

Niagara has been known on two occasions within the records of European settlement to have run dry at the Falls for several hours at a time. But our tides are as certain as the motion of the moon, which causes their rise and fall, and though poetry charges our satellite with being "the inconstant moon," science teaches that the charge is a slander, and proves it by the fact that the moon's motions can be calculated on and predicted to a second of time for half a century ahead. Hence we can have no more reliable power than that of the tides, but the question is how can it be impounded and released in such a way as to furnish regular, if not continuous, power?

An esteemed contributor to the Canadian Engineer, Charles Baillairge, C.E., of Quebec, recently presented a paper to the Canadian Society of Civil Engineers, in which he expressed the opinion that the tides cannot be successfully used as a source of power, because, among other things, of the low head obtainable, and the intervals of idleness at half flood and half ebb. The latter can be got over to a great extent by electrical storage; and the former difficulty is to be got over by wheels constructed to operate on a low head. We gave in 1895-96 an account of a motor operated by the tides in England in such a way as to be utilized successfully for lighting and for a small amount of power. But low tides are not universal. We have in the upper reaches of the Bay of Fundy tides that rise and fall 66 feet, and the total available power of the Fundy tides would be almost incalculable. Here, at least, there are situations where enough head could be obtained and enough water impounded to supply power on an extensive scale. As a matter of fact, tidal-power saw-mills were operated for years in the last century near St. John, N.B., as briefly described some years ago in this journal; and the remains of a tidal-power grist mill is to be seen at Knightville, a suburb of Portland, Me. A representative of the Canadian Engineer, on a visit to Portland the other day, was informed by an old resident that this mill was in regular operation down to about fifteen years ago, and that it was the successor of several other mills operated by the tides since the time of the British occupation of Maine, the mill privilege having been granted by the British Colonial Government. This mill and its predecessors must therefore have been in successful working for over a hundred years. The last mill was operated by turbine wheels which yielded about 100 horse-power. It was built on an embankment which extended across the mouth of a stream emptying into Portland harbor. The lowlands enclosed by this embankment comprised several acres, and as the tide rose the water was let in through a sluice gate under the mill. At high tide the gates were closed and when the tide fell in the harbor the mill was operated by letting the water out. Thus the grinding had to be done during a few hours out of the day; but the machinery in other cases was so arranged that it could be operated in both directions, that is by the rising tide as well as the ebbing tide. If a mill could be successfully operated by the crude machinery of the early part of the last century, surely the hydraulic engineer of to-day can design a better tidal motor.

Dr. Louis Bell, writing in an engineering contemporary, gives his views on this subject, as follows:

Tidal power has been utilized in only a very small way; its large use has always been considered dubious. In the first place, tides of a height readily available are local in their occurrence; and, second, tides are essentially periodic, so that their direct power is available only in two short daily periods occurring in cyclic order during each part of the twenty-four hours, as the month is rounded out. Hence the first problem of tide utilization is storage of power. It is possible by the use of multiple reservoirs to extend the use of the tides throughout the twenty-four hours. A three-pond system accomplishes this end at considerable cost in complication of waterways and variations in head, and even a two-pond system helps to a steady use of tidal power for part of the day. There is, too, great variation in the rate of flow in the tides in different localities, the most favorable case being that in which the tide rises and falls most rapidly. But the main trouble with the tides is that the total rise and fall is relatively small, compelling one to deal with low, as well as variable heads, and to provide enormous reservoirs to store even enough water for use in two daily five-hour runs. In very few places would it be possible to rely on more than six feet mean working head. This means that if the storage pond were six feet deep, each square mile of reservoir would store water for about 5,000 horse-power for a five-hour run. Even this is an unusually favorable case, and it is evident at once that hydraulic works on this scale imply a very large investment for the power obtained. The only tidal powers to be taken seriously as able to count in large work are such as exist in exceptional spots, like the Bay of Fundy, where the tides run forty feet high under normal conditions. There it should be possible to obtain, for two five-hour runs, more than 50,000 horse-power per square mile of reservoir. A glance at a map will show that the inner extremity of the Bay of Fundy is almost a tidal lake, known as the basin of Minas. At its outlet rise two great headlands, less than three miles apart, while the narrower tide-race between them takes the full current for the basin within. This covers an area of more than 400 square miles, so that it is safe to say that through that narrow gap more than 200,000,000 horse-power hours run daily to waste. To utilize it would require an engineering feat more tremendous than anything yet attempted by man, but in years to come the game may be worth the candle.

#### CANADA'S SHARE IN IMPERIAL DEFENCE.

Not the least important of the resolutions offered at the Congress of Chambers of Commerce, in Montreal, last month, was that on Imperial defence, presented by George E. Drummond, representing the Canadian Manufacturers' Association. The resolution simply affirmed the duty of the self-governing colonies to participate in the cost of the Empire's defence. To this an amendment was offered by D. Masson, representing the Chambre du Commerce of Montreal, expressing the opinion that Canada's duty