was being built. The bottom of this opening was about 2 feet below the crest of the old dam. The penstock thimble, which is located at about the middle of the section, was concreted in, and the first sections of the penstock riveted on and blocked up. The racks, which are of steel 3 inches x 5/16-inch spaced 1½-inch apart, were also erected, and stop-logs inserted to about 4 feet higher than the bottom of the opening referred to above, it being considered unsafe to leave the penstock entirely open on account of the thrust which would be caused by the swift flow around the 16° angle 10 feet from the dam.

The old north shore head gates were then blown out, permitting about half the flow of the river to go through the 14-foot opening. During the low water, which occurs on Sundays, due to the fact that the factories higher up the river are