

movable character, until penstocks with a proper removable intake dam had been placed just behind the margin of the Falls or a distributor emplaced along the bank. Then the removal of this small obstruction from water moving less than four miles per hour, would free 9,000 second-feet or 160,000 horse-power for these penstocks.

When more power were wanted at this point, three or four times this amount, or more *ad libitum*, could be sent down this American mill race by deepening the channel and extending a weir averaging under three feet high from the head of Goat Island southerly by southeasterly to the International Boundary, without interfering with the plants on either shore. Instead of literally placing obstructions, particularly in an installation of this size, a dam with movable gates could be used at the head of Goat Channel. The rate of progress for this part of the work would exceed the progress on the machinery.

The development of this, say, 600,000 h.p. would make it easy to bare the Terrapin Rock end of the Horseshoe, where further penstocks could be placed and then some water diverted toward them (by placing a gated dam on the shortest line between the Horseshoe and the Canadian shore below the Canadian Niagara Power Co.) to develop 300,000 h.p., more or less, depending on the amount of power wanted for development below the dam by an installation of overhanging penstocks and littoral penstocks or canal. The International Railway plant could be compensated by flume or electric power.

The Canadian and United States Government technical reports favor putting a protecting weir just above the apex of the Horseshoe; but an engineer, attempting to elaborate on this plan in the press, was ridiculed as attempting the impossible in such a raging torrent. If there were a risk of failure in this step of the way here proposed, there are others to turn to; but to divert a torrent is a thing that has been done and can be done again with greater certainty. Anyone, who has pushed a canoe over rapids or falls two or three times its depth, or has ever travelled the rapids of the St. Lawrence, knows that a boat can be held in swift water, whether from a cableway or otherwise, and from the boat the rocks beneath can be drilled and fastened into at any place to any extent, if suitable pier frames and works for movable gates cannot otherwise be held and set.

The mere closing of the gates above, while it will provide a way to set the intake openings for 900,000 h.p., more or less, on the Canadian side, will not divert the maximum quantity to the Terrapin end nor will their opening supply enough water for the wheels and a full flume or canal along the cliff, unless the Horseshoe channel be obstructed. The long weir or dam above the apex, favored by reports of both governments, would therefore be constructed to distribute properly the remainder of the water between the Terrapin penstocks and the proposed Canadian shore works. From this dam any water not taken will be utilized, as has been done similarly elsewhere, by river bed shafts and tunnels with unseen power plants under the floor of the rapids, which would develop secondary power in the final post-bellum design. Otherwise, the power as mentioned is equally divided by the international boundary lines.

It is evident this plan can be varied to any extent, both as to quantity or so that most or all of the development is either on the Canadian side or in the United States. Thus, by abrogating the treaty, either country might develop at will; but the treaty covers the St. Lawrence, and friction would result, not to mention the year's notice the treaty requires.

Regarding conversion to permanent international development by equal flow canals to the escarpments behind Queenston and Lewiston, the U.S. Congress has been advised by the highest officers against permitting fractional

developments of either fall or flow, while the Canadian authorities have taken the lead in seeking to get all of the inter-lake fall possible and in opposing as wasteful any developments using only part of the attainable fall. Several hundreds of men are now at work for the Hydro bringing to completion a construction which will give double the power they now have developed in Canada.

Immediately upon the conclusion of peace, the permanent development must be made, reserving enough flow for ice and a uniform flowage over both falls equal in thickness to that on the American. Canada has already taken the first step in this direction by building a power canal over the escarpment to get all possible of the 326 feet of inter-lake fall. The United States cannot do better than follow her example. While 210 feet can be had from the hydraulic companies' canal, less is available for the existing tunnel and enlargement is expensive; and, while the development of the rapids will (considering friction, backwater and ice) give 80 feet head, the total is scarce 290 feet, while the fall from Chippewa to Queenston is over 312 feet, which (in combination with a regulated flow of 204,000 second-feet) gives over 7,000,000 continuous horse-power!

The larger electric generators are the more economical. There are few on hand, and although the plan outlined makes it feasible and handy to use every possible size, many must be made. The biggest now is 90,000 h.p., and would ordinarily take a year to make. The wheels, penstocks and controlling dams can soon be ready. By priority orders, the United States government could be of great aid in speeding up the electrical machinery.

Legislation should be obtained proposing the prompt draft and conclusion of a new treaty to exclude Lake Erie and Niagara River from the present treaty, and naming an authority to develop them for war use,—a single plenipotentiary, as proved best at Panama, or at the most, one from each country.

Among such able public servants as former United States presidents and British ambassadors are men who have the confidence of the people in both countries, and have pre-eminently the judicial temperament so essential to prevent injustice to individuals and corporations affected by their acts, and to give the public confidence that this great national resource would be strictly conserved solely for public benefit. Nor need a representative be sought overseas, for pioneers in the public control of hydro-power in the Dominion have the knowledge, experience and personality for the undertaking. Experience has shown that a single head, or at the most two, is vital to prompt decisions and the progress needed to make Niagara a great and timely help in winning the war.

### Conclusion

It is, therefore, evident:—

(1) That power, coal, transportation, nitrate and general war manufacturing conditions necessitate an emergency development of Niagara.

(2) That a clear grasp of conditions can be had by considering that while rapids and other sites require equal machinery and a tedious dam besides, Niagara's nearly two million horsepower is larger than them all, located in the centre of manufacturers and transportation, and with a dam built and waiting.

(3) That this dam is favorably formed for the quick application of power in many ways; for instance, by making a millrace of the American spillway and constructing a corresponding littoral development in Canada.

Will the people of the United States and Canada allow the prodigious waste at Niagara to continue for years more after nearly four years of war have already passed?