

EUGENE ROUILLARD



THE WHITE COAL

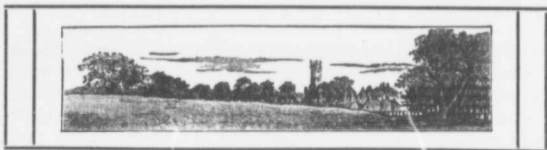


THE WATER-POWERS
OF THE PROVINCE
OF QUEBEC.



QUÉBEC

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1909



THE WHITE COAL

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FEW months ago, an European review, which ranks as an authority, *La Revue Minière*, of Paris, published statistics of the white coal in each country. The United States, France, Switzerland, Italy, Germany, in brief, nearly all the regions of globe were embraced. Alone, of Canada, there was not a solitary word.

It is true that not long before that an eminent French engineer, Mr. Fabrègues, had written: "On the day when all the coal on the earth shall have been consumed by our machines, Canada will be mistress of the world. Like the rest, the appreciation must have escaped the notice of the *Revue Minière*, which is usually well informed. Such an oversight naturally provoked some surprise and one of our fellow countrymen, rightfully annoyed at this silence of the European review, requested explanations. The reply he received was simply:

"Our reviews cannot speak of the Canadian waterfalls, for they do not exist as far as we are concerned. We cannot tabulate except on exact figures. There is no statement, even approximate, of the water-powers of Canada".

Must it be admitted that there is a grain of truth in this assertion? The public authorities have undoubtedly from time to time had measurements made of a pretty large number of our sources of energy; but all this is buried in official reports and mixed up with a host of other matters, which, for this reason, renders their consultation rather difficult. Moreover, the circulation of these official documents is somewhat limited and it is probable that they never or very rarely reach the great reviews which deal with such subjects.

Here, therefore, is a deplorable want well calculated to do us harm. It is to help supply this want that we have decided to prepare and publish herewith as complete a list as possible of our principal water-powers, basing ourselves to determine their respective capacity upon the authority of our most competent engineers and experts.

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It does not come within our purview here to relate the history of the formidable power, which dates back hardly fifteen years and which has already effected such a revolution in the industrial world. It suffices to say that, disposing of the immeasurable forces which the genius of man has succeeded in storing and directing at its pleasure, *white coal* since it is thus that the motive power of natural sources and falls of water is designated, is tending daily to dethrone the black coal hidden in the bowels of the earth and to replace it. Over its competitor, it enjoys a double advantage : that of being less expensive. Above all, its superiority asserted itself when it was demonstrated that the energy produced by bodies of water could be transported to immense distances without suffering any appreciable loss. From that moment, its triumph was assured and the results have since proved that small, as well as large, industries could no longer dispense with so valuable an auxiliary.

True, Europe was the first to recognize the useful account to which these sources of energy, so long overlooked, could be turned, but America, and especially Canada, still more bounteously favored in this respect than the old continent, were not slow to hollow its lead and to experiment with the new discovery.

We had here the finest forests in the world and more particularly an admirable spruce region, co-terminous, so to speak, only with the geographical boundaries of the country itself. Alone, the province of Quebec had upwards of two hundred millions of acres of forest concessions composed in greater part of black spruce, the wood regarded as the best for the manufacture of pulp and paper in general. Now, to render all this immense wealth available, to convert this wood into pulp and paper, to light through the same medium our cities and rural districts, in a word, to produce rapidly and at slight cost, we needed the help of an agent of enormous power and this agent had just been found and harnessed. There were still some inherent difficulties in the first attempts, but science and oft-repeated experiments ended by overcoming these. Nature, which had strewn with pro-

digious prodigality over the entire surface of our territory these hitherto unsuspected forces, found itself thus powerfully seconded, and soon throughout the whole country, immense workshops were seen to arise, set in motion by threads of water escaping from the summit of a mountain or coming from a rushing stream.

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Taking into account the extent of the country, certain parts of which are not yet sufficiently explored, it has not yet been possible to determine with exactness either the value or the capacity of the united force of all the water-powers of Canada. We have, however, data sufficiently complete to enable us to boldly assert that there is not another country in the world, which commands so large a body of acting forces. A map has only to be consulted to prove this. While in the United States, great rivers like the Mississippi, the Missouri and the Ohio possess no water-powers because they flow over beds that are almost uniform, here, in Canada, it is just the contrary. The St. Lawrence and its tributaries, as well as most of our rivers, from east to west, are broken by rapids and imposing cataracts. From the Straits of Belle-Isle to Montreal and thence, ascending the St. Lawrence, the tributaries of the St. Lawrence and those of the Ottawa, descending through the region of the Laurentian Mountains, are at an elevation of 1,000 to 1,800 feet above the level of the sea and, in many cases, these rivers have their principal falls quite close to their mouths.

It is calculated that the St. Lawrence, taken as a whole, has a capacity of 10,000,000 horse-power.

Some years ago, the Ottawa Board of Trade organized an exploration to ascertain the capacity of the water-powers of the Ottawa river and its affluents. This exploration demonstrated that, within a radius of 50 miles, the Ottawa river and its tributaries could alone supply a force equal to nearly 900,000 horse-power. This work was pushed further and the calculations of Mr. Surtees, civil engineer, finally established the respective force of most of the tributaries of the great river and of the Ottawa river itself. These calculations make a table as instructive as it is eloquent :

Above the City of Ottawa

	Horse-power.
Grande-Chaudière (city of Ottawa)	35,000
Petite Chaudière.	25,000
Deschênes and Britannia	15,000
Chats Falls.	141,000
Portage du Fort.	49,000
Grand Calumet.	186,000
Coulonge river.	24,120
Black river.	21,000

Mississippi River

Galetta.	1,800
Pakenham.	900
Blakeney.	1,800
Rosamont Rapids.	720
Almonte.	3,000
Appleton.	540
Carleton Place.	1,000
Innisville.	540

Madawaska River

Arnprior Rapids.	1,400
Burnstown.	1,400
Springtown Rapids.	1,120
Lake Calabogne.	3,640
Grand Falls of the Madawaska.	10,360

Bonnechère River

Castleford Rapids.	1,120
Renfrew and Douglas.	2,000
Quyón River.	80

Tributaries below the City of Ottawa

Gatineau River

	Horse-power
Farmer Rapids.	24,500
Chelsea Mills.	47,790
Eaton Fall.	24,508

Gatineau River.—(Continued.)

	Horse-power.
Cascades	14,000
Wakefield	12,000
Pangan Falls	75,500
Pêche	375
Little Nation River	1,600
Blanche River	1,600
Priests' Creek	240
Little Blanche River	250
Clay Creek	120

Du Lièvre River

Buckingham	9,000
Rhéaume Falls	4,000
Dufferin Falls	12,500
High Falls	12,500
Little Rapids	500
Cascades	2,000
Grand Falls	36,000

As already said, these statistics indicate only the extent of the water-powers met with in a radius of 50 miles from the city of Ottawa. There must be added to them the immense sources of energy occurring between the Ottawa and Mattawa, over a distance of 200 miles, and the capacity of which has been estimated at 1,476,000 horse-power by Mr. Andrew Bell, a member of the Geological Survey.

We see also by the reports of the engineers of the projected canal between Montreal, Ottawa and the Georgian Bay that these authorities estimate the capacity of the utilizable water-powers along the course of the canal at 700,000 horse-power.

On the Sturgeon river, which discharges into Lake Nipissing, one cascade, the Smoky Falls, is noted, from which 50,000 horse-power can be obtained.

There are also numerous water-powers on the rivers St. John, Miramichi, Ristigouche and the rivers of British Columbia.

Nor, in this list, should we forget to include the famous falls of Niagara, one of the world's wonders, one half of which belongs to Canada and whose theoretical energy is estimated at 7,000,000 horse-power.

With these few data, one already realizes that white coal is generously distributed throughout all parts of Canada. One of our provinces, however, has been more royally treated in this respect than all the others and that one is the province of Quebec. Other sister provinces may have been better gifted in point of soil, climate and minerals, but there is none which presents so colossal an aggregation of sources of energy, which is a fact not sufficiently known abroad.

It must not be assumed from this that the analysis of our water-powers is nearly completed and that we can embody in figures the number of powers at our command. In a country so vast and so relatively new as ours, it is only from year to year that this knowledge can be acquired. We can state, however, that the scaling of the rivers and lakes of the province of Quebec is being prosecuted every year with incessant activity and that we are already in possession of valuable information on the yield of our principal cataracts. It is this information derived from the best sources that we wish to now lay before the public, so that they can at once realize the use which industry, great and small, can find and is already finding for the secret forces supplied by most of our water-courses. We shall begin by a summarized description of the principal water-powers of the Quebec region :

Montmorency Falls.—Here, at the outset, are the *Montmorency Falls* eight miles distant from Quebec. Who does not know and admire them ? There is no stranger making the tour of America, who does not come to contemplate them. They are as renowned for their picturesque beauty as for the grandeur of their aspect. A tramway, running every half hour, enables all desirous of enjoying the spectacle to do so. The Montmorency Falls, with their imposing height of 250 feet, do not constitute solely an object of curiosity. A whole system of tramways from Quebec to Ste. Anne de Beaupré derive from them their motive power. They also run an immense cotton mill established at their base and supply electric light to the city.

Chaudière Falls.—On the south side of the river St Lawrence flows a river, which, after traversing two large counties, Dorchester and Beauce, precipitates itself into the great stream from a height of 114 feet: this is the Chaudière river. Fifty small streams and some twenty lakes feed this river. The falls of the Chaudière, especially in the spring, when the waters are at their highest stage, are very imposing. They are utilized by the *Canadian Electric Light Company*, to operate the tramway of the

town of Levis and furnish electric light to the same town and to the surrounding municipalities.

Etchemin River.—The Etchemin river, which takes its rise in the highlands of Bellechasse and which from St. Anselme, in the county of Dorchester, flows close to the Chaudière river, is another important water course. It empties into the St. Lawrence three miles above Quebec and is broken in its course especially at St. Anselme, St. Jean Chrysostome and St. Romuald by several small cascades which are utilized by a number of mills.

Jacques-Cartier River.—At seventeen miles from Quebec and in the immediate vicinity of the *Quebec and Lake St. John Railway*, the Jacques-Cartier river is encountered with a fall of 35 feet and a utilizable force of 2,400 horse-power. This river flows through three counties: Portneuf, Quebec and Montmorency. The Jacques-Cartier Company to whom has been leased one of the water-powers in this river, supplies electric light to the city of Quebec, besides furnishing light and motive power to many private establishments. Four powers of some importance at Pont Rouge, on the same river, are also to be noted. In the opinion of our hydraulic engineers, the water-powers of the Jacques-Cartier river would be greatly strengthened, if some day the waters of the immense reservoir formed by great Lake Jacques-Cartier were diverted into this stream, which could be done—it seems—at slight cost. In any case, the water-powers of the Jacques-Cartier and all the other rivers which take their rise in the Laurentides National Parks possess a special importance which they owe to the fact that they all pass through heavily wooded lands.

Lake St. Joseph.—Crossing the Jacques-Cartier river, we reach the Lake St. Joseph Railway station, where the existence can be noted of water-powers supplied by the discharge of the lake which is fed by the River aux Pins. A little on this side and at a mile distance from the Ste. Catherine station there is a series of falls and rapids with a 65 feet head of water and capable of developing a force of nearly 4,000 horse-power.

Portneuf River.—At the Bourg Louis station, 35 miles from Quebec and still on the line of the Quebec and Lake St. John Railway, the Portneuf river presents in its turn falls of a height of 40 feet.

Ste-Anne River.—The most important stream next crossed by the Quebec and Lake St. John Railway is that of the Ste.

Anne river at St. Raymond. The paper mills of the St. Raymond Paper Company take their motive power from this river.

At a few miles from the village of St. Raymond, on the north branch of the Ste. Anne river, there is a series of pretty cascades from which about 1700 horse-power may be derived.

At eight miles above the same village that is to say, at the mouth of the Talayarde on the Ste-Anne river, another water-power of some importance is met with, besides two good mill sites in the neighborhood, on the north-east branch of the Ste. Anne river, near Stoneham and the other on the Tourilli river.

Batiscan River.—Another very interesting river on account of its numerous hydraulic resources and which is skirted by the Quebec and Lake St. John Railway is the Batiscan river. This stream which is of pretty considerable length is broken by falls and rapids, which constitute splendid water-powers.

One of these water-powers occurs near the line of the Quebec & Lake St. John Railway below the mouth of the Jeannotte at 81 miles from Quebec. It is estimated that 1200 horse-power can be obtained from it.

The second, to which the name of *Rickaby's Rapids* has been given, is situated at about 4 miles to the east of Stadacona station on the Quebec and Lake St. John Railway.

The rapids in question have a total fall of 19 feet within a distance of nearly 1200 feet. The first forms a regular little cascade of a few feet high; the others are less abrupt, that is, their descents are less steep.

At Notre Dame des Anges in the county of Portneuf, in the same Batiscan river, the St. Maurice Lumber Company has since 1901 become the owner of two cascades.

On the line of the Canadian Pacific Railway, always on the north side of the St. Lawrence, a certain number of water-powers may be noted in passing, among others at Pont Rouge on the Jacques-Cartier river, at Portneuf, on the river of the same name, and Ste. Anne de la Pérade on the Ste. Anne river.

Noire and Blanche Rivers. Along the line of Transcontinental Railway, at the confluence of the Noire and Blanche rivers, the firm of Grandbois, of St. Casimir, utilizes a cascade for its mills. A fall of 40 feet in height on the Batiscan is met at St. Stanislas and another in the township of Hackett on the

Eaux-Mortes river. The Iroquois falls on the Vermillion river may be also mentioned.

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If we cross to the south side of the river St. Lawrence, we find that our hydraulic resources are not inferior in number to those noted on the north shore. A few of the latter have been already mentioned in the course of this article; to this list it is only right to add the water-powers of the Becancour river.

Becancour River.—This river, after watering the townships of Nelson and Somerset and the front of the townships of Stanfold and Bulstrode, in an easterly direction, for about 46 miles, then turns to the north-west, flows for about 21 miles between Ashton and Maddington, and finally empties into the St. Lawrence.

This river is broken in several places by falls and rapids.

One of its principal falls is known under the name of the *Maddington Falls* and is situated in the village of Daveluyville at a few paces only from the Intercolonial Railway bridge.

This fall is a remarkable water-power both by its situation and by the very great facilities offered by its development.

Its height, at ordinary low water, is about 14 feet and Mr. Gauvin, C. E., has estimated its capacity approximately at 4,000 horse-power. However, a gauging made at the Saut Rouge (township d'Inverness) on the same river, in December, 1903, has proved that the flow of this river may fall to 0.217 of a cubic foot per second and per square mile of the area of its basin.

The portion of the Becancour basin situated above Maddington Falls being about 850 square miles, it follows that the minimum of the Becancour's volume at that place must be about 185 cubic feet per second.

The absolute capacity of the falls in question, at low water, must therefore be about 925 horse-power in round figures.

Let us note also two other water-powers on the Nicolet river, one at St. Leonard at the junction of the Intercolonial with the Drummond County Railway and the other at Ste. Brigitte.

Nicolet River.—Along the line of the Grand Trunk Railway, several water-powers occur, which possess some importance. Firstly, at Lyster, on the Becancour river and at a few miles from the railway, on the same river, there are the Red Falls. A little further on, at Arthabaska, the south-west branch of the Nicolet river is in a position to supply industry with a good many water-powers. The same may be said of the St. Francis river, which

has two excellent cascades at Windsor Mills and Broughton Falls.

Lake St. Francis.—Along the line of the Quebec Central Railway, we meet with quite a series of utilizable or already utilized rapids and falls. In the first place, at St. Anselme on the Etchemin river, then at the Great Pozer rapid on the Chaudière in the vicinity of Scott's Junction. Next comes the Disraéli water-power, in the county of Wolfe on the discharge of Lake St. Francis, which runs the Messrs Champoux' mills. Three miles further on, the St. Francis Water Power Company, by erecting dams has created another water-power with a capacity of 4,000 horse-power, which is used to generate electricity that is transmitted to the workshops at Thetford, to those of Black Lake and to East Angus, where then is a large paper mill. On the other hand, at the junction of the Canadian Pacific with the Tring branch of the Quebec Central, the Matapedia Paper Company utilizes, on the discharge of Lake Megantic, a fall of 25 feet in height.

Rivière du Sud.—In the vicinity of the Intercolonial Railway, to the east of Quebec, the cascades susceptible of development for water-power sufficient for industrial purposes are equally numerous. They are met with on the river du Sud at St. Raphaël and Montmagny, the latter serving the firm of Price Bros. for the manufacture of pulp, on the Bras St. Nicolas, at St. Cyrille of L'Islet and at St. Aubert on the river Trois Saumons. If we descend a little further, we meet other water-powers on the river Ouelle, at St. Pacome, in the township of Ixworth, on the Kamouraska river, at St. Paschal, at l'rois-Pistoles and then at River du Loup, where a splendid fall of early 200 feet in height can be seen and admired.

The Seven Falls.—Still nearer to us, on the great plateau of St. Ferreol, behind St. Joachim, at a distance of four or five miles from the St. Lawrence, there is a series of thundering falls designated under the name of the *Seven Falls*. In height, this is the greatest water-power known, 375 feet, and it is said that from these wonderful cascades formed by the Ste. Anne river, an amount of energy equivalent to 15,000 horse-power can be obtained.

Ste. Anne's Falls.—The Ste. Anne or Grand River, which is a powerful body of water fed by a host of lakes, makes another leap before casting itself definitely into the St. Lawrence river. This has been given the name of the great falls of St. Joachim,

as it belongs equally to both parishes, at it is accessible from both sides, as well from the side of St. Joachim as from that of the Ste. Anne de Beaupré.

The "Great Falls" is distant a couple of miles from the shore of the St. Lawrence, in a fold of the St. Joachim mountain. It is encased in a narrow and steep gorge, whose sides are strewn with steep precipices.

From the aesthetic point of view, said some years ago Mr. Ulric Barthe, who made a description of it, it is one of the most beautiful horrors which nature has revealed to the human eye.

"At the top, we see the waters emerging from underneath the bush, spreading in singularly symmetrical sheets along a line of large round rocks, which form a sort of dam: the whole looking like the quiet outpouring of great artificial fountains. But there ends the similarity, for a few paces lower down begins the terrible descent, an abyss which the hand of man can never imitate."

An engineer who has calculated the depth, breadth and velocity of the water, at the low water stage, places the force of the Ste-Anne Falls at 10,000 horse-power, of which 7,000 can surely be developed at lowest water. The distance between the projected intakes and the foot of the falls is a thousand feet and the vertical elevation of the cataracts is 190 feet and even 194 feet, if the intake is established at the first rapid.

Rivière du Gouffre.—After the Ste. Anne Falls, one of the most remarkable is that occurring on the River du Gouffre, at St. Urbain, 60 miles from Quebec.

Murray River.—On the Murray or Malbaie river, in the county of Charlevoix, at a distance of 8 miles from the St. Lawrence; this is a pretty falls of 30 feet in height, which furnishes sufficient motive power for the electric lighting of the villages of Murray Bay and Pointe à Pic. This same river, which flows through a mountainous and well wooded country, has several other cascades of pretty considerable power.

Rivière Noire.—Twenty miles below Murray Bay, on the river Noire, there is a falls of 30 feet in height, which is only at a distance of one mile from the St. Lawrence.

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So much for the Quebec region, but it is not the only one upon which Nature has profusely lavished its incalculable riches. The white coal has been scattered with equal profusion through the counties of Maskinongé, Terrebonne, Montcalm, Joliette, Soulanges, Chambly etc. From all the rivers which traverse

these different electoral divisions, industry can surely derive the elements essential to its sustenance. Without entering into a nomenclature, which would might be fastidious owing to its length, we shall however note the principal water-powers that have been examined by experts.

Magog River.—Let us begin by the Magog river in the county of Sherbrooke. This stream, which takes its rise in the lake of the same name, has several small rapids that are utilized by the city of Sherbrooke for its electric lighting. This has been done by means of a dam. The Magog rapids could produce 1360 horse-power (1).

L'Assomption River.—In the county of Joliette, on L'Assomption river, an important falls called the *Mont-à-Peine* must be noted.

This falls is situate in the seigniorie of Ramsay, between the parishes of St. Jean de Matha and Ste. Melanie at 7 miles only, in a straight line, from the Canadian Pacific Railway station at St. Félix de Valois; its height is 65 feet and its nominal capacity 1535 horse-power. This water-power possesses remarkable working facilities.

Maskinongé River.—The Maskinongé river ranks among the important streams of the northern watershed of the St. Lawrence. The total superficies of its basin is nearly 400 square miles, of which about 360 are above the said falls and the distance from the mouth to its furthest source is 45 miles in a straight line.

The Maskinongé river properly so called, takes its rise in the lake of the same name, a splendid sheet of 4 to 5 square miles, on the banks of which is built the village of St. Gabriel de Brandon, connected with the C. P. R. by the Lanoraie, Joliette, &c. branch.

This lake might be made an important reservoir to regulate the outflow of the Maskinongé river. Its banks are nearly everywhere high enough except in the neighborhood of the head of the river in question.

Mr. Gauvin, C.E., of the Lands Department, scaled along the course of this river several cascades of some importance: *Lauzon* falls, which can give 900 horse-power. The *Poste* falls of 450 horse-power and the great falls of St. Ursule, a very remarkable water-power, with a height of 220 to 230 feet and a capacity of 4,000 horse-power.

Mr. Theodore Lefebvre, of Montreal acquired all these cascades in 1907.

(1) Report of Mr. Gauvin, C. E. 1905.

Rivière du Loup.—River du Loup in the county of Maskinongé, is a navigable and floatable stream. Its basin embraces an area of about 640 square miles, of which about 570 are above St. Paulin.

The principal falls are those of the *Poste*, where a force of 400 horse-power can be developed, of *l'Île à Baribeau*, 270 horse-power, of *aux Trembles*, which is in the channel on the right of Juineau island, 1,080 horse-power, of the *Chaudière* 600 horse-power, of the Grande Chute or Chute à Magnan, situated in the parish of St. Paulin at about half a mile below the bridge of the Great Northern Railway. This last cascade, which is far the most important, is capable of yielding 2,000 horse-power.

At a slight distance below the "Chute à Magnan", two falls are met with at a distance of about 200 feet from each other, each having a height of 25 to 30 feet. Their collective capacity, at low water, is about 1,000 horse-power.

Most of these water-powers were conceded in 1907 to Mr. Henry L. Auger, of Montreal.

Coteau Rapids.—In the county of Soulanges, the *Coteau Rapids* occur in the river St. Lawrence opposite the parish of Coteau du Lac.

Experts estimate that these rapids are capable of producing from 10,000 to 15,000 horse-power.

Rivière du Nord.—In the county of Terrebonne, the river du Nord, which empties into the Ottawa is worthy of note. In the town of St. Jérôme, through which it runs, this stream furnishes the motive power to one of the largest paper mills in Canada.

One of the best water-powers is that provided by the *Sanderson rapids*, two miles from St. Jerome and quite close to the branch of the Canadian Pacific Railway. Mr. C.-E. Gauvin, C.E., estimates its capacity at 1200 horse-power.

Trembling Lake.—In the same county, the falls on the discharge of Trembling lake or Trembling Mountain lake, township of Grandison, situated at about two miles from Trembling Mountain station of the "Montreal & Western Railway."

Trembling Lake, which has a superficies of at least 4 square miles, forms a splendid reservoir, which imparts great value to this water-power.

The falls is 36 feet high and it is Mr. Gauvin's opinion that, by properly utilizing the lake as a reservoir, a constant force of 800 to 900 horse-power may be obtained.

Rivière du Diable.—On its part, the river du Diable can yield more than 200 horse-power. Its principal falls is situated between the townships of Grandison and Wolfe.

Ouareau River.—In the county of Montcalm the Ouareau river, also designated under the name of *Lake Ouareau river*, is a very important stream. The chief branch of l'Assomption river, it is in a sense, from certain points of view, more important than the latter itself above their point of junction, as it is fed by two large lakes, lake Archambault and lake Ouareau, which, formed into reservoirs, would serve to regulate the flow.

The principal falls are the *Magnan*, the *Darwin*, and the *Manchester*.

The first is in the 6th range of Rawdon at about a mile from the village. Its height is 25 feet and its capacity about 1,125 horse-power. This falls has been worked for some years.

The *Darwin* falls is in the 4th range of the township of Rawdon at about half a mile from the village of the same name. There, the river Ouareau, much hemmed in, flows between steep rocks which below the falls attain an elevation of 80 feet. The absolute force of this falls, at ordinary low water, is 3,000 horse-power.

The *Manchester* falls is at about one mile from the village. 37 feet high and its absolute capacity is about 1700 horse-power.

The average distance of these three falls from the nearest station of the Great Northern Railway is nearly 8 miles.

Richelieu River.—We here deal with one of the principal affluents of the river St. Lawrence on the south shore.

This affluent, the Richelieu river, takes its rise in the State of Vermont at some 115 miles south of the boundary line (45th parallel) between Canada and the United States and receives, by its numerous tributaries, the waters of a basin, whose area is estimated at 9114 square miles, the surface of the part that lies above Chambly Basin being equivalent to about 8554 square miles.

From a point situated at about a mile below Ste. Therese island to the basin of Chambly or for a total distance of $4\frac{1}{2}$ miles, the Richelieu river may be said to be an uninterrupted rapid, presenting fine mill sites on each of its banks.

Above Chambly basin, the Richelieu has always been famed for its water-powers and, as a matter of fact, for many years, great mills, borrowing their motive power from the stream, have existed on its banks. At different points, the ruins of old mills still visibly attest in a sense the richness of the beautiful valley of the Richelieu, which the importance of its water-powers has so long contributed to render celebrated.

On the side of the village of Richelieu and built in the river

itself are the works of the Chambly Manufacturing Company, which have a superficies of 208 square acres and the Willett works, of lesser importance.

The total flow of the river, according to the estimate of the Company's Engineer, is 8800 cubic feet per second, at ordinary low water, which corresponds to a depth of 8 inches of water on the rim of the dam.

This volume of water, with an available head of 28 feet, represents (at ordinary low water) a force of 28,000 horse-power.

The company is actually using 4 groups of 4 turbines each, whose collective power of 10,000 horse-power is only half of the total power for which the plant was installed.

The water-power operated by the Chambly Manufacturing Co., at Chambly, is admirably situated on the score of communications by rail and water. It is only 15 miles in a straight line from Montreal.

The Company proposes to erect a new dam on the river, in the vicinity of lot No 237 of St. Joseph de Chambly ; the fall formed by this dam will, according to Mr. Gauvin, C. E., be 17 feet high and yield an approximate force of 17,000 horse-power.

On the side of the village of St. Ours, the river whose flow at that point is 2,000 cubic feet per second, can give 5,000 horse-power.

What gives value to the power that may be developed at St. Ours, according to Mr. Gauvin, is the important fact that there is not, it seems, any *frasil* or anchor ice in the river at that point and the very great advantage of being pretty near to Montreal and very close to Sorel.

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In the counties along the Lower St. Lawrence and especially in the counties of Rimouski, Bonaventure and Gaspé, the water-powers are much smaller than in the other parts of the province. However, a few among them deserve special mention.

Rimouski River.—First, there is the Rimouski river, which takes its rise far inland. This stream traverses 12 concessions of the township of Duquesne and then enters the seigniorship of Rimouski to finally empty into the St. Lawrence at St. Germain de Rimouski.

One of its principal falls known under the name of the *Grand Sault* is on the 10th lot of the 5th range of the township of Duquesne.

The distance of the *Grand Sault* from the St. Lawrence is 14 miles as the bird flies.

The height of the falls is 50 feet and Mr. Gauvin estimates that its absolute power is equivalent to about 1,000 horse-power.

Cascapedia River. In the county of Bonaventure, we have the Little Cascapedia river, 75 miles long, flowing from the east and parallel to the great river of the same name. It runs through the whole township of New Richmond.

The falls formed by this river was granted in 1901 to the New Richmond Lumber Company.

Mr. Gauvin, C. E., in a report of the year 1900, emits the opinion that a dam of 30 feet on this river would create a motive power equal to 3,300 horse-power. If this dam was extended to 50 feet, 5,500 horse-power would be obtained.

Magdalen River.—Next, in the fine county of Gaspé, we have the beautiful Magdalen river, which discharges into the Gulf of St. Lawrence, at 343 miles below Quebec. It is about 80 miles long and is the largest affluent of the St. Lawrence between Rimouski and the promontory of Gaspé.

The territory drained by this stream and its tributaires embraces an area of about 400 square miles of 256,000 acres. The forest upon it is rich and varied, comprising white spruce, fir, cedar, pine, white birch, elm, ash and black birch. The access to these forests is also easy.

The great falls of the Magdalen is only $7\frac{1}{2}$ miles from the mouth of the river. This cascade is perpendicular and the water falls from a height of 62 feet. With a dam of 15 feet in height to form an intake, it would be possible, according to Mr. J. C. Langelier, to get a total head of 77 feet, capable of developing 13,202 horse-power in the low water of ordinary seasons. The great falls is not the only water-power on the Magdalen river. There is also the little falls ending in a series of rapids and cascades which begins at the foot of the great falls. According to Mr. J. C. Langelier a dam 55 feet high, erected 2,231 feet above the cascade, would give, at the foot of the latter a fall 100 feet high, with a capacity of 17,143 horse-power in the ordinary stage of the water, and of at least 5.045 at the very lowest stage of the water.

The water-powers of the Magdalen were adjudged in 1902 to Mr. Chas. W. Mullen, of Bangor, State of Maine.

* * *

If, from the county of Gaspé, we pass to another region, entirely opposite, from the topographical point of view, that of

Chicoutimi, we note that there also there is no lack of water-powers. Nearly all the rivers and even certain lakes, with which that region abounds, have a rapid course or present a multitude of falls, large and small, which will some day be turned to account for manufacturing.

Chicoutimi River.—The principal one of these falls is that formed by the Chicoutimi river, which, on issuing from Lake Kenogami, a sheet of water of great depth and 21 miles in length, hurls itself after a course of 17 miles into the great Saguenay river.

The magnificent cascade, which ends this river, in the town of Chicoutimi itself, and whose hydraulic capacity is estimated at over 30,000 horse-power, has enabled a French Canadian syndicate to instal at its foot one of the largest works in the country. At the outset of its operations, the Chicoutimi pulp mills already turned out daily 14 tons of wood pulp. At present, the company has so increased its plant and the capacity of the mills that it can produce 100 to 150 tons of pulp per day. All this output is shipped to the English and French markets in steamships which load in the port of Chicoutimi. Shipments have also ben made for some years past to the United States.

It may perhaps not be superfluous to here add that the equipment of this great pulp mill on the banks of the Saguenay has wrought quite a revolution in that region. The town of Chicoutimi has doubled and trebled its population and the surrounding centres have also developed in unexpected proportions.

In the same region and in the township of Jonquières may be mentioned also the river au Sable whose power estimated at 1,000 horse-power has been utilized since 1901 by the Jonquières Pulp Company.

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We now come to the great cataracts f the regions of the Ottawa, the St. Maurice, the Lake St. John and the North Shore. Owing to their importance, these call for a little more comment. In fact, they represent forces so colossal that their equivalent is found in no other country. True, a few cataracts of the grandest aspect are met with in Brazil, Uruguay and in the interior of Africa, which astonish tourists, but nowhere else except in the province of Quebec and especially in the regions just mentioned, can there be seen so imposing an aggregation of water-powers. Indeed, there is no exaggeration in saying that the streams in these regions—and they number hundreds—can

indefinitely operate manufacturing on the most extensive scale.

To more surely guide the reader, we shall proceed by regions, beginning with the most important of all—that of the Ottawa.

OTTAWA REGION

Ottawa River.—Who does not know the great river of the Ottawas, a name that comes from the tribe of Indians who formerly inhabited its banks? It is the largest tributary of the St. Lawrence.

Taking its rise far back on the Laurentian plateau, it forms lake Temiscamingue, flows in a southeasterly direction and falls into the St. Lawrence near Montreal, having run a distance of over seven hundred miles. Many rapids and several falls intercept navigation. At Ottawa, the famous Chaudière falls is crossed by a suspension bridge; the Chats falls; the Long Sault between Carillon and Grenville. Its principal tributaries are the Noire, the North, the Rouge, the Little Nation, the Lièvre, the Gatineau, the Coulonge and the du Moine. On the other hand, numerous islands are scattered along its course, the principal ones being: Calumet island, Allumettes island, Chats island. At its mouth are the island of Montreal, Ile Jesus and other smaller ones.

It is estimated that the area of land watered by the Ottawa and its tributaries is about 60,180 miles, 40,324 of which are in the Province of Quebec alone. The Ottawa basin alone includes nine whole counties, among which is Pontiac containing 21,000 miles or 13,500,000 acres.

One can readily conceive the infinite resources offered by a river of such proportions which is, moreover, broken by a myriad of cascades, each one more formidable than the other. We will now consider the power of each of these cascades.

Chats Falls.—These are formed by the Ottawa river about 30 miles above the capital of Canada.

On the province of Ontario side, they have a capacity of 50,000 horse-power. On the province of Quebec side, their capacity has been estimated by Mr. C. E. Gauvin, the engineer of water-powers of the Quebec Government, at 15,000 horse-power. (1)

The same engineer gauged the volume of water of each of

(1.) See Report of Minister of Lands for 1906.

the cascades forming the Chats falls in the province of Quebec and obtained the following results :

Chute du Vieux Moulin.. . . .	320	cubic feet (per second).
Chute No 1.. . . .	221	“ “
“Egan Chute”.. . . .	116	“ “
“Conroy Chute”.. . . .	54	“ “
“Sturgeon Chute”.. . . .	1,134	“ “
“Black Chute”.. . . .	1,084	“ “
Moore’s Chute West”.. . . .	248	“ “
“Moore’s Chute East”.. . . .	2,500	“ “
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Total flow (Quebec side).. . . .	5,667	

The capacity of these various cascades was also estimated as follows :

Chute du Vieux Moulin...	470	horse-power
Chute No 1.. . . .	580	“
“Egan Chute”.. . . .	300	“
“Conroy Chute”.. . . .	220	“
“Sturgeon Chute”.. . . .	2,900	“
“Black Chute”.. . . .	2,800	“
“Moore’s Chute West”.. . . .	650	“
“Moore’s Chute East”.. . . .	7,000	“
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Total (Quebec side)..	14,920	“

A good portion of these magnificent cascades was adjudged in 1889 to the Uper Ottawa Improvement Company, to the Pontiac Gold Mining Company and in 1900 to Mr. Louis Simpson, manufacturer, of the city of Ottawa.

The Joachims Rapids.—These rapids are situated partly in the province of Ontario and partly in the province of Quebec.

These rapids occupy on the Ottawa river a total length of one mile and their fall is, at low water, 26 feet.

The flow of the Ottawa at the *Joachims* is 9,050 cubic feet of water, which gives 1,000 horse-power for each foot of fall.

The power of the *Joachims* rapids is therefore 26,000 horse-power at low water and as, at low water, there passes very little water through the channel to the west of the great *Joachims* island, in which there is the Federal Government’s slide, it follows that we can consider half of that power (13,000 horse-power) as belonging to the province of Quebec. This is, of course, the

lowest power (26,000 horse-power) that the rapids in question probably reach ; at high water, their force probably exceeds 100,000 horse-power.

Portage du Fort Rapids. These rapids of the Ottawa river, in the county of Pontiac are situated partly in the province of Quebec and partly in that of Ontario.

The village of Portage du Fort itself is only 63 miles from the city of Ottawa and 10 miles from the Shawville Station of the Pontiac & Pacific Junction Railway.

The total fall of these rapids, without being very great, can develop nevertheless 400 horse-power.

Grand Calumet Falls.—These falls are situated in the county of Pontiac at about 65 miles above the city of Ottawa in the branch of the Ottawa river known as the Calumet channel, to the east of Calumet Island, which forms the township of Grand Calumet and is about $3\frac{1}{2}$ miles distant, in a straight line from the nearest railway station, "Clark's Station" on the Pontiac & Pacific Junction Railway.

These fine falls, which form one of the most remarkable water-powers of the entire Ottawa river, occur between the village of Bryson on lots Nos 14, 15, 16 and 17 of the first range of the township of Litchfield, on the east bank, and lots Nos 2, 3, 4, 5, 6 and 7 of the first range of the Government Reserve comprised in the south range of the township of Grand Calumet, on the west bank. They are formed by a succession of cascades and rapids dotted with islands separated here and there by basins. Their total length, measured according to the axis of the river, from the Government dam, north of island No 10, to the foot of the old portage, on Calumet Island, is a little over a mile or 5,550 feet; but the distance in a straight line from the southern extremity of the said dam to the foot of the last rapid, almost opposite the landing place of the old ferry on Calumet Island, is about 4,600 feet.

Mr. Gauvin, C. E., estimates the minimum energy of all the falls of the Grand Calumet, taken together, at 52,000 horse-power (1), which is already a handsome figure.

On the other hand, it is shown that the power of all these falls can be advantageously utilized. In fact, there is on the west side of the river, near the foot of the falls, in the township of Grand Calumet a suitable spot for the erection of the build-

(1) Report of 1902.

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ings required for the installation of a great manufacturing plant.

The Mountain Rapid.—This is one of the most remarkable spots in the Calumet channel. It is situated at about $2\frac{1}{2}$ miles below the foot of the Grand Calumet falls and at about 63 miles above the city of Ottawa.

The flow of the branch or arm of the Ottawa river called the "Calumet channel" at the Grand Calumet falls, is estimated by Mr. Gauvin, hydraulic engineer, at 8,000 cubic feet and the flow of the lower part of the river at the *Mountain Rapid* at 7,500 cubic feet per second.

The conclusion from this is that the force of this rapid attains at the minimum 13,000 horse-power, while its average force may rise to 20,000 horse-power.

Dargis Rapids.—Situated at about a mile above the Mountain Rapids and nearly midway between the latter and the Grand Calumet falls. Its average capacity is estimated at 4,500 horse-power.

Des Sables Rapids.—Situated at the confluence of the Calumet and Split Rock arms.

The minimum force of these rapids should be about 3,800 horse-power.

Desjardins Rapids.—Situated to the north of Desjardins Island on the Split Rock arm, in the 6th range of the township of Grand Calumet.

Its length is about 1,000 feet and its capacity 3,000 horse-power.

Gauvin Falls.—On the north channel of the Split Rock arm, in the 9th range of the township of Grand Calumet at 6 miles from the Pontiac and Pacific Junction Railway.

About 5,000 horse-power can be obtained from this fall.

Crawford Rapid.—This follows the Gauvin falls and has a total length of 3,100 feet with a head of nearly 20 feet. Capacity 7,000 horse-power.

Musk Rat Rapid.—Situated in front of lots 6 and 7 of the 9th range of Grand Calumet.

Its capacity is estimated at 7,000 horse-power.

Split Rock Falls.—This cataract is at the head of the lake of the same name. The greater part of it is in the province of Quebec in front of lots Nos 1 and 2 (patented in 1884) of the 4th range of the township of Grand Calumet.

It is not very powerful, being only 5' 6" high on a length of 700 feet, but its height might probably be increased by that of a

part of the Long rapid. Its total minimum force is estimated at about 5,600 horse-power.

Long Sault Rapids.—The "Long Sault" is not a continuous rapid, but a series of rapids of different lengths separated from each other by steps. It is in all 6 miles long, extends along the whole front of the 1st range of the township of Gendreau and comprises all that part of the Ottawa river between Twenty One Miles lake and lake Temiscamingue.

The principal rapids of the "Long Saut" are:

1.—The first rapid met with in ascending the river from Twenty One Miles lake, and which bears no particular name. 2.—The "Oven" rapid. 3.—The "Crooked" rapid. 4.—The "Flat" rapid. 5.—A rapid opposite the mouth of Gordon creek at the foot of Lake Temiscamingue.

The "Long Sapult" is situated, half or nearly half, in the province of Quebec and half in the province of Ontario.

It has been estimated that the flow of the Ottawa river at the Long Sault is nearly 6,500 cubic feet per second and that all these rapids (we refer to those in the province of Quebec) are capable of producing a force of more than 20,000 horse-power.

The Cave and Demi-Charge rapids.—The Cave rapid is situated at about 6 miles above Mattawa and facing lot No 22 of the Ottawa river, township of Boisclerc. It is about 600 feet from the line of the Temiscamingue Railway (C.P.R. branch) which skirts the left bank of the Ottawa.

The Demi-Charge rapid is half a mile lower down.

An examination has established that the flow of the Ottawa river at the Cave rapid reaches 7,800 cubic feet per second.

The minimum power of the rapids in question (the Cave), the Little Rapid and the Demi-Charge) is 8,300 horse-power in round numbers, one half of which, or 4,150, belongs to the province of Quebec.

The principal arm of the Ottawa, at the head of the Cave, is only 300 feet wide at low water and is admirably adapted for building a dam, by means of which the head of water can be increased by nearly 13 feet, which would give a total fall of about 22 feet.

The total minimum, under these conditions, would reach about 10,000 horse-power.

Maple Rapids.—The Maple rapids are situated on the Ottawa river about four miles above the Cave and facing lots Nos 14, 15 and 16 of the 7th range of the township of Boisclerc.

These rapids have a total fall of 12.85 feet (say 13 feet) at low water and a length of about 2,000 feet.

The only important stream that falls into the Ottawa between the Cave and the Maples being Cotton Creek on the Quebec side, whose flow is very slight at low water, Mr. Gauvin estimates, from the results of a gauging made by him at Mattawa, that the flow of the Ottawa at the Maple rapids amounts to 7,700 cubic feet per second.

With this flow and the fall aforesaid, the minimum force of the rapids in question is 11,300 horse-power, half of which (5,650 horse-power) belongs to the province of Quebec.

At the head as at the foot of these rapids, the difference of height between the level of high and of low water is about 11 feet.

The track of the Temiscamingue Railway, opposite the lower landing of the old tramway at the foot of the rapids is at 25 feet over the level of low water.

The Roche Capitaine Rapids.—These rapids are met partly in front of lots numbers 1 to 7 of range A of the township of Aberford in the county of Pontiac and partly opposite the vacant lands of the Crown contiguous to that township.

The nearest station to the Roche Capitaine is Bissett on the transcontinental line of the Canadian Pacific.

Mr. Walter Shanley, C. E., said in 1858 that these were the most remarkable of the Ottawa's fine rapids.

These rapids have a total length of two miles and a fall of 42 feet. According to the estimate of Mr. Gauvin, C.E., in 1901, the total force of the Roche Capitaine rapids, at low water, is 40,000 horse-power.

According to the same hydraulic engineer, the rapids of the Roche Capitaine constitute one of the finest water-powers of the Ottawa river and are well situated as regards communications, being on the line of the projected canal from Montreal to Georgian Bay ("Montreal, Ottawa and Georgian Bay Canal") and quite close to the transcontinental line of the Canadian Pacific railway. They also possess the great advantage of being situated in one of the finest and richest forest regions of the country: certainly their importance and value can only increase from year to year.

Rivière du Lièvre.—This river, one of the principal tributaries of the Ottawa, has a basin of 4,000 square miles, containing considerable number of large lakes. It takes its source in the county of Maskinongé, flows through the county of Ottawa and,

after a course of 250 miles, falls into the Ottawa at Buckingham station, 13 miles from the Dominion capital.

This great stream of the Ottawa region has several water-powers. We may mention the following:

1. **The Orignal Rapid**, between the township of Campbell and Robertson, whose capacity is estimated at about 200,000 horse-power.

Mr. Gauvin, C. E., is of opinion that the establishment of an important industry here would almost immediately give rise to the construction of a railway. (1)

2 **The High Falls**, 22 miles above Buckingham, and 28 miles in a straight line from the city of Ottawa.

The Lièvre river at High Falls presents a series of falls and rapids over a distance of about 4,000 feet.

The total height of the first three falls, including the great cascade, is 147 feet.

The absolute minimum capacity of these three falls is 33,000 horse-power in round numbers.

In summer, a steamboat runs between Buckingham and High Falls, putting the latter place in communication with our network of railways.

In his report for 1906, Mr. Gauvin, C. E., says that High Falls possesses one of the finest and most important water-powers of the whole Ottawa valley, for it must not be forgotten that this capacity of 34,000 horse-power (33,000 plus 1,600) is merely the capacity of these falls at low water.

High Falls also has the great advantage of being on a very fine navigable river, watering a richly timbered country and one where there are—as has already been known for many years—remarkable deposits of graphite, phosphate of lime, mica and other valuable minerals.

All these advantages combined make High Falls one of the future leading manufacturing centres, not only of the Ottawa region, but also of the whole province.

The James McLaren Company, of Buckingham, acquired this water-power in 1901.

Gatineau River.—The Gatineau river, one of the principal tributaries of the Ottawa, is itself a majestic stream 225 miles long. Like the Ottawa, it is broken by falls and rapids of colossal power.

[1] Report of Mr. C. E. Gouvin, C. E. 1904.

Mr. Gauvin, C. E., mentions in particular the Six Portages rapids, the Cascades, the St. Joseph and the Eaux rapids and the Pangan falls.

1. The **Six Portages Rapids** are a series of rapids which, altogether, are nearly five miles long. They extend from lot 14 of the first range of the township of Kensington to lot 51 of the third range of the township of Cameron.

The aggregate capacity of these various cascades has been estimated at 17,745 horse-power.

According to Mr. Gauvin, all that is lacking for the moment is means of communication. Still, as work on the extension of the Ottawa and Gatineau Valley Railway is being actively pushed, and the line will soon be built as far as Maniwaki, that is to say, 2 or 3 miles from the rapids, one may expect to see their utilization made practicable within a short time.

2. **The Cascades.**—Cascades is the name of one of the stations on the Ottawa and Gatineau Valley Railway (now one of the branches of the Canadian Pacific). It is in the 14th range of the township of Hull, about 16 miles from Ottawa and is evidently so called because it is at the foot of the five cascades formed by the Gatineau river in a distance of a little over a mile.

As one descends the river, the first cascade is only a short distance (about 400 feet) below Mohr's hotel, in front of the level crossing of the railway; the others are at distances of 1,200, 2,300, 3,100 and 5,650 respectively from the first.

The capacity of these various cascades, at low water, is as follows :

First cascade	1,300 horse-power
Second "	1,500 "
Third "	1,000 "
Fourth "	4,000 "
Fifth "	2,200 "
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Total	10,000

It should be observed that this is merely the minimum capacity of the Cascades. According to the official engineer, Mr. Gauvin, their average capacity should be four times as much, that is to say, about 40,000 horse-power.

3. **St. Joseph and des Eaux Rapids.**—The former are situated between range C. of Egan township and range B of Aumond township and their capacity may be 5,000 horse-power.

The capacity of the latter is estimated at 2,700 horse-power.

4. **Pangan and Rock Island Falls**, situate in the townships of Low and Denholm.

These were conceded in 1899 to Messrs. Hanson Brothers. Their capacity has been officially estimated at 27,000 horse-power.

Rivière des Quinze.—This river, whose total length is 18 miles, falls into lake Temiscamingue. It takes its rise in lake des Quinze and is so called on account of the fifteen rapids by which its course is broken. This river is considered as the channel which puts the Ottawa river properly so-called, or the Lower Ottawa, in communication with the Upper Ottawa. It is moreover the only outlet by which all the streams of a vast fully timbered basin, whose area is 9,000 square miles, fall into lake Temiscamingue.

Following its course from lake Des Quinze, the following rapids and falls are met with on this river :

1. Head Rapids ; 2. Maple Rapids ; 3. Cypès Rapids ; 4 *Ka-ka-ke* Rapids ; 5 Big Pipe-Stone Rapids ; 6 Little Pipe-Stone Rapids ; 7 Island Rapids ; 8 The falls and rapids (including the Devil's Falls) are sold to the Bronson Company.

The capacity of the first water-power has been estimated at 4,420 horse-power ; that of the second at 6,120 and that of the Cypès Rapids at 6,800 horse-power.

The *Ka-ka-ke* Rapids are on the river des Quinze, in the county of Pontiac, about 12 miles from the Indian village of North Temiscamingue where the steamboats run that connect with the Canadian Pacific . The total fall of these rapids is 46 feet and they can develop a capacity of over 15,640 horse-power.

The water-powers formed by the rapids known as the Big Pipe-Stone, Little Pipe-Stone and Island Rapids, are on the rivière des Quinze, county of Pontiac, about 8 miles from North Temiscamingue where the steamboats run that connect with the Canadian Pacific railway trains at Temiscamingue.

Their aggregate capacity is estimated at 32,000 horse-power.

Kippewa River.—This river is the outlet of lake Kippewa, covering an area of about 124 square miles, deducting the islands. The lake constitutes an immense reservoir for the water-powers in question, as well as for those on the lower part of the same river.

The total capacity (at low water) represented by the upper portion of the Kippewa river, from the lake to the bend of the river, is 3,700 horse-power.

With a proper dam at the outlet of the lake Mr. Gauvin,

C.E., says that, throughout the year, a uniform flow of 2,000 feet per second could be obtained provided the flow of a portion of the water of the lake by Gordon creek could be regulated at will. With such a constant flow, the total capacity of that part of the Kippewa river would be 12,000 horse-power is round numbers.

LAKE ST. JOHN REGION

Chamouchouan River.—This is one of the great tributaries of Lake St. John. Navigable for a distance of forty-five miles to St. Félicien, this large stream falls into the lake a mile and a half north-west of St. Prime. It is three quarters of a mile wide at its mouth and four hundred feet a hundred miles further up. The cascades, which have been gauged by experts could easily supply 300,000 horse-power on the first fifty-six miles of the river. For further details we will show how Mr. J.-C. Langelier, superintendent of forest-rangers, in his report for 1899, calculated the power that could be obtained from each cascade of that great river :

1. **Great Bear Falls.**—Situate 8 miles from the St. Félicien bridge and about 18 miles from Lake St. John. The falls are perpendicular with a height of 80 feet and give 99,680 horse-power. With a dam 12 feet high the capacity might amount to 111,601 horse-power.

2. **Little Bear Falls.**—These are a mile higher up than the great falls of the same name. Their height is 44 feet and their capacity 54,520 horse-power.

3. **Rapides des Roches.**—About 20 miles from Lake St. John. Two good water-powers of some 15,00 horse-power each could be developed here.

4. **Pemoka Rapids.**—Twenty-eight miles from Lake St. John. The water-power of these rapids is all the more easy to utilize that dams can be built at various places as the banks of the river are high and consist of solid rock.

5. **Chaudière Falls.**—Fifty-seven miles from Lake St. John and a mile above the confluence of the Chigobiche river. The first fall, as one ascends the river, drops from a height of 60 feet and can develop 80,000 horse-power. The other cascades, on their part, could easily develop 50,000 horse-power.

6. **Rapide du Pont.**—In the first range of the township of Demeules. The total length of this rapid is 1900 feet and its capacity 6,000 horse-power.

The mere list of the above shows that the industrial future of a region so richly provided is a promising one.

It is true that the forest land drained by the Chamouchouan

formerly suffered through great conflagrations, but, even in the present state of affairs, a vast field for lumbering still remains. Mr. Langelier is of opinion that in the portion of the Chamouchouan territory situate above the Bear Falls, ten million cords of white and black spruce of the best quality for making pulp and paper could be found.

Great Peribonka River.—The largest of the tributaries of Lake St. John.

Its length, from the estuary to the sources of the river, is about three hundred miles, while its width, in some places, is from a third of a mile to a mile.

This river, which is navigable for a distance of nine or ten miles, is fed by a large number of lakes, some of which are 25 miles long, so that the volume of its waters is barely affected by summer droughts.

From the terminal point of steam navigation, about 14 miles from Lake St. John and for a distance of 5 to 6 miles as one ascends the river, it forms a series of cascades and falls that make it a real Niagara. Within that distance there are seven cascades or falls, one above the other, which could develop a capacity of over 300,000 horse-power. Mr. J.-C. Langelier, superintendent of forest-rangers, made out in 1898 a very interesting list of the cascades of the Great Peribonka, giving the height and capacity of each.

Falls	Height	Capacity
Grand Falls	21.17 feet	39,000 horse-power
Falls of Portage la Savanne . .	20.00 "	3,850 "
Willie Falls	20.00 "	26,500 "
L'Islet "	10.00 "	18,425 "
Bonhomme Falls	20.00 "	35,000 "
McLeod Falls	40.00 "	73,750 "
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	166.17 "	301,025 "

The basin of the Great Peribonka covers an area of 8,320,000 acres and there is no exaggeration in estimating the quantity of white and black spruce in that region suitable for the manufacture of pulp, at five cords per acre. This represents a total quantity of 41,600,000 cords of pulp wood for this part of the Lake St. John region alone.

We may add, for the information of those who are not familiar with the province, that this immense territory of Lake St.

John is in communication with Quebec by a railway whose length, from Quebec to Roberval, is 192 miles.

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On the Little Peribonka river, 80 miles long and situate to the west of the Great Peribonka, starting from its mouth, there is a series of cascades and falls at the 8th, 12th, 14th, 16th, 23rd and 78 th miles. The most important are the White Falls between the 5th and 6th ranges of the township of Dalmas. Their capacity is about 679 horse-power. There is a site for a mill here.

Mistassini River.—This is an immense stream 200 miles long and three miles wide at its mouth. It borders the townships of Parent, Racine, Albanel and Pelletier and falls into Lake St. John at the extremity of Racine township.

This river, which is navigable for a distance of 18 or 20 miles, forms cascades and water-powers whose capacity is worth noting.

The first falls are at the terminus of steamboat navigation, about 24 miles from the mouth of the river ; the second 11 and 16 miles above the former and finally at the 120th mile there is a splendid fall 80 feet high .

Measurements made in 1898 showed that the flow of the river near the first cascades is equal to 667,183 cubic feet per minute and that the combined capacity of the three cascades would represent 60,000 horse-power.

According to Mr J. C. Langelier's calculation, the basin of the Mistassini covers an area of 4,800,000 acres of woodlands, which, at five cords per acre, would give 24,000,000 cords of pulp-wood.

Mistassibi River.— This river, as large as the Mistassini into which it falls, drains a vast plateau extending north of Lake St. John and which, in the neighborhood of the Ouatichouaniche, looks like an endless plain.

The first falls, about a mile from the confluence, are called "Chutes des Pères". Their capacity is about 12,000 horse-power and they are partly used by the Trappist Fathers, Mistassini, for their mills.

Besides the "Chutes des Pères" the Mistassibi has six other falls in the following 34 miles as one ascends the stream.

The capacity of these various cascades has been estimated at 80,000 horse-power.

Rivière aux Rats.—This is another tributary of the Mistassini which falls into it above the Mistassibi.

This river has three cascades in the first seven miles from its mouth. Their aggregate capacity is 22,726 horse-power.

Ouassiemka River.—This great tributary of the Mistassini runs parallel to the latter for a distance of 50 miles. Its course is but one series of rapids, cascades and falls, sometimes of great height, which means that here again we have considerable water-powers.

Metabetchouan River.—This fine river, 80 miles long, takes its source in the neighborhood of Lac aux Rognons, in the township of Malherbe, divides the township of Dequen from the township of St. Hilaire and falls into Lake St. John six miles west of St. Jérôme.

This river contains a series of cascades and rapids from which industry may derive much benefit.

White Falls.—According to Mr. Gauvin, C.E., in his report for 1901, one of those cascades, the White Falls, 19 miles from the mouth of the river and 8 miles from the village of St. André de l'Epouvante, could be very easily utilized.

The falls are 29 feet high when the river is low. If to this we add the height of the rapid, 400 feet long, immediately above, we get a total height of nearly 34 feet.

The Cascades.—The falls called "The Cascades" are about a mile and a half above the White Falls, in the township of St. Hilaire and $6\frac{1}{2}$ miles from the village of l'Epouvante.

At the Cascades, the Metabetchouan is very narrow and flows between rather high rocky cliffs.

The total height of the Cascades is 32 feet in round numbers. As the flow, at this point, is pretty much the same as at the White Falls, it follows that the total capacities of the Cascades are as follows :

At low water (in winter) about	1350	horse-power
At low summer level	1525	"
At the average level (about)	2330	"

Lamartine Falls.—These falls are in the third range of the township of Metabetchouan and are divided into two distinct groups.

The upper group, that is to say, the first as one descends the river after passing the dividing line between ranges 3 and 4 of Metabetchouan township, following the main axis of the river, covers about 2,000 feet. It comprises 7 principal cascades of a

total height of 77 feet, 67 only of which can practically be utilized when the water is at its lowest.

The minimum capacity of this group of falls is estimated to be 2,900 horse-power.

The lower group, about half a mile above the former, covers a length of about 1,000 feet. It consists of four distinct cascades, of a total height of 86 feet and capable of developing 3,760 horse-power.

Mr. Gauvin, C. E., who gauged the flow, says that these falls are almost terrifying in their beauty and that their utilization would be rather costly.

L'Epouvante Falls.—In the first range of the township of Dequen.

In its natural state, this fall is about 25 feet high, but, as the former Metabetchouan Pulp Company has built a dam of about the same height at the head of the fall, the head of water that could be utilized would be about 50 feet.

We may add that the former company, which owned this fall, has built a railway 11 miles long to connect its establishment, now abandoned, with the Quebec and Lake St. John Railway in the vicinity of Lake Bouchette station.

The Saguenay River.—One of the great tributaries of the St. Lawrence. The Saguenay river flows out of Lake St. John by a double channel, one of whose arms is called the Grand Discharge and the other the Little Discharge. These two arms, separated by Alma island, at the outlet of the lake, unite three leagues further down and there the river begins which takes its regular course seven miles above Chicoutimi, continuing down to Tadousac, after flowing a distance of forty leagues. The Saguenay could furnish water-powers of great importance. We may mention more especially, the *Chutes à Caron*, the Little Discharge and the Grand Discharge.

Caron Falls.—The Saguenay river forms a series of falls between the "Chutes à Caron" and the Shipshaw river whose capacity is estimated at 130,000 horse-power. They have been the property of Mr. Thomas L. Wilson since 1899, but have not yet been utilized.

The Little Discharge.—This name is given to a branch of the Saguenay river by which the waters of Lake of John flow out at St. Joseph d'Alma in the county of Lake St. John.

The Little Discharge can supply considerable motive power to industry. In fact along its course there is a series of rapids whose height was measured and whose flow was gauged by Mr.

Gauvin, C.E., starting from the head of the river, that is from Lake St. John :

	Feet.	Horse-power.
1. Rapide de la Dame	17.05	658
2. Rapide à la Main (about)	6.00	232
3. Rapide de l'Islet (about)	20.00	772
4. Small falls (old Government dam)	9.26	358
5. Little rapid of Ruisseau Rouge	3.17	123
6. Fall caused by the dam of St. Joseph d'Alma (Lapointe's mill)	17.13	662
7. Carcajou rapid	39.54	1528
Total approximate fall.	112.15	4333

The total length of the Little Discharge is about 10 miles.

Of all these rapids, the last is the most important and it would be comparatively easy to utilize it.

* * *

So much for the chief sources of power of the Lake St. John region. Some of them are already used for industrial purposes on a large scale; but the most of them are still awaiting capitalists capable of utilizing them and making them yield all they can give.

A simple recapitulation will show out more clearly and strikingly the resources of that kind we possess in that vast territory. It is supplied us by Mr. Langelier in his report of the year 1898 :

Great Péribonka	301,025	horse-power
Little Péribonka	1,500	"
Mistassibi	75,000	"
Mistassini	60,000	"
Au Rat	22,723	"
Quassienska	15,000	"
Chamouchouan	100,000	"
Au Saumon, aux Iroquois and Ouiatchouaniche.	2,000	"
Ouiatchouan	33,000	"
Métabethouan.	2,500	"
Belle Rivière and Aulnaies	500	"
Little Discharge	25,000	"
Grand Discharge (1)	15,000	"
	653,248	"

(1) The water powers of the Grand Discharge on the Saguenay river were sold in 1900 to Lt.-Col. B. A. Scott of Roberval, the manager of the Oyamel Company.

ST. MAURICE REGION

The territory it covers with regard to outside trade is divided into two parts : the settled part and the forest part. The settled part, whose natural centre is the city of Three Rivers on the St. Lawrence, contains a farming population of about 300,000 inhabitants.

The forest part covers an area of over 30,000 square miles. This territory contains, throughout its extent, forests of pine, white spruce, cedar and hard-wood trees, sufficient to form an inexhaustible source of supply to the outside trade. There is also an abundance of iron, mica, limestone, granite and other mining products.

But by far the most important point, and that which deserves to have public attention called to it, is that nature has distributed throughout this region, side by side with the raw material, water-powers of a capacity and facility of utilization beyond the ordinary.

Let us note first of all that the St. Maurice river, which waters the whole of that vast territory, is one of the largest tributaries of the River St. Lawrence. It flows into it near Three Rivers and takes its rise on the water-shed dividing the St. Lawrence slope from that of Hudson's Bay. Its waters are rapidly swelled by various rivers it meets on its way and, barely a few leagues from its source, it has become a majestic river navigable for quite a long distance.

The St. Maurice flows from west to east. Its course, about 350 miles long, runs generally through a mountainous region and is broken here and there by a series of cascades, the more important of which are the Shawinigan, La Tuque, Grand'Mère, the Rapide des Hêtres etc., all or nearly all of which are utilized for large manufactories.

The area of territory watered by the St. Maurice and its tributaries is 18,020 square miles and the greater portion is covered with forests of pine and spruce of great value.

Rapide des Hêtres.—We have mentioned this rapid as being one of the water-powers formed by the St. Maurice. It lies about half-way between Grand'Mère and Shawinigan, in the county of Champlain. Its length is about half a mile and its total fall 17 to 18 feet.

Mr. Gauvin, C. E., who inspected it in 1905, estimates its capacity at 7,000 horse-power.

Shawinigan Falls.—The famous Shawinigan Falls which have since 1897 become the property of the Shawinigan Lakes

Electric Power Company, have a total height of 200 feet and a capacity of 250,000 horse-power.

So far the company has spent nearly five millions dollars for the development of that water-power, for machinery, works, transmission and railway lines.

Moreover, the utilization of that great water-power has given birth to a manufacturing town whose growth has been prodigious of late years. Shawinigan is now a town of 6,000 souls with water-works, sewerage, electric light, a fire protection service and all modern municipal improvements.

Grand'Mère Falls.—The Grand'Mère Falls, no less celebrated than the foregoing, were sold in 1899 to an American company, The Laurentides Pulp Company, Limited, which has spent over three million dollars on its pulp and paper mills. Its pay-roll amounts to \$400,000 a year.

The capacity of its cascades is estimated at 66,000 horse-power.

Gabelle Rapids.—In 1905, Mr. Gauvin, C.E., who gauged the water-powers above the rapid called *Les Grâis* and formed by the rapid called *La Gabelle*, in the parish of St. Etienne, estimated that the minimum flow of the St. Maurice at *La Gabelle*, was 3,500 cubic feet per second which, with a supposed head of water of 20 feet, corresponds to an absolute capacity of 8,000 horse-power.

La Tuque Falls.—La Tuque is about 65 miles above Grandes Piles, the terminus of the Piles branch of the Canadian Pacific. In addition, a new link of railway connects the Lake St. John Railway with the St. Maurice.

La Tuque was a profound solitude but yesterday. The coming of the railway and above all the existence of a magnificent water-power, one of the finest of the country, which is about to be utilized for manufactures on a large scale, have caused quite a revolution in that hitherto unknown corner of the province. An embryo village has already arisen and all that is wanting is the putting in operation of extensive works which will soon be done to convert the village, like those of Shawinigan and Grand'Mère into a flourishing manufacturing town. (1)

The prospects of a brilliant future for La Tuque are due to the fact that the whole surrounding region is covered with the

(1) The La Tuque water-power is now owned by the Brown Company which will build its pulp mill in 1909. The same company owns 16,000 miles of timber limits in the upper St. Maurice region.

best of merchantable timber and that the St. Maurice is one of the most suitable rivers for floating logs.

We referred, a moment ago, to the water-power at La Tuque. The gauging made by the engineer of the Quebec Government, shows that it is simply marvellous. The La Tuque rapids or falls are in the first range of the townships of Vallières and Mailhot. The flow of the river at that spot is 7,945 cubic feet per second and the head of water 88 feet which, according to the engineer, would give a total capacity of 79,000 horse-power. By damming the river above the rapids and raising the head of water to 100 feet, the engineer says that the capacity would attain 90,000 horse-power.

Grandes Piles Falls. This great cascade is opposite the southern end of the village of St. Jacques des Piles, at a spot where the St. Maurice is about a thousand feet wide.

The river, between Grandes Piles and Petites Piles—the latter are about three miles above the former—is very wide as a rule. At one spot it is over half a mile (about 3,000 feet) wide. At the Petites Piles it narrows considerably and is barely 250 feet wide.

The engineer, Mr. Gauvin, has calculated that, supposing the minimum flow to be 15,500 cubic inches per second and the maximum head of water 15 feet, the capacity of the Grandes Piles falls is 23,000 horse-power.

Nevertheless, when the same hydraulic engineer gauged this cascade on the 23rd May 1900, its capacity was then 74,000 horse-power.

Mr. Gauvin added the following remark in his report : “Let means be found of regulating the course of the St. Maurice between the Grandes Piles and the Petites Piles, that is to say of preventing the extensive variations that occur to-day in the level of the river between those two points and there will be at the Grandes Piles, one of the finest water-powers possible from the standpoint of easy development.”

It should also be stated that the principal advantage of this cascade is that it is on a stream of such importance as the St. Maurice which is navigable for a distance of 65 miles above the Grandes Piles, that is to say, as far as La Tuque. It also has the further advantage of being almost on the very line of the Piles branch of the Canadian Pacific Railway.

Manouan Falls.—Situated on the Manouan river, in the county of Champlain. These cascades a little over four miles

from the mouth of the river, were sold in 1906 to Senator Choquette. Their capacity is 1,000 horse-power.

All the tributaries of the St. Maurice and the rivers in its neighbourhood are no less supplied with water-powers than the main river. It should be stated that all these sources of power are not exposed to be decreased or rendered useless by clearings or other similar causes; they have inexhaustible reservoirs in the cold and remote regions of the north.

Thus there are to be found in that region, as a former mayor of the city of Three Rivers once said, side by side with the raw material, unlimited powers which Providence has reserved for human industry and which await but the action of intelligence and capital to produce comfort and wealth. Electric power, now so easily developed by means of water-powers, will evidently be the mighty factor which will soon effect the transformation of those vast solitudes.

NORTH SHORE AND LABRADOR

What is generally called the North Shore consists of that vast area of land and shores comprised between the Portneuf river, 146 miles from Quebec, and Natashquan. The remainder, from the interior of the territory to Blanc Sablon, the eastern limit of the Province of Quebec, forms what it has been agreed to call the Canadian Labrador. Properly speaking, it is the continuation of the north shore of the St. Lawrence, covering in all a distance of over seven hundred miles.

The whole wealth of the North Shore and of the Canadian Labrador consists in their rivers, forests, fisheries and iron mines, their immense hunting territories and their water-powers beyond number.

The forest includes chiefly white and black spruce, that is to say, the best wood for making pulp. It is also pre-eminently the land of the *white coal*, since we have there over one hundred rivers, some of considerable size and nearly all broken by incomparable cascades.

This region, where so much wealth is accumulated, is barely known, but the day is not far distant when industry in all its branches will feel the need of utilizing all these powers whose existence has been so long unsuspected.

We will merely give the principal rivers whose water-powers might easily be utilized :

Sault au Mouton River.—This river, thirty three miles from Tadoussac, in the county of Saguenay, is 54 miles long and is accessible to flat-bottomed boats at high tide.

Several water-powers have been scaled along its course and, in particular, a cascade sixty feet high. Timber can easily be floated along nearly the whole length of the river.

Portneuf River.—This is 146 miles from Quebec and nine miles east of Sault au Mouton.

There are several cascades of some importance. The first fall is 4 miles from the mouth of the river. It is 40 feet high and 200 feet long. An expert, who made measurements there, estimates that the volume of water flowing over the dam now built in the river is about 165,700 cubic feet per minute.

The second fall, two miles higher than the first, is an almost uninterrupted succession of cascades, each being from 10 to 15 feet high, the aggregate height being 70 feet.

The trees along the river consist chiefly of balsam fir, white birch and black spruce.

There is now a large saw-mill in Portneuf village.

Sault au Cochon River.—Eight miles to the east of the Portneuf river, with a good harbor quite close.

Experts have estimated the capacity of the various cascades of this river at more than 2,000 horse-power.

The cascades of this river were leased in 1906 to a Montreal manufacturer, Mr. J. P. Mullarkey.

Laval River.—Sixty miles below Tadoussac and two miles from Sault au Cochon.

Twenty miles from the shore, the river has three falls within a short distance of one another where saw or other mills can be put up at no considerable cost.

Bethsiamis River.—This river, 260 miles long, falls into the St. Lawrence, 170 miles below Quebec.

Bordered by mountains, this river, whose volume of water is enormous, is broken by many falls, some of great height, as much as a hundred feet high and over.

A great deal of lumbering was formerly done along this river.

Manitou River.—This river falls into the Gulf of St. Lawrence, 15 miles to the east of Rivière au Bouleau.

Two miles from its mouth, the river, whose volume is considerable, forms a magnificent cascade 113 feet high. It is one of the most remarkable of the falls of the North Shore.

Schooners and batteaux can ascend the river, at high water, as far as the falls, where there is a fine mill-site.

Rivière aux Outardes.—Although smaller than its neighbour, the Manicouagan, the Rivière aux Outardes is none the less one of the finest streams flowing into the St. Lawrence.

Mr. Bignell, P.L.S., who scaled it, estimates its average depth at 8 feet, in width varying from seven to fifteen chains.

The principal falls are $7\frac{1}{2}$ miles from the sea and from Pointe aux Outardes.

The height of these cascades is about 200 feet. According to the calculation made by Mr. J. C. Langelier, in 1901, their capacity would be 180,992 horse-power.

There is no access by navigation to these falls, but it would be easy to put them in communication with those of Manicouagan by a tramway or railway.

The forest along this river, whose length is 300 miles, equals that of Manicouagan. There is chiefly an abundance of pulp wood. According to the official explorers, two cords per acre could be obtained which would represent a total of 9,400,000 cords.

Manicouagan River.—This is one of the largest rivers on the north shore of the St. Lawrence, which call more than ever for the attention of the manufacturers.

Its length is 350 miles and it is broken by numerous cascades. It is 205 miles from Quebec.

The height of the first falls, 12 miles from the mouth of the river, is 85 feet and, from the estimate made, these fine falls could produce a motive power of 331,000 horse-power.

On the other hand, the capacity of the second falls is estimated at more than 500,000 horse-power, and that of the third falls, 65 miles from the sea, at 265,000 horse-power.

The experts also found that it would be comparatively easy to utilize these immense water-powers.

In 1906, a French syndicate leased the first falls, but has not yet begun to utilize them.

It is worth noting that the forest of the region, which is almost inexhaustible, consists of various kinds of trees : white birch, white spruce, aspen, black spruce, poplar, balsam fir, balm of Gilead, black and yellow birch, banksian pine, white pine, etc.

Pentecost River.—This river, fed by the waters of a number of small lakes, is 300 miles from Quebec and 9 miles from Egg Island.

At its entrance there is a safe harbor for small craft .

The river has two important cascades between its mouth and lake Misticipiu.

A fairly large village has arisen here in connection with the lumbering operations on the river.

At present, the timber limits on both sides of the river are operated by the Pentecost Lumber Company.

Rivière des Rochers.—About 20 miles from the Pentecost river. Its length is a little over 150 miles and it falls into the sea by a series of falls whose height varies between 20 and 80 feet.

The water-powers supplied by these falls have been for some years the property of Messrs Mossom Boyd & Company, of Ontario, but they are not yet utilized.

Marguerite River.—287 miles from Quebec and 11 miles to the west of the village of Seven Islands.

It is one of the fine rivers of the North Shore. It is navigable for schooners and bateaux to the first rapid.

One of the two cascades near its mouth is 75 feet high.

These water-powers have, since 1903, been the property of the North Shore Railway and Navigation Company which has put up an immense pulp-mill at the village of Seven Islands, costing nearly two million dollars.

The Marguerite river and its tributaries are timbered with white spruce of good quality and in large quantities.

Great Mecatina River.—This river, situate 578 miles from Quebec, flows through the Laurentian mountains and falls into the Gulf of St. Lawrence about 40 miles above the St. Augustin River.

It runs through 22 lakes and is broken, here and there, by cascades, some of which have a height of 50 feet.

Little Mecatina River.—The Little Mecatina river is about 100 miles long and in that distance are five or six very important cascades.

Manitou River.—This river falls into the St. Lawrence 350 miles from Quebec.

Two miles from its mouth, the waters of the river, whose volume is considerable, form a magnificent cascade 113 feet high. It is one of the finest water-falls of the whole North Shore.

It is also an excellent stream as regards merchantable timber. The territory is 50 miles long 5 in depth, well timbered with white spruce around the lakes and tributaries and along the river.

Thunder River.—376 miles from Quebec. It is navigable by canoes to nearly 40 miles from the falls. Experts consider that the cascades on this river are of importance as regards industry.

Mingan River.—Situate 390 miles from Quebec. It is one

of the fine rivers of the North Shore. It is navigable by canoes for a distance of 50 miles.

Its many falls give excellent water-powers.

Romaine River.—The four falls on this river are really Niagaras on a small scale and can give all the power needed for manufacturing pulp and paper and for working the iron mines with which this territory is richly provided.

Hamilton River.—This river, which falls into the Atlantic Ocean, forms the dividing line between the north of the Province of Quebec and the immense territory of Ungava which is shortly to be annexed to our Province.

It is about 700 miles long and its falls are the most majestic and considerable in all America. According to Mr. Low, of the Geological Survey of Canada, the waters of the Great Falls of the Hamilton river drop in a straight line from a height of 312 feet while the series of falls at that spot have a height of 700 feet. Mr. Low estimates that this immense cataract, far more powerful than Niagara whose reputation is world-wide, can furnish a motive power of nine million horse-power. (1)

ABITIBI REGION

The recent and merely partial exploration of this region of Northern Quebec has shown that we possess there sources of wealth that were practically unknown and water-powers beyond calculation capable of putting the largest industries of the world in motion.

Everybody is already aware that the whole of the northern portion of Quebec is watered by very considerable rivers, such as the Nottaway, Rupert, East Main etc.

According to the measurements made by Mr. O'Sullivan, C.E., the flow of the Nottaway is 4,000,000 cubic feet of water per minute and that of the Rupert 3,000,000. Moreover, the Nottaway is 400 miles long and in many places near its mouth it is about a league wide.

The Rupert flows from the Mistassini lakes, waters a valley of 1,150 square miles and falls into James Bay at the end of a course of over 275 miles.

The East Main river, over 450 miles long, falls into James Bay to the west.

Nottaway River.—Let us return to the Nottaway, which will probably be one of the first to attract the attention of the manu-

(1) A small map has been made on which are shown, in colours, the principal sources of power on our rivers. A copy of this map may be obtained on application to the Department of Lands and Forests at Quebec.

facturing world when railways run through the vast territory it waters.

On the first sixty miles from its source on the height of land, there are several water-powers of a capacity of from 250 to 750 horse-power, and, 10 miles lower down, at Flower Hill portage, are cataracts 66 feet high ending with a perpendicular fall of 14 feet, the whole having a capacity of 30,000 horse-power. Ten miles below, the *Kiask Sibi* falls, 30 feet high, can produce 13,000 horse-power and, a couple of miles further, there is another water-power of a capacity of 4,000 horse-power. The tributary of Gull lake, about 135 miles from the height of land, would, with a single dam, supply 85,000 horse-power. Starting from lake Mattagami, the Nottaway, with its falls and great cascades, could supply the following water-powers: at 150 miles from the height of land, 50,000 horse-power; at 175 miles, 106,000 horse-power; at 200 miles, 275,000 horse-power; at 230 miles, 400,000 horse-power.

To sum up, over a distance of 100 miles, the Nottaway can supply an aggregate power which it would not be rash to estimate at one million horse-power.

Rupert River.—The water-powers of the Rupert river are no less considerable. Thus, the Smoky Hill falls, at the head of tide-water, are 50 feet high and have a capacity of 300,000 horse-power. On the next 50 miles, as one ascends the river, the capacity of the chief water-powers is as follows: Portage du Chat falls, 74 feet high, 419,025 horse-power; Quatre Portages falls, one 63 feet high, 340,000 horse-power; one 80 feet high, 453,000 horse-power; one 32 feet high, 175,000 horse-power; 20 miles higher the Oatmeal Portage falls, 18 feet high, 100,000 horse-power; 20 miles higher still, a fall of 60 feet, 339,813 horse-power. These seven water-powers, scattered over a distance of 50 miles, represent an aggregate capacity of over two million horse-power.

On the East Main, which flows parallel to the Rupert, some 50 miles further north, there are also water-powers of considerable capacity.

Speaking of these three immense rivers, Mr. J. C. Langelier in his pamphlet intitled: "*The Forest Wealth of the Province of Quebec*," observes that at the south-eastern extremity of James Bay and within a radius of a hundred miles, there are water-powers capable of supplying manufactories with motive power exceeding four million horse-power.

It is almost needless to add that all these rivers in the northern region of the Province water immense territories rich in mines and forests.



