For THE CANADIAN ENGINEER.

THE TORONTO AND HAMILTON POWER AND WATER-SUPPLY AQUEDUCTS ARE THEY FEASIBLE SCHEMES?

BY J. H. KILLEY, HAMILTON.

The notion that the water supply for Hamilton could be got from Lake Erie is a very old one. The levels were taken, I believe, by T. C. Keefer, C.E., some 35 or 40 years ago, to see if it was practicable to supply the city with water from that source. It was found, however, that a vast deal of tunneling would have to be done before the water could be run to the city, as the high land to south of the city was shown by the survey to be 53 feet above the level of Lake Erie. Assuming the distance from the lake to Hamilton to be 36 miles, and the fall required to give the water in the aqueduct a velocity of 200 feet per minute, or say 2¼ miles per hour, 2 feet in the mile, and the bottom of the channel 10 feet under the level of Lake Erie, the aqueduct at Hamilton would have to be 135 feet under the level of the mountain. The aqueduct is proposed to be 100 feet wide, with a depth of 8 feet of water, and suitable for canal boats, as they say it will very much cheapen the carriage of coal to Hamilton. How they propose to construct it through the intervening high lands has not been explained. At some places it will be nearly 200 feet under the level of the land, and there is nothing for it then but tunneling. How this is to be done, with a clear opening through the land or rock of 1,000 square feet, or 20 per cent. over the sectional area of the canal, I am at a loss to know. If it is pierced in square section it will have to be 32 feet square—a tremendous piece of tunnel engineering. If the navigable portion is done away, it will take ten 10-foot drain pipes laid side by side to carry the water proposed to be delivered at Hamilton, the pipes to go under the land the same position as the tunnel. The aqueduct, if an open one in part, would have to be at least 6 feet above the level of Lake Erie to the top of its embankments, as the lake with certain winds rises much higher than its normal level. The construction of the aqueduct will have to pierce through solid rock for nearly its whole length. If the aqueduct is brought near to the city, its bottom would come out below the level of the entrance of the inclined railway to the mountain. If power has to be realized, as proposed, to give a fall of say 100 feet, a tail race would have to be excavated from the mountain to the bay, at least half the width of the canal proper, to take off the water passing through the turbines. Near the mountain it would have to be 110 feet deep and 50 feet wide to realize the fall mentioned. If the whole of the water passing through the canal was realized as electric power, it would develop 17,000 h. p., allowing for the losses invariably connected with this method of transmission.

When the matter of conveying Lake Erie water to Hamilton for domestic and manufacturing purposes by a pipe, was proposed 35 years ago, it was estimated to cost $6,000,000, I believe. At the present time the work could be done much quicker than then, as there are very much better appliances for the purpose. Now in placing this very much larger project at, say, $8,000,000, it is safe to say that it is very much under what the cost would be, without considering the machinery and buildings required to realize the power. Even at $8,000,000, the cost of construction per 1 h.p. would be $470. For water alone, at 8 per cent. interest on capital invested in the canal alone, the cost for 1 h.p. per year would be $37.60. The Manchester, England, ship canal has cost over $120,000,000. It is only 26 miles long, and is yet incomplete. I have not thought it necessary to fill up this report with a long array of figures required to work out the power, etc., but if any of your readers desire them I will on a future occasion give you them in extenso.

The Lake Simcoe proposed aqueduct, if constructed, will not have the advantage of an unlimited supply of water, as would the Lake Erie one. I will endeavor to point out what would be the effect on Lake Erie of an aqueduct supplying water near Toronto, developing, say, 50,000 h.p., or nearly so. I do not propose to worry your readers with the calculations leading to the result, but to place the matter before them in a manner that can be easily understood. The available head at Toronto from the level of Lake Simcoe is, I understand, 420 ft. I think if a fair allowance were made for loss in transit by friction, etc., that I should not calculate the power from more than a head of 300 feet, the conduit to be as the Lake Erie one, 100 feet wide, with a depth of 8 feet and a fall of 2 feet to the mile, and a velocity of 200 feet per minute. This channel would be, as proposed by the Hamilton and Lake Erie aqueduct, equal to the carrying capacity of ten 10-foot in diameter pipes set side by side for the whole distance. Allowing for all losses in the conversion of this water into mechanical and electrical power, it would develop, if the quantity could be continued from the source of supply, 56,000 h. p. Let us see how this development of power would affect Lake Simcoe. The area of the lake, bays, etc., is, I have been informed, very nearly 300 square miles, having a superficial area of 8,363,520,000 square feet. Assuming the aqueduct to be 100 feet wide and 8 feet deep, with a fall of 2 feet to the mile and a velocity of 200 feet per minute, the power developed, as stated before, would be 56,000 h.p. This power would require 41,077 millions of cubic feet of water for a year of 315 days. This applies to all purposes for which the water might be applied, and this would cause the lake to lower its water surface *five feet every year*, assuming that the flow from the lake to Toronto could be kept up.

In this I have supposed that the comparatively small quantity of water going down the Severn River will continue to flow, but I am informed that in parts of the summer the mills cannot run for want of water. The cost of making the water connection from the lake to Toronto would be very heavy indeed. Until the nature of the strata that the aqueduct would pass through in its course is ascertained by borings and profiles got out, it would be impossible ever to guess at it. Then there would be the very large amount of work and cost of distribution of power at the power station, with buildings, and machinery and the large tail race to take off the water.

To use this water for domestic supply in Toronto through the main and service pipes of the city, would be a great mistake, as the continual lowering of the water in the lake, which is sure to take place, would drain out all the stagnant marshes, bogs, and water courses around the lake. Further than this, the lake, being a comparatively shallow one, and the temperature of the water high in summer, it would retain a large portion of this temperature in its course to the city, and probably increase it in the open parts of the conduit. There would be also a loss from evaporation and absorption of the