Fig. 1. Blasting the downstream rock plug of the diversion tunnel

Manicouagan River Development

Preliminary particulars are given of this scheme which is being undertaken by the Manicouagan Power Company—a subsidiary of the Quebec North Shore Paper Company.

THE Manicouagan is the largest river entering the Gulf of St. Lawrence east of the Saguenay and traverses the area from which the Quebec North Shore Paper Company derives its pulpwood. To the north this area forms part of a vast tundra region, a circumstance that makes the river subject to flash floods of such severity as to require engineering precautions of the first magnitude. In devising the working operations, therefore, it was considered necessary to anticipate a possible flood of no less than 360,000 cusecs.

At the site chosen for the dam, Fig. 3, the course of the river is deviated by a rocky projection and flows in two streams to form an island, subsequently passing

through a narrow parallel-sided gorge containing two series of falls which are instrumental in creating a substantial part of the available head. In erecting the dam, the construction of a normal cofferdam was ruled out because of the devastating flash floods and the fact that the river bed was exceptionally uneven. After considering various alternatives, it was finally decided to construct a tunnel to carry the entire flow of the river by a direct path to the downstream side of the falls. In this way the original loop formed by the river was short circuited and dewatered, so leaving the bed dry for the erection of the dam foundations. This direct channel is 1,600 ft. long and has an equivalent diameter of 35 ft.

As is now customary in operations of this kind a hydraulic scale model of the river and station site was constructed to a scale of 1 ft. to 200 ft. horizontally and 1 ft. to 50 ft. vertically, the finished model occupying a floor space measuring 40 ft. by 30 ft. Accurate contours were moulded in sand to the appropriate scales and consolidated with cement, the test flows up to the equivalent of 360,000 cusecs were studied for 12 months before the final engineering design was determined. To provide protection against damage caused by waves, the top of the main dam wall, apart from the spillway sections, will be built up to an elevation of 5 ft. above the maximum water level. At the spillways the discharge level will be 1 ft. above normal operating level, this margin having been decided as being adequate to protect the power house and roadways after studying flood conditions simulated in the model.

The turbines will normally operate under a head of 125 ft., and initially the plant will

Fig. 2. Downstream tunnel mouth and upstream plug being blasted

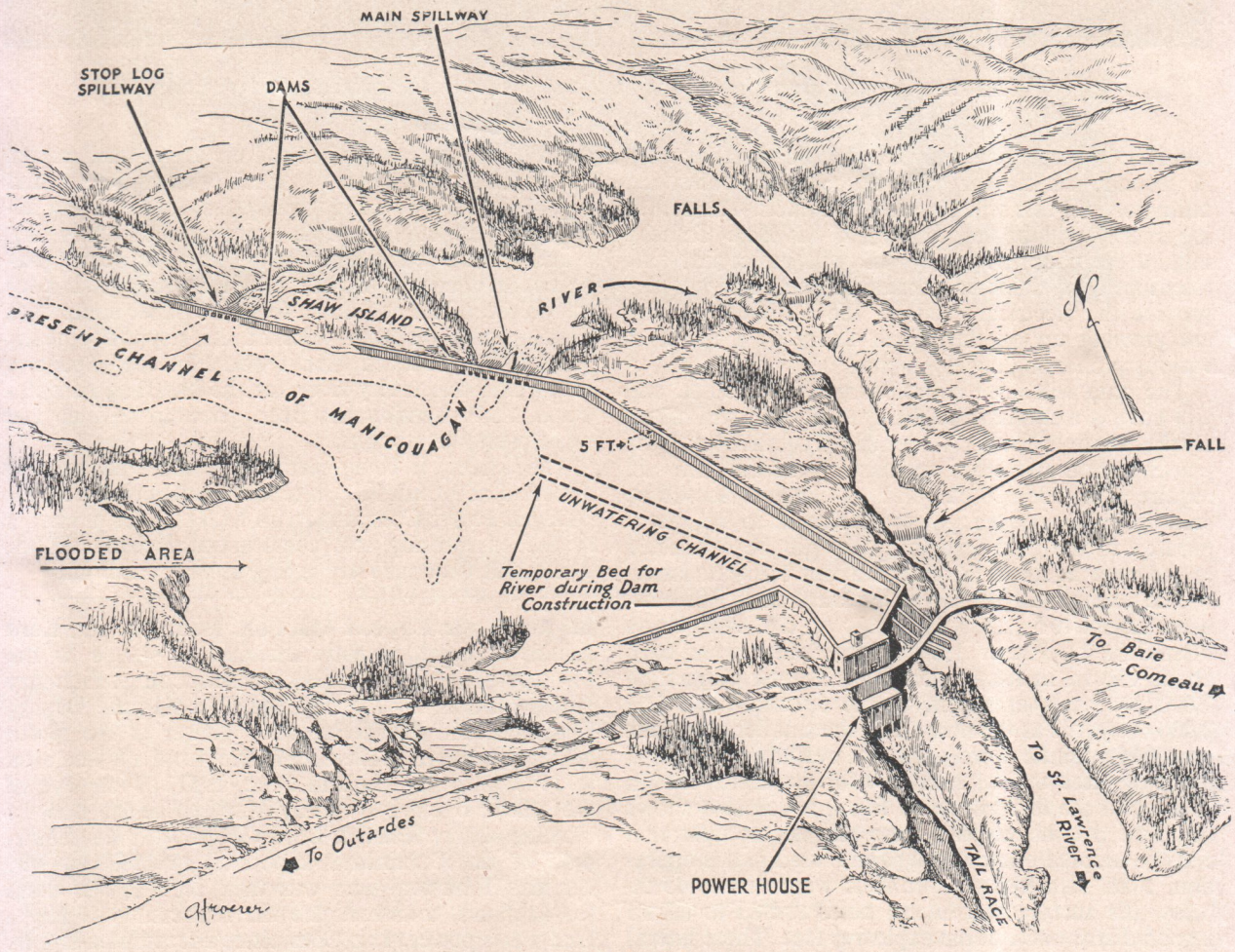

Fig. 3. Perspective sketch of the Manicouagan development

Fig. 4. The river flowing into the diversion tunnel, leaving the original bed virtually dry

consist of a single generator set of 45,000 h.p. capacity. A second and similar set will be added later and ultimately six sets will be accommodated. The resulting energy will be transmitted to the Baie Comeau mill of the paper company and will suffice not only to ensure all anticipated expansions there but will also provide the electrical needs of the communities that are growing up on the North Shore as a result of various pioneering developments.

The dam will have a total length of 4,630 ft. and will have a maximum height of 96 ft. and will create a lake about 11 miles in length. Together with the power station and other ancillary works the dam will require some 135,000 cu. yards of cement. As will be seen from Fig. 3 the power station is to be incorporated in the dam structure and will be connected to the river again by a tailrace about 1,200 ft. long.

The excavation of the diversion tunnel has now been completed, the rock plugs at the ends being blasted in December 1951. These plugs were each about 150 ft. in length, leaving a barrier containing 7,000 cu. yards of granite at the upstream end and 2,000 cu. yards at the other. For the smaller plug four tons of dynamite were used, the resulting explosion being pictured in Fig. 1. A view of the tunnel mouth is given in the foreground of Fig. 2 which also shows the blast that disintegrated the plug at the upstream end. To accommodate the dynamite used in this operation, 5 ft. diameter pilot tunnels were driven 45 ft. below the surface and lateral holes drilled to afford a good distribution of the explosive face. These lateral holes were designed to shatter the rock before the main blast was initiated in the explosive-filled tunnel itself. The results were eminently satisfactory and Fig. 4 shows how satisfactorily the flow is being accommodated, leaving the old river bed virtually dry.

In addition to regularising the flow for power purposes the dam will provide a safe holding ground for the pulpwood floated down from the paper company's timber limits on both sides of the river. For many years it was believed that it would be too expensive to harness this tricky river for the handling of pulpwood, and attention has been given to smaller and more tractable streams.

The scheme is being carried out under the general direction of Arthur A. Schmon, President of the Manicouagan Power Company, with M. H. Jones in charge of the engineering and constructional work; H. G. Acres and Company are acting as the consultants.

Plaque to Sir Edward MacColl. Lord Cooper, Lord Justice General, recently unveiled a plaque to the memory of the late Sir Edward MacColl at Pitlochry Power Station. Sir Edward MacColl was the Deputy Chairman and Chief Executive Officer of the North of Scotland Hydro-Electric Board from its inception in 1943 until his death in June, 1951, on the eve of the official opening by Lady MacColl of the Board's Tummel-Garry Scheme. Lord Cooper was the Chairman of the Committee appointed in 1941 by Mr. Thomas Johnston, who was then Secretary of State for Scotland, to investigate the harnessing of Highland water power. This Committee's recommendations led to the establishment of the Hydro-Electric Board.