transmission wire. We can therefore only state a hypothetical case especially as to the power to be assigned to the available water. Where the rainfall is known, the proportions which reach the streams have been ascertained, in the construction of reservoirs for water supply and other purposes. The chief difficulty with respect to the quantity of water is the want of rain gauges over so great an extent of unoccupied territory. Assuming therefore an average annual precipitation of twenty-four inches and taking one-half of this as available for water power, every ten square miles would yield an average of nearly one horse power for every foot of fall. A million square miles (and there is much more), would give nearly 100,000 horse power for every foot of fall; as there would be several hundred feet of fall which could be utilized, our water power must be immense—and commensurate with this country in other respects.

The above applies only to the tributaries of the St. Lawrence and the Ottawa, and to the Hudson Bay watershed so far as that may be utilized. The Canadian portion of the water power of the St. Lawrence, from Lake Superior to Montreal, in which there is a fall of 546 feet, is not included, being below the level of the tributaries. We have measurements of the flow in both the St. Lawrence and the Ottawa in cubic feet per second, as follows:

| | c. ft. per sec. |
|---|---|
| In St Mary's river, outlet of Lake Superior.. ... | 80,000 |
| In St. Clair river, outlet of Lake Huron..... | 225,000 |
| In Niagara river, above the falls..... | 265,000 |
| In St. Lawrence river, above the rapids..... | 300,000 |
| In Ottawa river, above Lake of Two Mountains... | 35,000 |

Canada's share of the St. Lawrence water power from Lake Superior to Montreal would be about ten million horse power. Canada has half the water of the St. Lawrence from Lake Superior to Cornwall, and all of it between Lake St. Francis and Montreal; but only a portion of this half could be utilized—and this would apply more or less to the Ottawa and other rivers, where all the power could not be utilized without an expenditure probably beyond its value. The power at Niagara has been estimated at seven million horse power, from less than half of the fall between Lakes Erie and Ontario, but the flow of the Niagara river, as given above, does not support so high an estimate. The whole of this fall (over 320 feet), can be utilized on the Welland Canal, but the quantity is comparatively insignificant, from the limited channel and necessarily low velocity of the current in it. In like manner the whole fall upon our canals in the St. Lawrence can be utilized subject to the limitations imposed by the requirements of navigation. Because these canals have not had the work for which they were intended, they have in some cases become mill races rather than slack water channels. This has been the less felt, hitherto, on account of the lightness of their west-bound traffic, the strong current toward the mills being in favor of the deeper laden east-bound craft, thus incidentally compensating for a violation of canal maxims.

While water power was at first the only substitute for the windmill in new countries, and its economy as well as superiority has always been recognized, several causes have contributed to limit its more general application. Before the invention of the turbine in the first half of the present century, heads exceeding about seventy feet could not be utilized on account of the comparative weakness and excessive cost of wheels of large diameter. In these days of structural steel, and "Ferris" wheels, this difficulty could be overcome; but, with the turbine, the conditions are reversed, the higher the head the less the size and cost of wheels, so that the most valuable water powers were the most cheaply utilized in this respect. A previous check to greater extension of water power was given in the latter part of the last century by James Watt's discovery of the steam engine, which by bringing the power to the work, to the city, and to the mine, revolutionized industrial conditions. A still greater revolution has recently occurred which brings water power to the front again, by its amalgamation with electricity, whereby its economical power is transferred to the work, over many miles of distance, upon a single wire. Within the last ten years high voltage electricity has been firmly established with annually increasing power of extension, and this has brought Canada into the first rank of economical power-producing countries. Water is thus represented by a power to which it can give birth, but which is superior to its own, in that, wherever transplanted, it can do nearly all the parent power could do, as well as give light, heat and greater speed; moreover it has given rise to industries only possible with abundant cheap electricity. What is more important to us is that such industries are those for which Canada possesses the raw material, but which, without water power, she could not engage in. There are important industries in which we have for some time utilized water power, for which electricity is not indispensable; but which equally require large amounts of cheap power, and are capable of indefinite extension; but while these may not need the intense electric current necessary for electro-chemical industries, they will find electrical transmission of inestimable value in many situations; while, for lighting and heating purposes, water power is invaluable to all. Heretofore we have cut our spruce into deals and exported it to Europe, and more recently into pulp wood and exported that to the United States; but, manufactured by our water power into paper, the raw material would yield this country ten times the value it is now exported for. The extension of railways, combined with electrical transmission, will promote the local manufacture of such wood products (including all valuable hardwood), as can bear transportation; thus giving the largest amount of local employment, as well as tonnage to the railway; and delivering us from the position of "hewers of wood" for other countries.

(To be continued).

## AN ELECTRICAL CENTRE.

We speak of the natural resources of Canada in a vague way as we do of the sands of the sea, and with no more clear conception of what we are saying. It is sometimes a surprise to us when something comes up which gives us a more definite idea of what are our resources. Such is the map issued under the authority of the Board of Trade of Ottawa, which shows that within a radius of 45 miles from Ottawa city there is water power which at low water amounts to 917,603 h.p., and at high water to 3,347,630 h.p. Of this half a million h.p. (maximum flow), is within four miles of