THE WATER POWERS OF THE PROVINCE OF ONTARIO.*

I N connection with the extensive water power exhibit of the Dominion Government at the Panama Pacific Exposition, the Dominion Water Power Branch has just issued a series of monographs on the water powers of Canada. The one relating to the province of Ontario is under the authorship of H. G. Acres, B.A.Sc., hydraulic engineer of the Hydro-Electric Power Commission of Ontario. The following is a reproduction of Mr. Acres' monograph, substantially in full, necessarily omitting, however, a number of most interesting interior and exterior views of power developments and sites.

The drainage system of the province of Ontario comprises four main divisions, namely, the territory drained by the Ottawa River and its tributaries, that drained by the tributaries of the Great Lakes, that drained by the rivers flowing into James Bay, and that drained by the Winnipeg River and its tributaries. As the distance between the east and west extremities of the province is 950 miles, and the distance between the north and south extremities 1,050 miles, the rivers forming the arteries of the drainage system will naturally possess' variant characteristics. The extremes are represented, on the one hand, by the gently flowing rivers and creeks of the southwestern peninsula, and on the other by the slack-water pools and turbulent rapids and falls of the Laurentian rivers along the north shore of Lake Huron and Lake Superior. Between these two extremes, each possessing characteristics peculiar to themselves, lie the rivers in the limestone region of the eastern counties and the large rivers which reach tidewater by way of James Bay and the Hudson Sea.

Ottawa River and Its Tributaries.—From a hydraulic standpoint the more important rivers tributary to the Ottawa are the Mississippi, the Madawaska, the Bonnechere, the Petewawa and the Montreal. The territory drained by these rivers at one time maintained a great lumbering industry. The removal of the virgin forest has undoubtedly influenced the regimen of the streams, but the effects of deforestation have been to a certain extent neutralized by the development of second growth timber. This beneficial influence will probably be permanent, owing to the fact that the territory drained by these rivers is for the most part unsuited for cultivation and the extent of the forest cover is likely to increase rather than diminish.

The basins of these rivers contain a considerable proportion of lake and marsh, and their flow characteristics are susceptible of material improvement through the agency of artificial storage. The gradient of the streams themselves is generally steep, and concentrated natural heads, ranging from 20 to 100 feet, offer numerous opportunities for cheap development. The power capacity of these rivers is, however, not comparable to that of the Quebec tributaries of the Ottawa, owing to their generally smaller drainage areas. The basin of the Madawaska, the largest Ontario tributary, has only about one-third of the area of the Gatineau basin, which is the largest Quebec tributary. For this reason, instead of natural capacities of 10,000 h.p. and over, such as are common in Quebec, the Ontario tributaries offer facilities for the development of capacities ranging from 1,000 to 5,000 h.p. only, except in one or two isolated cases. One exception is the High Falls on the Madawaska, where the

*See The Canadian Engineer for January 21, 1915, p. 166.

natural head can be increased to 150 feet, and 12,000 h.p. developed under natural flow conditions, and probably 20,000 h.p. with artificial storage.

The status of these water powers as regards possibility of development is peculiar and unfortunate. the possible exception of the High Falls site, their individual capacities are not sufficient to justify development for long distance transmission, and at the same time are generally too great to permit development for local markets, most of which are now adequately supplied by existing developments of small capacity immediately adjacent to the point of consumption. Such development has taken place on the lower Mississippi at Carleton Place, Almonte and Galetta; on the Rideau at New Edinburgh, Perth, Smith's Falls, Merrickville, and Andrewsville; on the Madawaska at Bancroft, Arnprior and Mountain Chute, and on the Mattawa at Mattawa. These developments have capacities ranging from 40 to 1,000 h.p. and supply power to a large number of labor-using industries which contribute materially to the prosperity of the municipalities in which-they are located. Renfrew, particularly, is developing into a flourishing industrial centre as a result of power development on the Bonnechere, the business being divided between the recently completed municipal plant having 700 h.p. capacity and To the 750 h.p. plant of the Renfrew Power Company. meet the present and future requirements of the power users on the Bonnechere River and on their behalf, the Hydro-Electric Power Commission has constructed a storage dam at Round Lake, and has reported as to the feasibility of creating additional storage should the same be required.

In connection with the development of power in the Ottawa Valley the important developments of the Northern Ontario Light & Power Company deserve special mention. This company supplies power to the mines in the Cobalt district, and it is a notable fact that the introduction of hydro-electric power has caused the use of steam to be almost wholly discontinued for the operation of mines. In 1909 the camp imported 63,739 tons of coal, between June and December. In 1910, subsequent to the advent of hydro-electric power, only 17,349 tons were imported during the same period.

This company has two hydro-electric plants in operation, one on the Metabitchewan operating under a head of 312 feet, with 8,000 h.p. installed, and one at Hound Chute on the Montreal River, operating under a head of 33 feet and with 3,800 h.p. installed. The power is transmitted to Cobalt, and the vicinity, over wood pole transmission lines 25 and 17 miles long respectively, the transmission pressure being 44,000 volts in the first case, and 11,000 volts in the latter. The distribution of the average load is approximately: Electric railways, 400 h.p.; domestic and commercial light, 200 h.p.; mining load, 10,000 h.p.

The Metabitchewan site is now fully developed, and any additional power required by the Cobalt camp must be supplied from the Montreal River. The most important undeveloped site on this river is that known as the "Notch," where a head of 100 feet is available, and where about 7,000 h.p. can be developed under ordinary lowwater conditions. These are commercial possibilities in connection with the development of this water power which merit serious consideration.

Concerning the Ottawa River itself, mention has previously been made of the fact that with regulated flow, 600,000 h.p. will be available to Ontario, between Lake