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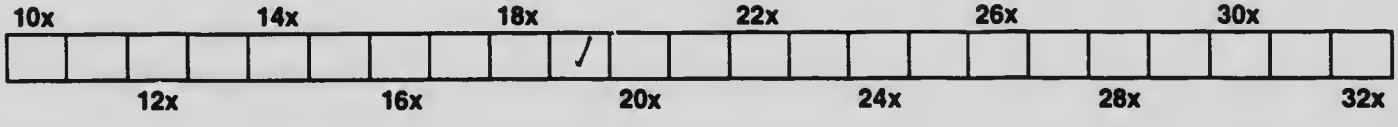

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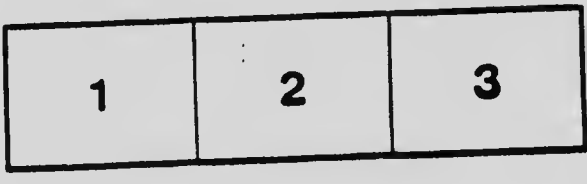

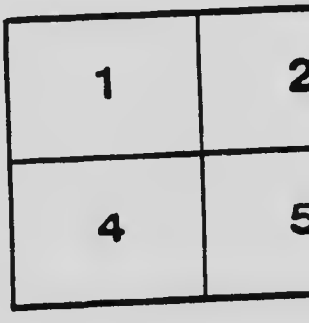

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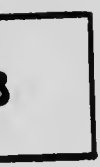

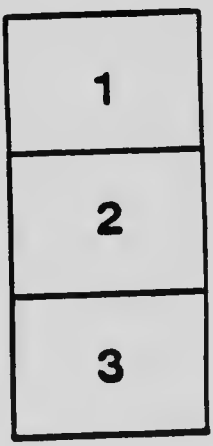

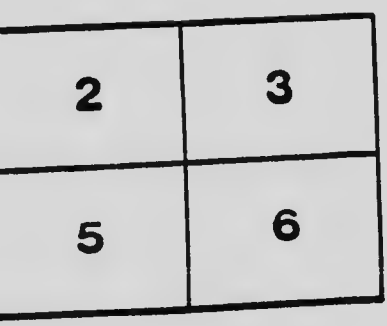

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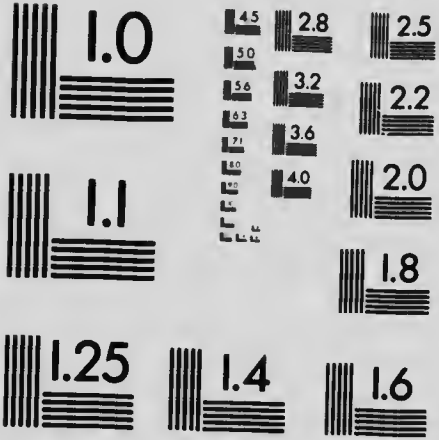

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THE FOREST WEALTH OF CANADA.

LOUISIANA PURCHASE EXPOSITION

1904.

PULP WOOD OF CANADA

BY

GEORGE JOHNSON, D.C.L., F.S.S. (HON.)

STATISTICIAN

DEPARTMENT OF AGRICULTURE, OTTAWA

PRINTED BY DIRECTION OF THE

MINISTER OF AGRICULTURE

1904.

Pulp Wood and Wood Pulp in Canada

BY GEORGE JOHNSON, F.S.S. (Hon.)

EGYPT AND CANADA.—The first was the land of the early paper plant; the second is the country of the latest paper tree.

Egypt was the land of the papyrus, from which the ancient dwellers on the banks of the Nile obtained the material on which to write those well nigh imperishable records which, three thousand years after they were stored away, have been produced from their hiding places looking as fresh with their cuttle-fish ink as though indited but yesterday.

The Papyrus, "the paper-reed of the brook," gave us the name "paper." The word "library" in English, and the French word "libraire," preserve for us the record of the fact that books were once formed of the bark (liber) of trees. The French word "livre" traces its origin to the same source. The English word "book" comes from the Anglo-Saxon word "boc," the beech tree; and was so denoted because the early Anglo-Saxons, like the other Teutonic tribes, used the bark and wood of that tree for writing material.

In modern times we have reverted to the ways of our ancestors and have gone back to the arboreal growth for the supply of paper to meet the world's marvellous demands.

The banks of the Nile were the early store-house of the paper supply. The beech groves of Germany and of England succeeded Egypt. Then towards the close of the 19th century came the opening up of the Canadian spruce forests.

The slopes of the St. Lawrence, the St. Maurice, the Ottawa, the St. John, the Ste. Marie, the Fraser and the Qu'Appelle rivers are substituted for the Nile and the rivers of Europe. The eyes of commerce turn to the New World with confidence that there need not be a famine of paper while the spruce flourishes in Canada.

The centuries of the Pyramid-builders and the 20th century—the latest born—salute each other within the shades of Canadian forests.

Through the experiments of a student, working in the quiet of a German laboratory, untold millions have been added to the wealth of Canada.

The Cinderella of the forest trees of Canada takes rank with the best of her sisters and becomes the idol of popular interest, scattering largess among thousands of toilers.*

At what time in the world's history paper began to be used is a question surrounded with obscurity.

The Chinese appear to have employed the wood of the cotton plant reduced to a pulp in the manufacture of their paper. The first rude efforts in other parts of Asia to secure a material suitable for the purposes of man, as a record of his thoughts and transactions, can be traced beyond the Christian era back to the second century, B.C.

When the Arabs captured Samarcand, 704 A.D., they found the people skilled in the manufacture of paper from cotton and, learning the art, rapidly disseminated the knowledge throughout their empire.

The product of their skill thus acquired from the E[illegible] became known as Charta—a specially fine quality being called Charta Damascena, from the fact of the best equipped factories being in operation in Damascus.

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* The Shawinigan Water and Power Company is but a few years old, but it has built up a prosperous village of 5,000 people where no one ever dreamed of living six years ago.

In Egypt there had been for many years a paper manufactured from papyrus, a member of the vegetable world which, like the palm, was employed for a great variety of purposes. From the stem of the papyrus were made boats, sails, mats, cloth, cords and paper. The pith was used for food. Sandals were made out of a material provided by the papyrus. The seams of ships were caulked with a tow made from it.

But the Asiatic plan of making paper from cotton seems to have spread all along the northern shores of Europe, to Greece, to Italy and to have been carried by the Moors to Spain.

As the industry went further and further afield from the home of the cotton plant, the ingenuity of man sought out other material from which to make the paper. In some cases a fair paper was produced by the mixture of woollen rags with the original material. Linen rags were added in countries where the flax plant flourished.

By the 14th century paper-making had become a recognized European industry.

At first Italy became the centre of the paper-making industry. Then Germany began to build factories after 1390, A.D. France secured her knowledge of paper-making from Spain late in the 13th century; the early paper being made of cotton.

By the 14th century paper was not uncommon in England.

At first paper was made entirely by hand. Then, as in the history of most manufactures, machinery was invented for the more rapid preparation; then came the division into writing paper, printing paper and wrapping paper, cotton rags being still the chief source of the material from which paper was made.

The demand becoming greater than the supply, the wit of man became actively engaged in finding material from other plants possessed of the necessary fibre. The cotton plant, the papyrus and the palm,

flax and some other members of the vegetable kingdom had been employed. But still the demands for paper were inexorable and constantly enlarging.

Every zone was searched for suitable material. It was thought that in Esparto grass the requisite material had been discovered,and for years Esparto, treated after a somewhat similar fashion as rags, was extensively used.

The tenacity of fibre and flexibility of the leaves have led to their use for centuries for making ropes, sandals, baskets and ships' cables, and because they contain 56 per cent. by weight of fibre, or ten per cent. more than straw, they came into requisition as a substitute for linen rags in the manufacture of paper. About 200,000 tons of the fibre have been imported yearly into Great Britain during the past fifteen years, and its use continues to be maintained at about that rate, without, however, showing any tendency to increase.

Straw, de gras from Northern Africa, the leaves of the dwarf palm, sugar cane refuse, the stalks of the hop plant, nettles, the American thistle, peat and other articles have been successively or simultaneously experimented with in the hope of securing an ideal paper.

Bamboo cane has also been made the subject of experimentation.

Naturally those who were in search of a good material for the manufacture of fibre, reverting to the early employment of the palm tree for the purpose, began to experiment on other wood fibres.

In the year 1845, Keller took out a patent in Saxony for a process of manufacturing paper from ground wood. Before that date its pre-industrial history is known only to the chemist. After that date many improvements were made in the machinery and methods used in grinding, the main object being to produce a longer and finer fibre.

Business men soon began to realize that the

students were on the right track. The chemists, thus encouraged, made a series of experiments to ascertain the best commercial way of reducing wood to a fibre capable of being made into paper. As a result of their investigations two methods have been selected (1) mechanical treatment and (2) chemical treatment.

Practically by the mechanical treatment, which consists of grinding up the wood under water, a pulp has been obtained which answers for the inferior kind of paper.

But something more was wanted. Mechanical pulp is used chiefly as an adjunct in the manufacture of news and wall papers and printings, but there are several distinct classes of paper made from mechanical pulp without any other ingredient. Woodpulp boards are also made from mechanical pulp chiefly for the purpose of making paper boxes.

The rapid development of railways and telegraphs; the spread of education; exciting events on this continent, such as the civil war in the United States of North America, combined to create an enormous demand for news, and led to the establishment of many newspapers. The growth of the literary taste led to the development of book-making. In Canada, during the past 16 years, the number of newspapers increased from 644 in 1885, to 1,251 in 1900, and the daily newspapers from 71 to 121, with a circulation in the aggregate proportionately greatly in advance of the increase in the numbers.

The same development, or one nearly equal to the Canadian, taking place in other countries on this continent and in Europe, led to a very enlarged demand for paper, and soon paper-makers found it impossible to meet the ever-increasing demand. Rags, cotton waste, straw, esparto and all the other articles tried and used together were not sufficient. Nor did the price suit. Out of the necessity of the time came the development of the chemical processes

by which a good and cheap paper was evolved. Wood paper suited for most requirements was in fact invented.

Chemical pulp is used as an adjunct with esparto, rags or mechanical pulp in the manufacture of news, printing, colours and some kinds of wrapping paper.

By combining chemical pulp and mechanical pulp in the proportion of about 30 or 40 per cent. of the former a good paper results such as can be used with success for most of the purposes for which paper is needed.

But complete success had not even yet been reached. The practical operations connected with the manufacture of pulp from wood by the caustic soda process—such as barking, sawing, chopping, crushing, boiling or digesting, washing and bleaching and soda recovery—had not, even in combination with pulp partly made of rags, etc., produced the ideal paper.

The world was ransacked for the proper wood. All the earlier efforts at wood-pulp making had been confined to pine wood and to poplar wood. Experiments were also made with the wood of the willow, bass, cedar, hemlock, maple and birch. Experiments were further made with trees of various ages, and in this respect it was found that for chemical pulp trees on an average of 20 years old were the best, the younger growth producing fibre of inferior quality.

The different kinds of wood suitable for the manufacture of pulp are white and black spruce, Canada balsam, poplar, aspen and pine; spruce and balsam being the most valuable on account of their colour. These comparatively soft woods are easily ground. Poplar and aspen have the same quality but they are faulty on account of knots and black veins which spoil the colour of the paper. Pine, which, in the earlier stages of the development of the wood-

pulp, was used in far the greatest proportion, is now used only in the manufacture of chemical pulp. It gives a good pulp but the process required to bleach is somewhat expensive. Besides the wood is too high-priced to be used profitably in the manufacture of paper. With the low rates that have ruled for paper for some years pulp manufacturers require wood of small value if it can be obtained without the sacrifice of length of fibre.

When, therefore, the chemist hit upon spruce and balsam and found them suitable in every respect for the production of the ideal cheap paper, and commercial men realized that these woods were comparatively cheap, quick of growth and well located for the needs of commerce—the world knew that at length, after all the centuries of seeking, the right paper, meeting all requirements, had been invented.

It was soon learned that the material could be utilized for the manufacture of many other articles besides paper of various kinds, such as news, printing, writing, wrapping, millboard, etc. Among these are pails, dishes and other hollow ware, paper parchment, cotton wool for hospital dressings, cotton yarn and cloth, silk yarn and fabrics, cigar boxes, medals, cornices, panels and other architectural details, picture frames, car wheels, steam pipes, telegraph poles, electric conduits, roofing material, coffins, boats, cigar holders, carpets, mattresses, lead pencils, artificial straw, shoe heels, vases and ornaments, furniture, horse-shoes, spools and bobbins, tool-handles, buttons, cycle bar handles, fruit cans, hats, pinions for machinery, pulleys, letters for signs, substitutes for building stones and for boards, piano cases, tiles, paving bricks, fibre chamois, etc. It has also been used for encasing broken arms and legs.

It was only necessary to find the land which had the best spruce and the best facilities for the production of the most profitable pulp, which at the same time filled the requirements of pulp users.

The land of the spruce tree, as of the pine, is Canada. In acordance with a great law of the vegetable kingdom that plants and trees attain their greatest excellence along the northern limit of their growth, the spruce of Canada was, naturally enough, believed to be the best. Experiments proved the belief to be sound.

The quality has been tested by the severest tests. The United States of North America have large spruce forests and a very large demand for wood pulp. The United States paper manufacturers have found it profitable to come to Canada for the wood, and in 1903 imported from Canada over $3,354,000 worth of wood pulp and pulp wood.

In competition with the Scandinavian stores of woods, Canada in 1903 sent to Great Britain $1,129,000 worth of wood pulp.

The latest advices are that an immense trade with Europe in pulp and paper is in sight.

Mr. John Macfarlane, of the Canada Paper Co., reports, as the result of his observations in England and Europe recently, that Great Britain and the Continent form a market that will stand at least half a million tons of Canadian pulp per annum.

The arrangements made in Canada indicate the development that practical men foresee to be probable.

In the Census of 1871 pulp mills were not mentioned. In 1881 and 1891 the Census returns showed the following pulp mills:

Year	No.	Capital Invested	Employees No.	Output
1881	5	$ 92,000	68	$ 63,000
1891	24	2,900,910	1,025	1,057,810
1901	25	11,555,560	3,177	4,246,781

Since 1901 the increase has been still more rapid, and during the past year or two it has been difficult to keep track of the new enterprises begun and of the old establishments enlarged.

The following is a list of pulp and fibre mills in Canada with a total capacity of about 1250 tons per diem. The largest has a capacity of 250 tons in each 24 hours and the second largest a capacity of 170 tons. The others range from 100 to 10 tons capacity. In addition to these there are six large establishments not in operation yet, construction not completed ; last year two of the best were not worked.

PULP AND FIBRE MILLS IN CANADA.

MILL OR COMPANY.	POST OFFICE ADDRESS.	KIND.
Toronto Paper Mill	Cornwall ..Ont.	Sulphite fibre.
Trent River Paper Co.	Frankford "	Mechanical.
Georgetown Paper Mill	Georgetown "	Soda Fibre.
Riordan Mill, Ltd.	Hawkesbury "	Sulphite Fibre.
Riordan Mill	Merriton "	Sulphite fibre and mechanical.
Sault Ste. Marie Mill	Sault Ste. Marie "	Sulphite and mechanical.
Glen Miller "	Glen Miller "	Mechanical.
Thorold "	Thorold, and Niagara Falls "	Mechanical.
Sturgeon Falls "	Sturgeon Falls "	Dry pulp.
Chicoutimi Pulp "	49 Rue Desjardins, Quebec, Q.	Mechanical.
Royal Paper "	763 Craig St. ..Montreal	Soda pulp,
Canada Paper Co., Limited	Windsor Mills ..Que.	Soda fibre and mechanical.
Laurentide Pulp Co.	Grand-Mere "	Sulphite fibre and mechanical.
E. B. Eddy Co., Paper Mill	Hull "	Sulphite fibre and mechanical.
Chatham Pulp "	Lachute "	Mechanical.
Lake Megantic "	Lake Megantic "	Mechanical.
Imperial Paper Mills of Canada, Ltd.	Sturgeon Falls ..Ont.	Mechanical.
Jonquiere Pulp Co.	Jonquiere ..Que.	Mechanical.
Price, Porrett Pulp & Paper Co.	Rimouski "	Mechanical.
Brompton Pulp & Paper Co.	Brompton Falls "	Mechanical.
Ouatchouan Mills	Ouatchouan Falls "	Mechanical.
St. George's Pulp Mill	St. George ..N. B.	Mechanical.

PULP AND FIBRE MILLS IN CANADA.(*Continued.*)

Mill or Company.	Post Office Address.	Kind.
Fraserville Co.	Fraserville ..Que.	Mechanical.
Nicolet Falls Pulp Mills	Nicolet Falls ..Que.	Mechanical.
Riviere du Loup Pulp Co.	Fraserville "	Mechanical.
Dominion Paper Mill	134 McGill St. ..Montreal	Chemical fibre.
Florentine Soucy "	Old Lake Road ..Que.	Mechanical.
Jacques Cartier Pulp Co.	Canada Life Building, Montreal "	Mechanical.
J. C. Wilson & Co.	St. Jerome "	Mechanical.
St. Raymond Co.	Montreal "	Dry Pulp.
Dominion Pulp Co., Ltd.	Chatham ..N.B.	Sulphite fibre.
St. John Sulphite Fibre Co.	St. John "	Sulphite fibre.
Cushing Sulphite Fibre Co.	St. John "	Sulphite fibre.
St. Croix Paper Co.	Halifax ..N.S.	Mechanical.
Nova Scotia Wood Pulp Co.	Mill Village "	Mechanical.
Acadie Pulp Mill Co.	Halifax "	Mechanical.
Sissiboo Falls Paper Co.	Weymouth "	Mechanical.
Belgo Paper & Pulp Co.	Shawenegan Falls..Que.	Mechanical.
Peribonka Pulp Mills	Roberval "	Mechanical.
St. Raymond Co., Ltd.	Montreal "	Mechanical.
Metabetchouan Pulp Co.	216 Paul St., Quebec "	Mechanical.
Jas, MacLaren & Co.	Buckingham "	Mechanical.
Jas. Stutt	West Flamboro "	Mechanical.
J. R. Booth	Ottawa..Ont	Mechanical.

The amount of capital invested, or to be invested in the near future, is between fifteen and twenty million dollars.

At present about one-fourth of the output is sulphite, or soda, pulp, and three-fourths mechanical pulp.

This development has taken place not only because it has been demonstrated that Canadian spruce is the very best quality for the purpose, but also because Canada is the possessor of the largest spruce forests in the world, and, in addition to quantity and quality of material, possesses advantages in the wide distribution of water power and in the conditions of the labour market, all of which, combined, give her undoubted pre-eminence for the production of paper.

In Canada there is practically an unlimited supply of wood suitable for pulp of the highest character.

The area of Canada upon which the spruce grows is also conterminous with the geographical boundaries.

Far east, the spruce grows along the shores of Hamilton Inlet and the northern shores of the Gulf of St. Lawrence. Far north, around Ungava Bay, and far north-west in Coronation Gulf, and to the mouth of Mackenzie River, the spruce matures and arrives at good size. Far west, along the fiords of British Columbia, spruce abounds, increasing in quantity as one goes north, and the Douglas fir, a good pulp wood standing midway between the spruce and the balsam, is widely distributed towering 250 feet in the air and having a base of from 30 to 50 feet.

The extent of the forests of Canada is only beginning to be viewed in its true proportion, even by the people of Canada.

In 1887 Hon. Sir Henri Joly de Lotbiniere made a report to the Minister of Agriculture, on the forests of Canada. In it he says:

"Let us try and make an inventory of the timber resources of the Dominion, beginning in the West. On the Pacific shores of the Dominion, in British Columbia, the bountiful gifts of Providence are still stored up for us, and the forests have been scarcely attacked by the lumberman.

"The great forest of Canada, *par excellence*, is spread over that vast territory watered by the Ottawa, the St. Maurice, the Saguenay and their tributories, over 100,000 square miles in extent. Other timber limits are found in the Georgian Bay country, the Muskoka and Nipissing regions; the Eastern Townships and the south shore of the St. Lawrence to the Gulf; the region on the north shore of the St. Lawrence from the Saguenay to the Betsiamis, and perhaps still lower down as far as Mingan, and the country watered by the St. John, the Miramichi, the Restigouche and their tributaries .. .. These timber limits contain an immense supply of spruce."

The Federal Government, and the several provincial governments, employ agents, principally surveyors, well qualified to report on the condition of the land and the forest growth. A great body of these reports has accumulated, and, from these, pages by the score could be supplied to show how widespread is the spruce in Canada. It must be added that heretofore in Canada pine has been the king, and the search has been rather for pine than for spruce. The acknowledged superiority of the Canadian spruce for pulp has raised spruce to an equality with pine in the estimation of commerce and trade. But, even when all eyes were centered upon the discovery of pine, it was impossible to avoid reference to the abundance of spruce.

In the province of Ontario, north of Lake Nipissing, the surveyors, though specially charged to look for pine, were compelled by the great abun-

dance of spruce to make constant mention of it. Wherever other woods were but partial in the area upon which they grew, and were, therefore, frequently omitted in the enumeration of the trees, spruce is general. Thus, in Blezard township, Nipissing District, the surveyor reports,—"Well timbered with spruce, tamarac, birch, balsam, poplar, cedar, maple, in order named." Of 150 reports examined in connection with the forest wealth of the northern part of the province of Ontario, the greater number refer to the surprising extent and value of the spruce growth, though the primary object of the reports was to discover the extent and value of pine preserves of the province. Thus Borron, in the narrative of his explorations of Hudson Bay basin (1881), says:—"The timber consists of spruce, aspen, poplar, tamarac and white birch chiefly. Of these the spruce is the most valuable. . . . . .The largest trees are about seven feet in circumference." Lyon, in his report of lands in the Rainy River district, says:—"The whole of the country is covered with timber with the exception of spots where it has been burnt. The timber is chiefly poplar, spruce, oak, elm, basswood, cedar, white pine, red pine, jack pine, tamarac and birch."

The Dominion surveyors' reports give evidence of the same desire to discover pine, but these, as those of the provincial land surveyors, describe the abundance of spruce.

The reports of the Geological Survey contain much information on this subject. Thus, in the exploration of Rainy River region, 1887-88, the following is the report: "It cannot be called a pine country though there is some in spots; the prevailing timber is spruce, cedar, tamarac, balsam and hard woods."

In the Province of Quebec over ninety reports of land surveyors—made before the great discovery that spruce was *par excellence* the wood for paper pulp—have been examined. These corroborate the

conclusions of the surveyors of Ontario. Thus of Bras du Nord of River Ste. Anne and tributaries, the surveyor says:—"The spruce is of greater quantity than other kinds of timber;" of Bay Lake, Ottawa County, the surveyor says:—"Abundance of white and red pine and spruce." Other surveyors report "mechanical spruce," "white and black spruce," "chiefly spruce," "good spruce," over a wide extent of country.

The officers of the Geological Survey report, for the regions under Federal control, that black and white spruce abound. A. P. Low says of James Bay:—"The coast and inner islands of James Bay are covered with thick growths of small black spruce and larch, along with white spruce, balsam, fir, aspen, poplar and white birch." Even in northern regions, though the trees become dwarfed, yet black spruce holds its own with tenacious grip. Along the outer coast, in the vicinity of Richmond Gulf, he says stunted black spruce and larch grow in clumps in the low protected gullies, but around the margin of the lakes the trees grow thickly everywhere, and on its eastern side they rise nearly to the summit of the hills, showing that the climate is more moderate away from the cold waters of the Hudson Bay."

Richmond Gulf, or "Gulf Lake," as it is sometimes called, is on the east side of Hudson Bay, slightly south of the bottom of Ungava Bay. Mr. Low's statement that spruce grows abundantly in the neighbourhood of this lake is conclusive as to the growth all over the great peninsula between the Atlantic Ocean and Hudson and James Bay. The conditions have not changed since 1610, when Henry Hudson, trying to bring the natives to friendly terms, found his efforts frustrated by the Indians setting fire to the woods and placing between him and them a zone of fire.

In the course of a lecture recently delivered, Mr.

A. P. Low, of the Geological Survey, described Labrador as a section of Canada a thousand miles long and about the same in width—thus comprising an area larger than Great Britain, France and Germany combined. Of this region enormous tracts of pine and spruce covered the country.

Dr. Robert Bell, Acting Director of the Geological Survey, says:—"Spruce timber begins to be met with, according to all accounts, about 30 miles to the westward of the Hudson Bay Company's post at Nachvak. To the westward of Nachvak, the northern limit of spruce, according to Capt. William Kennedy, reaches the shore of Ungava Bay, north of the George River. On the western side of this bay, the Eskimo informed me, it begins to be found in the Bay of Hope's Advance, or five day's journey southeastward of Cape Prince of Wales on the south side of Hudson Strait, and that in this neighbourhood it was found further north in the interior than on the coast."

Dr. Bell further says:—"On the east main coast of the Hudson Bay the northern limit of the spruce was found to be a few miles north of Richmond Gulf, but it was reported to extend much further north at a distance inland from this coast. On the west side of the bay it was seen in considerable quantities all along the coast from Cape Churchill to Buttons Bay; and Mr. George McTavish, who has made several coasting voyages to the north and who at my request has kindly made observations and collected information from the natives in regard to the distribution of timber, informs me that it (spruce) leaves the shore about 20 miles beyond Seal Island He was told by the Eskimo of these parts, who travel a great deal in the interior, that spruce timber begins to be met with at two days, say 55 miles west of the mouth of Big River, and that it is considerable further inland opposite to Eskimo Point,

which is about in latitude 61° 40′ North. From this neighbourhood it runs west, north westward and crosses the Coppermine River about 20 miles from its mouth and thence reaches nearly to the Mackenzie River." This testimony corroborates the statements of Messrs. Simpson & Dease and Richardson and other early explorers of the northern littoral of Canada who report the presence of good-sized spruce trees.

In the Province of New Brunswick there are several pulp mills of considerable capacity, in the aggregate amounting to about 140 tons per diem. Mr. Chalmers, of the Geological Survey, began an examination of the province in 1882. During the intervening years he has studied that section of Canada with care. The result, so far as the flora of the province is concerned, is of the most satisfactory character. In his first report he says:—"The black spruce is probably the most abundant tree in the district." (North-west New Brunswick.)

In the report of 1885, taking in the whole province, he says:—"The chief trees are white spruce, balsam fir, &c., on the more elevated and drier grounds, and on the swampy grounds we find spruce fir, white birch, poplar and white cedar in abundance." In later reports Mr. Chalmers tells of the rapidity with which the second growth of spruce covers the sections of the country upon which the forces of destruction have exercised their most powerful influence. Without any care, without any forestal supervision, nature unaided, not given even fair play, has been able to carry on the process of reproduction so successfully as to create an equilibrium.

In the Province of Nova Scotia the comparatively greater degree of moisture stimulates the growth of the forest, so that though the demands have been made during a longer period and to a larger extent than in some other portions, the spruce still abounds

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and pulp manufacturers have set up four or five mills for the production of pulp.

From an investigation made in 1894 it appeared that from 38 to 40 per cent. of Canada consists of woodland and forests. This is about 1,400,000 square miles. If one-half of this area is spruce there will be about 450,000,000 acres of spruce area in Canada. In the manufacture of newspaper wood pulp according to present methods, a cord of spruce wood is estimated to equal 650 feet of board measure, and this quantity of raw material will make half a ton of sulphite pulp or one ton of ground wood pulp. Newspaper stock is made up with 20 per cent. of the sulphite pulp and 80 per cent. of the ground wood pulp. Now, as figured by experts, the best of spruce land possesses a stand of about 7,000 feet to the acre. This is equal to 6 tons of sulphite and 11½ tons of ground wood-pulp per acre.

Taking ground wood pulp as the basis and 10 tons per acre as the product, there are 4,500,000,000 tons of wood pulp in sight in Canada.*

Great Britain and the United States consume yearly about 900,000 tons of pulp wood—which is the product of about 90,000 acres of spruce woodland to be denuded of its spruce every year to supply the demand of these two countries. At the rate it would take 5,000 years to destroy the present existing spruce crop. But spruce reproduces itself, to the sizes best suited for pulp, in 30 years. As the first 90,000 acres cut over would have 5000 years to reproduce the second growth, it is evident that the spruce forests of Canada can stand all demands upon them without fear or total deprivation in the lapse of time.

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*In paper read before a number of persons interested in forestry, Dr. Bell, Assistant Director of the Geological Survey, estimates the area of the northern forest of Canada at 1,657,600,000 acres. This, he calculates, would yield 16,500,000,000 cords of spruce. The estimate in the text is therefore a very conservative one. (See Appendix A.)

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Experts, in order to indicate the great area in Canada occupied by the spruce as its habitat, have declared that in Canada an area equal to that of England could be cut over every year and still the reproductive powers of the spruce would maintain the equilibrium of demand and supply. There may be exaggeration in this statement but it fairly enough gives expression to the immensity of the area fitted for the growth of spruce.

In the Province af Quebec it is estimated that there are 200,000,000 acres of timber limits mostly timbered with black spruce, the most valuable of all woods for pulp and paper purposes.

There is still another consideration of great importance in estimating the value of the wood-pulp industry. The black spruce is considered to be better than white for pulp. As the black spruce grows on the hills and rocky ground, while the white spruce loves the valleys of the streams and other situations where there is more soil, it follows that we have a much larger extent of black than of white spruce forest.

The premier of the province recently stated that in 1892 spruce limits were sold for about $8 per mile, while in the year 1899 the Government sold similar limits for $150 per mile, the price thus rising, under the pressure of demand, nearly 19 times what it was seven years before. It has risen still higher in later years.

The evidence of surveyors and of the officers of the Geological Survey has been adduced to show the area of spruce in Canada.

A few quotations from practical manufacturers will emphasize the statement already made respecting the quality.

The "Manufacturer," of Canada, says:—"It is a generally expressed opinion now among the paper makers that Canadian pulp is distinctly superior to

that made in Norway, and still more so compared with Swedish pulp. Much of that superiority is to be attributed to the nature of the wood itself; the fibre seems to mill better and is certainly of a tougher and finer texture."

During a recent visit to Canada one of the principal of the London publishers said:—"During the past ten years I have paid several visits to Canada. I have always held, as the outcome of my observations, that Canada must, through her enormous natural resources in regard to the paper trade, become in time one of the most important factors in paper manufacturing for the whole world. Our (English) paper makers have already begun to realize something in regard to what Canada can do for them; and the leading manufacturers in this particular line have demonstrated to their satisfaction that Canadian spruce makes a stronger sheet of newspaper than the Scandinavian varieties. It is certainly longer and stronger in fibre, which makes it a far better sheet for newspaper offices to print on with the rotary machinery..... Canada is destined to become, through its illimitable tracts of spruce and other woods, not only the foremost wood pulp-making nation, but the paper manufacturer of the world, more particularly of the lower grades, such as newspaper."

The Canadian Journal of Commerce says:—"Among the many spots throughout the Dominion which, owing to favourable water facilities or falls for the creation of electric power, have recently sprung into prominence, Shawenegan Falls, Que., is proving in no sense backward in the race. The Belgo Pulp & Paper Corporation of which Messrs. Edmond de Vialder and Herman Cortnet, of Brussels, are the principal shareholders, have just arranged, says a Quebec letter, to establish there a 100-ton ground pulp mill, a seventy-five-ton sulphite pulp mill and a

one-hundred-ton paper mill. Representatives have contracted with the Shawenegan Water & Power Company for 15,000 horse power of water, and land for the storage of the pulp-wood and for their numerous buildings. The Pulp & Paper Company have also purchased 700 square miles of spruce lands on the St. Maurice River, from which they will obtain an almost inexhaustible supply of pulpwood. The factory buildings of the Pittsburg Reduction Company, who are now establishing a plant at Shawenegan Falls, are nearing completion. It is probable that the third of the four large manufacturing concerns who have contracted for mill buildings and power to operate the same will commence work at Shawenegan Falls this season. These three industries have contracted for the use of over 30,000 horse power, which in that capacity brings this district next to Niagara Falls.

The establishment at Grand Mere, River St. Maurice, is on a large scale. The Laurentide Pulp Co. has invested over $3,000,000 in this establishment. The company employ in the rivers, woods and works over three thousand men. They have built in the very heart of the forest a town containing 5,000 souls; a modern village up to date in every respect, with water system, electric light, and well laid out streets.

Their timber limits cover an extent of 1800 square miles. The water power developed and used is about 16,000 horse power. The full water power at driest season of the year is 70,000 horse power.

The plant this company employs consists of the saw mill, the daily capacity of which is 160,000 feet, board measure; and a wood-preparing room in which the wood for the manufacture of ground wood pulp and sulphur pulp is stripped of its bark and prepared. In this room the company prepare daily 3,000 logs of an average length of thirteen or fourteen feet, and diameter of twelve inches.

The digester plant consists of a tower 160 feet high in which are tubes filled with limestone.

phur is burned in iron and brick retorts at the base of the tower. The fumes pass through long cooling tubes and then stream up through the limestone. The water, which is contained in tanks at the top of the tower, percolates through the limestone and meeting the sulphur fumes forms sulphurous acid which passes through pipes into large stone tanks and from there into digesters, these latter being filled with chips. The acid comes into contact with the chips—live steam is turned on and the mass is cooked. When sufficiently digested the cooked pulp is blown into a tank where it is washed with water to remove unnecessary acid. Other processes follow till the article is finished ready for shipment or for use in the various manufactures in which the company is engaged.

In addition to this chemical pulp the company, of which Sir William Van Horne, K.C.M.G., is president, have a good plant for the manufacture of mechanical pulp. The company estimate that their shipments for this year will exceed 40,000 tons.

In addition to the possession of such abundance of the right kinds of wood as will justify expenditure of the large fixed capital necessary for buildings and plants, water powers are needed. These have to be extensive, widely distributed and within easy distance of transportation facilities.

Brebeuf, one of the early Jesuit missionaries, leaving Three Rivers for Lake Huron by way of the Ottawa River, relates that during his journey he had to carry his canoe over thirty-five portages because of the rapids and cataracts encountered.

The hydrographic condition of the rivers the burly Jesuit traversed, in his bare feet, nearly three hundred years ago, remains the same to-day as then, and in each of these rapids and cataracts, which were a source of annoyance to the zealous pioneer, there is to-day a reserve of horse power calculated to delight

to an even greater degree the souls of those who seek locations for pulp mills and water power to drive the machinery, than these same rushing, roaring water falls disturbed Brebeuf's equanimity and put to severe test his philosophy and his religion.

The water falls, over which energy has been running to waste for centuries, at the command of science have had given them a value and a use that most vividly suggest the transformating power of chemic science.

LaSalle passed up the St. Lawrence River from Lachine and made his way by its great lakes to the Mississippi River. As his light canoe bore him on its broad bosom past wide prairies, over which countless herds of buffaloes grazed and nature, in her animal and vegetable life everywhere seen, proclaimed her vast prodigality, the adventurous Frenchman of the seventeenth century rejoiced because he believed his mission to be to call into light the hidden riches of the western land and to add to his own and the world's wealth. Long after LaSalle's time the student, macerating in his tubes different woods by various processes to meet the loud-voiced demand for the cheap newspaper, performed for civilization a service scarcely less meritorious when he discovered that in the spruce wood of Canadian forests there was the needed combination of strength, abundance and cheapness the world for years had been seeking.

To run a mill capable of producing 25 to 35 tons of ground pulp per diem requires a motive power of from 2,500 to 3,000 horse power. The generation of such motive power by means of steam is a costly matter, and experience has demonstrated that pulp can be manufactured profitably only in those places where power can be supplied by water.

A glance at the map will show that Canada is one of the best watered countries on the globe. Everywhere there is water, and from the geological character of the country water falls are abundant.

Thos. C. Keefer, C. E., C.M.G., in the course of a presidential address before the Royal Society of Canada, says:—"An examination of any good map of our broad Dominion, reveals, as its most striking feature, an extraordinarily wealthy and remarkably uninterrupted succession of lakes and rivers, suggestive of ample rainfall, the first great requisite in the occupation of any country. Over a length of several thousand miles, between Labrador and Alaska, and over a width of several hundred miles, there is an almost continuous distribution of lakes, lakelets and rivers; the lakes of varied outlines, dimensions and elevations above sea level, and many possessing facilities for the storage of their flood waters. In many places the outlet from the lake or the connection between a chain of lakes is a narrow cleft in rock where an inexpensive dam will hold back the water supplied by the winter's accumulation of snow."

With the exception of our prairie region, the rivers of Canada differ from those draining the western and central States of the United States of North America, in that they are not naturally navigable from their mouths or above tidal influence to any considerable extent, except in detached sections. The great rivers of the Mississippi, the Missouri and the Ohio, are navigable for thousands of miles and are, therefore, without water power. They flow upon a nearly uniform grade of a few inches per mile, while the St. Lawrence and its tributaries, and in fact all the great rivers of Canada, east and west, are interrupted by rapids, chutes and cataracts, affording a great variety, quantity and quality of water power.

From the Straits of Belle Isle to Montreal, and thence ascending the St. Lawrence, the tributaries of the St. Lawrence and of the Ottawa descend, through the Laurentian region, from elevations of 1,000 to 1,800 feet above tide. In many cases they bring their principal cataracts very near their outfall, notably in the case of the famous falls of Montmorency, which,

leaping directly into the St. Lawrence from a height of 250 feet, are utilized to supply power to a cotton mill not far from their base, and to light the streets and drive the tram cars of Quebec city ten miles distant.

A short time ago an examination was made by the Ottawa Board of Trade into the resources of the region tributary to Ottawa. Estimates were obtained from surveyors, engineers, mill owners and others possessing full knowledge. It was found that within a radius of fifty miles there was an available power of water equal to nearly 900,000 horse power, the Ottawa supplying 664,000 horse power, and its tributaries 226,225 horse power; those on the Ontario side contributing 40,000 horse power, and those on the Quebec side 186,225.

This estimate is based upon a low average of water obtainable throughout the year.

At the sources of the twelve or fourteen rivers, which together aggregate the 900,000 available horse power mentioned, are great lakes that can be converted, by the construction of retaining dams, into immense reservoirs, by means of which the power can be increased. Estimating the cost of electrical energy generated by steam on a basis of $25 per horse power, per annum, the employment of a force of 900,000 horses would involve an expenditure of $22,500,000. Estimating the cost of the same power evolved by water at $10 yearly the saving effected by the employment of the falls and rapids around Ottawa would be $14,500,000.

This power is all within such easy distance of the federal capital that it can be centred in Ottawa over a comparatively small number of miles of wire with a loss of only 8 to 10 per cent. in efficiency.

Mr. Surtees, C.E., who has investigated this question for the Ottawa River, gives the following

information of the capacity of this river and its tributaries to supply power:—

ABOVE THE CITY OF OTTAWA.

	Horse Power
Great Chaudiere, Ottawa City (not in use)	35,000
Little Chaudiere	25,000
Deschenes and Britannia	15,000
Chats Falls	141,000
Portage du Fort	49,000
Mountain Chute	62,000
Grand Calumet	186,000
Coulonge River	24,120
Black River	21,000

MISSISSIPPI RIVER.

	Horse Power
Galetta	1,800
Pakenham	900
Blackeney	1,080
Rosamond's Rapids	720
Almonte	3,000
Appleton	540
Carleton Place	1,000
Innisville	540

MADAWASKA RIVER.

	Horse Power
Arnprior Rapids	1,400
Burnstown	1,400
Springton Rapids	1,120
Calabogne Lake	3,640
Madawaska High Falls	10,360

BONNECHERE RIVER.

	Horse Power
Castleford Rapids	1,120
Renfrew and Douglas	2,000
Quyon River	80

TRIBUTARIES BELOW THE CITY.

GATINEAU RIVER.

	Horse Power
Farmer's Rapids	24,500
Chelsea Mills	47,790
Eaton's Chute	24,508
Cascades	14,000
Wakefield	12,000
Paugan Falls	73,500
Péche	375
Petite Nation River	1,600
Blanche River	1,600
Priests Creek	240
Little Blanche River	250
Clay Creek	120

RIVIERE DU LIEVRE.

	Horse Power
Buckingham	9,000
Rheaume Falls	4,000
Dufferin Falls	12,500
Upper Falls	12,500
Little Rapids	500
Cascades	2,000
High Falls	36,000

These figures give a total of 589,320 horse power above the city of Ottawa and 269,683 horse power below the city, all of which is at present unused—the total in use being 58,400, giving a grand total of 917,403 horse power.

This estimate, as has been stated, is for water power within a radius of 50 miles of the city.

Beyond that no detailed estimate has been provided. Mr. Andrew Bell has estimated the aggregate water power available between Ottawa and Mattawa (200 miles) at 1,476,000 horse power

The engineers of the projected Montreal and Ottawa and Georgian Bay Canal estimate the water power developed along the route of the canal at 700,000 horse power.

On Sturgeon River emptying into Nipissing Lake, and, therefore, tributary to the projected canal, the power available at Sturgeon Falls, Smoky Falls, and one or two other points, is approximately 50,000 horse power, part of it being utilized by the Imperial Paper Company, already mentioned.

On the Montreal River there is a 150 feet fall within the first three miles, and a 180 feet of a fall in the distance to Lake Temagami.

All this immense reservoir of power is included in 300 miles of a river which is over 600 miles long.

Still further, the building of the dams proposed in connection with the Montreal, Ottawa and Georgian Bay Canal, it is calculated will increase the power between Sturgeon Falls and Montreal by 500,000 horse power—which is equal to the amount developed on the United States side of Niagara Falls.

Take another locality. The deep and sombre River Saguenay acts as the drain of Lake St. John. This lake is fed by many rivers and streams. These are fine reservoirs of power. Beginning on the east side the Peribonka River is navigable for a dozen miles from the lake. Then come the Grand Chutes. For five or six miles the water of the Peribonka rush through these chutes by a series of water falls capable of supplying 300,000 horse power, which can all be harnessed to do the world's work at an expenditure of a comparatively small sum of money—comparatively, that is to the cost required to secure the force utilized at Niagara Falls of but one-sixth of the horse power capable of being employed in the falls of Peribonka River.

The Mistassini River is another of the feeders of Lake St. John. On it, within 24 miles from the lake,

there are two falls not far from each other. These taken together can supply a force of 45,000 horse power.

One of the affluents of the Mistassini River is the Mistassibi. Its waters pass into the parent river by a succession of cascades whose collective force is estimated at 75,000 horse power.

Another of the tributaries of the Mistassini River is the River of Rats. The waters of this river mingle with those of the Mistassini by means of two cascades of 30 feet and a water fall of 60 feet; estimated to be able to supply a force of 22,000 horse power.

Perhaps the largest tributary of the Mistassini River is the Assiemska, whose rapids and cascades are of such a character as to warrant the statement that several thousands of horse power are there waiting to be set to work.

It is safe to say that there are, north and east of Lake St. John, within a sweep of 20 miles, not less than 150,000 horse power.

The River Chamonchouan, which is considered to be the upper part of the Saguenay River, falls into Lake St. John, south of the Mistassini. It can contribute as its share of the water power of the favoured region, not less than 100,000 horse power, supplied by several cascades, and especially by the falls of the Chaudiere, which have a height of 120 feet.

The River Ouiatchouan has a length of 60 miles and in reaching the Lake St. John widens into several lakes, of which the most important is the Lac des Commissaires, which is a lacustrine expansion of 21 miles in length. At a couple of miles from its mouth the river has a fall of 230 feet high, capable of providing a force of 33,000 horse power.

The Metabetchouan, in a distance of 80 miles has a descent of 225 feet—the greater portion of which is accomplished by means of cascades and rapids—within a distance of 4 miles.

Here, then, in the single region of which the basin of Lake St. John is the great water reservoir, are rivers and streams having over 700,000 horse power, capable of being utilized for manufacturing purposes. This, it is stated, is a power much in excess of that which could be supplied by the rivers of Norway and Sweden.

This territory of Lake St. John has an area of 19,000,000 acres, of which less than half a million have been stripped of their wood; the remainder are in forest.

Three-quarters of these forests are white, black and red spruce. The other quarter contains spruce, birch, cypress and pine.

The quantity of wood for paper pulp is, therefore, very large.

Taking the very low estimate of five cords to the acre as an average yield of the region, the following table expresses the immense resources of the region:

REGION.	EXTENT (Acres)	CORDS OF PULP WOOD.
Peribonka	8,320,000	41,600,000
Mistassini.....	4,800,000	24,000,000
Chamouchouan... ...	3,200,000	16,000,000
Ouiatchouan...	3,200,000	16,000,000
Total	19,520,000	97,600,000

It will be seen at a glance that even at the very lowest estimate of a cord and a half of wood for each ton of chemical pulp, there is in sight, in the region of Lake St. John, sufficient material to provide for a demand of wood pulp of 1,000,000 tons a year for 65 years—without taking into consideration the reproductive powers of nature.

In a word, this one little bit of a water centre of Canada has a forest area equal to the whole forest

area of Norway, or to more than one-third the fore area of Sweden, and has within this area 700,000 hor power of water fall, cascade and rapids, waiting to harnessed in order to provide cheap power for t reduction of the best kinds of pulp wood to woo pulp and paper.

These are but two examples of scores that migh be adduced to show the great capacity of the river and streams of Canada for the production of wate power easily utilized in the manufacture of wood pulp

The St. Lawrence River and all its tributar rivers, the St. John, Miramichi and Restigouch Rivers and their tributaries, the mountain-fed stream and rivers of British Columbia and the numerou water privileges of Nova Scotia, testify to the ex ceeding abundance of water courses specially fitte for the production of power in all those portions o Canada where the spruce abounds.

The Falls of Niagara have a theoretical force equal to seven million horse power, of which one-half belongs to Canada. This means several thousands of available horse power capable of distribution over a large area of the adjacent country. It has been estimated that the St. Lawrence River, from source to end, has a capacity of ten million horse power.

The canals of Canada have an approximate development of 20,000 H.P., with the capabilities of developing a greater amount of power.

Thus in regar to quantity and quality of the best wood pulp material, and the facilities for manufacturing and transporting the manufactured article to Europe on the one hand and to Asia on the other, Canada stands pre-eminent.

GREAT SPRUCE AREAS.

The reports of the Ontario Government exploration parties give encouraging statements of the existence of spruce in Northern Ontario. It has been

known for some time that there was pulp wood in this region, and the reports of the surveyors have shown that the spruce extends in a dense mass all the way to James' Bay. The discovery is heralded as an omen of future great paper and pulp industries in the northland, and as establishing still further our claim to possessing the greatest amount of raw material for paper of any country in the world.

The minister of Crown Lands for Ontario estimated in February last that in the Province there were 300,000,000 cords of pulp wood on Crown lands not yet sold by the Crown.

APPENDIX A. (Page 18.)

In our Canadian forests, east of the Rockies, there are ninety species of trees, but the greater number are confined to a comparatively small area. In our northern forests the principal trees are cedar, balsam (fir and poplar), aspen, white birch, tamarac or larch, banksian pine and white and black spruce.

The dimensions of our great northern forests are so vast that they seem almost incredible. The central line of the forest belt may be described as starting from the vicinity of the Straits of Belle Isle, and following a west south-westerly course till it passes to the south of James Bay, then turning northwest it follows this course all the way to the border of Alaska, opposite the mouth of Mackenzie River, the total distance being 3,700 miles. The breadth of the spruce belt taken at ten almost equal intervals in the above distance is as follows:—

	MILES.
From Halifax to Ungava Bay	1,000
In the Labrador Peninsula	950
From the north shore of Lake Huron to Richmond Gulf, on the east main coast..	800
From the international boundary on the northwest side of Lake Superior to Cape Henrietta Maria, on Hudson Bay	600
From the international boundry on Lake of the Woods to Cape Fatnam, on Hudson Bay	600

From Yorkton, East Assiniboia, to Fort Churchill	600
From Battleford to the limi of forest north-east of Raindeer Lake	600
From the summit of the Rocky Mountains on a north-easterly line passing through the Athabasca Lake	800
From the water shed of the Pacific slope on a north-easterly line passing through Great Slave Lake	700
From the water shed of the Pacific slope on a north-easterly line crossing the Mackenzie River on the Arctic circle	350

This gives an average breadth of 700 miles. If we multiply the total by this breadth the result is an area of 2,590,000 square miles as the approximate area of our northern forests, in which the black and white spruces are the prevailing trees.—DR. ROBERT BELL, Acting Director Geological Survey.

APPENDIX B.

CANADA

Pulp Mill Statistics, Feby. 1st, 1904.

BY GEORGE JOHNSON, F.S.S. (HON.)

The wood pulp business of Canada for the calendar year 1903 was carried on by 39 mills, which had an output of 275,619 tons of wood pulp. Of this quantity 187,871 tons were mechanical pulp; 84,808 sulphite and 2,940 soda.

The corresponding quanities for 1902 were: mechanical, 155,210 tons; sulphute 76,735 tons and soda 9,044 tons. The total value of the output of 1903 was $5,220,000. Nine of the 39 mills manufactured sulphite pulp and three soda pulp. Twenty seven manufactured mechanical pulp and five both mechanical and chemical pulp.

Taking the returns of 32 mills, the average time the mills ran during the year was about nine months.

The power to drive the mills was equal to 110,630 horse power, of which 102,960 was water power. Of the product of Canadian mills the customs returns show that during the calendar year 1903 the export amounted to $3,013,441, leaving $2,206,451 for home use. In a general way we export about 57 per cent. Of this export Great Britain took a total of $865,826. The United States took $1,899,448 and other countries $248,167.

The Customs returns of Canada, the United Kingdom and the United States do not call for a division of wood pulp into the three sorts known to the trade—soda, sulphite and mechanical, and those of Canada do not call for quantities.

It is, therefore, impossible to separate the several branches so as to ascertain the quantities of each of the three kinds we export—a point of considerable importance on account of the great difference in their value.

THE FOREST WEALTH OF CANADA

BY

JAMES M. MACOUN,

Assistant Naturalist, Geological Survey of Canada.

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OTTAWA.

The Forests of Canada.

Since the date of its first settlement, the products of the forest have been among Canada's chief exports and at no time has the value of these products been greater than to-day. Their character has changed, indeed, from year to year, but always to the advantage of the country at large. While in the early years of the lumber business, hewn timber and split staves were the chief articles exported, followed by logs, deals, boards, etc., industries in which large quantities of wood are required, have increased from year to year, especially during the last decade, and a great variety of articles which were formerly imported are now manufactured at home. Manufactories primarily established to fill the home demand, have increased their output and become competitors in foreign markets, while many new factories have been built of which the entire product goes abroad. During the season of 1899 the whole output of many of the large factories was required for home consumption. These, and those manufacturing for export, were run at their fullest capacity during the whole season, nearly all of them running at night as well as in the day time. This increase in production has been far slower than the natural resources of the country warranted, but capital has not always been available, and competition in foreign markets was so keen that Canadian manufacturers were slow in entering a field in which success seemed doubtful. The result has been that while excessive production went on in the United States and other countries, and their forests were depleted, those of Canada have not been drawn upon to relatively so great an extent, and "as regards raw material the future is with us."

No other country affords so good a field for the pr fitable investment of capital in the manufacture wood products; abundant raw material, cheap pow and an unfailing market insure success.

In the province of Ontario the export of pin spruce and other soft woods in the log, when derive from lands leased from the province, is prohibited and in the province of Quebec $1.50 per cord o stumpage dues is allowed on wood from which pul is manufactured in the province, and similar legisla tion is proposed in other provinces. The immediat result of this legislation will of course be a decreas in the quantity of raw material exported, but it i equally certain that there will be increased produc tion by existing factories and that many new one will be established.

Elsewhere in this pamphlet a table is given, whic shows the value of the chief products of the fores exported during the past ten years. These do no include farming implements, pianos and organs and other articles, in the manufacture of which large quantities of wood are required. The figures explain themselves, except for the years 1897 and 1898. In 1897 the export of lumber was abn ily large, and the decrease in 1898 was due chiefly to the fact that in anticipation of the import tax proposed by the United States, an immense quantity of lumber was sent into that country in 1897, which under normal conditions would have remained in Canada until the following year. As the figures given for each year include six months of that year and six months of the preceding year, the effect of this disorganization of the lumber business is also seen in the figures for 1899. These do not show the increase in the second half of 1899, which in the six months ending Dec. 31st. amounted to $21,246,871, as compared with $19,-191,907 during the same period in 1898.

Wise laws have been made by the provincial and federal governments, having for their object the pre-

servation of our forests, and the owners and lessees of timber limits now exercise greater care than formerly in the prevention of fires, supplementing to a very considerable extent the efforts of the government to lessen the destruction of valuable timber from this cause. The various governments are taking steps towards the re-foresting of the denuded areas under their control, and though the actual work so far done in this direction is not great, preliminary investigations are being made which will enable them to apply the methods best suited to each district.

A detailed account of the lumber business in Canada does not come within the scope of this pamphlet. It is intended simply, as its title indicates, to draw attention to the vast timber resources of the country, and it has seemed that this could be best done by giving a brief account of the distribution and more important uses of the chief forest trees, followed by such information regarding the conditions prevailing in the several provinces as seemed of greatest interest or value. All available sources of information have been drawn upon, and to these the reader is referred for further details. The most important for statistical purposes are the reports issued by the Department of Trade and Commerce, and by the Dominion Statistician, while the Crown Lands reports of the different provinces supply very full information relating to their timber lands, the regulations governing their use, etc. The limits given for the principal trees refer to their commercial distribution only. For further details as to their geographical distribution, the reader is referred to the annual reports of the Geological Survey of Canada, and of the Department of Dominion Lands, to special papers on this subject by Dr. G. M. Dawson, Dr. Robt. Bell and Prof. John Macoun and to the Catalogue of Canadian Plants, by Prof. Macoun, all of

which have been consulted for the information contained in this pamphlet.

No reference has been made to the prices, as these are subject to constant variation, and those interested may find them in trade journals. The "Canadian Lumberman," published at Toronto, Ont., gives in its weekly edition the current local prices at the principal lumber centres.

Under each species, the nature of the specimens in the Canadian Forestry Exhibit has been briefly given. The space allotted to Canada for this purpose was not large and it was thought advisable to devote the greater part to the raw products. While many manufactured articles are shown, the number and variety have been curtailed to as great an extent as possible, to afford space for raw material. In other departments, however, Canada's woods are exhibited, in a manufactured form, and those interested in the finished product will find it in the groups devoted to ornamental joinery, farming implements, vehicles, and household furniture.

The character of the information published in the reports issued by the Crown Lands Departments of the several provinces varies greatly, which accounts for the want of uniformity in the statistics given where the timber resources of each province are dealt with. The figures showing the value of each article exported from the different provinces are from the reports of the Department of Trade and Commerce, but the publication of these details was discontinued in 1897, so that while the total exports of the Dominion are given elsewhere for 1899 and 1900, for the present purpose the year 1897 must be used for all provinces. The reason for discontinuing the publication of these figures was that as shipments were frequently from provinces other than those in which the articles were produced they were misleading.

NOVA SCOTIA.

Though Nova Scotia continues to export a large amount of lumber and other products of the forest, the best of the timber lands in that province have already been granted by the Crown to individuals or corporations, and from these lands most of the lumber for export will continue to be taken. The greater part of the timber growing on lands still held by the Crown, is either at present inaccessible or is of too small size to be cut into lumber. Of the million and a-half acres of ungranted Crown lands about one half is covered with forest, mostly small spruce and other woods suitable for the manufacture of pulp. Little pine has been left in Nova Scotia, spruce being the chief coniferous wood exported. On much of the land from which the best of the lumber has already been taken there is a large quantity of pulp-wood and every year adds to this supply, as in both Nova Scotia and New Brunswick the climatic conditions are such that when re-foresting is left to nature coniferous trees as a rule replace the hard woods on cleared lands. With care, there should, in the future, be no falling off in the annual output of either lumber or pulp, indeed new pulp mills are being built every year and the output will consequently increase rapidly for some years to come.

Until 1899 timber lands were granted outright to purchasers, but the Provincial Government in that year adopted a policy of leasing such lands instead of selling them. Leases are issued for twenty years, the chief conditions being that the lessee shall pay to the Crown in advance a rental of forty cents per acre and shall not transfer the lease to any person or corporation without the consent of the Attorney General. The lessee is under the lease entitled to cut all timber of not less than ten inches in diameter and may erect upon the leased land such buildings as are neeessary for the prosecution of his business, which,

if not removed at the expiration of the lease, become vested in the Crown.

The value of the lumber and other wood products exported from Nova Scotia in 1897 was $2,781,365, of which $3,382, was foreign produce. The details are as follows:

ARTICLE.	VALUE.
Bark for tanning	$ 2,680
Firewood	$ 48,363
Logs of all kinds	$ 44,432
Lumber:—	
Spruce deals and other	1,370,828
Deal ends	47,732
Planks and boards	781,084
Laths, palings, pickets, joists and scantlings	3,064
Staves and headings	6,189
All other not otherwise stated	14,189
Shingles	6,865
Sleepers and railway ties	111,892
Shooks, box and other	6,865
Timber, square, all kinds	16,746
Wood for wood pulp	800
Wood and manufactures of:—	
Household furniture	2,407
Doors, sashes and blinds	9,845
Matches and match splints	23,751
Wood pulp	193,853
Not otherwise stated	96,905
	$2,781,356

NEW BRUNSWICK.

Of the twenty-nine indigenous trees of New Brunswick the spruce, hemlock, cedar, tamarac, fir, birch and maple are economically the most important. In the vicinity of the coast coniferous trees predominate, while the uplands of the interior are clothed with beech, maple, ash and birch and in the river valleys elm is abundant. A very considerable part of the timber lands of New Brunswick is in the hands of private individuals, and of the 12,000 square miles still in possession of the Crown over 9,000 square miles are under license to lumbermen. About 2,700 square

miles are still vacant and unlicensed. Great quantities of pine were formerly exported from this province, but very little of merchantable size remains. In New Brunswick, as in Nova Scotia, the demand for pulp-wood has made valuable large areas from which the best timber has already been taken and others on which the average size of the trees was too small to make it profitable to cut them into lumber.

The right to cut timber on ungranted Crown lands, or on lands for which the licenses already granted have expired, is in New Brunswick acquired by public auction, subject to stumpage regulations and restrictions, so framed as to admirably safeguard the interests of the Crown and prevent waste of any kind. The stumpage dues for the more important products of the forest are:

For Spruce, Pine, Tamarac, Fir or hardwood saw logs, per 1,000 superficial feet	$1.25
" Hardwood timber up to an average of 14 inches square, per ton	1.10
" Hardwood timber above 14 inches, additional, per inch per ton	.10
" Pine timber, additional per inch, per ton	.25
" Pine timber, additional per inch, per ton	.25
" Tamarac timber, per ton	.65
" Spruce timber, per ton	.65
" Cedar logs, per 1000 superficial feet	1.25
" Hemlock, per 1000 superficial feet	.40
" White Birch logs, for spool-wood, per 1,000 superficial feet	.80

The stumpage dues on railway-ties and on boom-poles are 2 1-2 cents each; on brackets and spurs one cent each.

No statistics of the amount of timber cut on land owned by private individuals are available, but it is almost as great as that cut on Crown lands, of which details are published by the Crown Lands Department of the province. These show the relative quantities of the different kinds of wood cut, and the proportion of each taken from private lands doubt-

less very much the same. Omitting the less important products, the following are the figures for the year ending Oct. 31, 1898:

Spruce and Pine saw-logs	80,856,347	sq.
Hemlock logs	3,726,756	"
Cedar logs	7,669,293	"
Hardwood logs	1,828,734	"
Spool-wood, White Birch	2,784,000	"
Fir logs	648,[illegible]6	"

In 1897 New Brunswick exported t[illegible]nd products of the forest valued at $6,599,697, practically all of which was produced in the province.

ARTICLE.	VALUE.
Bark for tanning	$ 48,409
Firewood	33,042
Logs, all kinds	866
Lumber:—	
Pine deals	23,231
Deals, spruce and other	4,016,700
Deal ends	124,461
Planks and boards	817,190
Laths, palings, pickets, joists and scantlings	502,613
Staves and headings	3,430
Not elsewhere specified	68,926
Shingles	604,663
Sleepers and railway ties	17,664
Timber, square:—	
White pine	2,569
All other	79,846
Wood, manufactures of:—	
Household furniture	2,650
Doors, sashes and blinds	885
Matches and match splints	1,186
Wood-pulp	145,405
Not elsewhere specified	95,050
	$6,599,697

QUEBEC.

The territory recently acquired by the province of Quebec to the north, northwest and northeast of its old boundaries, has added so much to the forest-covered area in that province that it now ranks first in that respect. Of the 344,450 square miles comprised within its boundaries much is yet unsurveyed —some of it unexplored. In 1898 there was about 47,000 square miles under license for the cutting of timber, but vast tracts remain unlicensed. These are chiefly north of the Ottawa and St. Lawrence rivers and are for the most part covered with spruce, fir, poplar and birch, the characteristic trees of the sub-arctic forest. No very accurate figures can be given for the quantity of standing timber in the province of Quebec, but according to a very moderate estimate recently made by the Crown Land Department, the standing timber, exclusive of pulp-wood and under-sized trees, will produce at least sixty thousand million feet of lumber, and in the opinion of the writer this estimate is below the true one. Some idea of the immense timber resources of this province may be gathered from a consideration of a single district—Lake St. John—which has recently been reported upon by the Superintendent of Forest Rangers. The area of the Lake St. John basin is about 30,000 square miles or 19,200,000 acres, of which only about 500,000 acres have been cleared; the remainder is covered with trees of which about 75 per cent. are spruce. A large proportion of these trees are of sufficient size to manufacture into lumber, but the spruce can be used with greater profit for making pulp. At the extremely low estimate of five cords of pulp-wood per acre there is growing at present on this area 100,000,000 cords of pulp-wood. 500,000 tons of pulp could be made there annually for an indefinite period. If the whole province were included in this estimate and an average nearer the true one used, the result

would be beyond belief, yet it is hardly possible to make an exaggerated estimate.

The forests of Anticosti and the Gaspé peninsula are of the same general character as those described above, but elsewhere, on the south side of the St. Lawrence and on the north side from the Saguenay River westward, and so up the Ottawa, there is for many miles back from these rivers a large proportion of hard woods. Except in the case of white birch, which has been extensively cut for spool-wood, the hard woods of this province are not used to anything like so great an extent for manufacturing purposes as they are in Ontario, but there is abundant maple, birch and beech, and industries in which they will be used must soon be established.

The timber lands of Quebec are worked under licenses from the Crown, at a yearly rental of three dollars per square mile, and an annual fire tax, the amount of which is fixed from time to time by the Commissioner.

Licentiates are forbidden to cut on Crown lands, pine trees measuring less than 12 inches in diameter, spruce trees measuring less than 11 inches in diameter and trees of other descriptions measuring less than 9 inches in diameter, at the stump; but they are permitted to cut black spruce, for the manufacture of paper pulp at a diameter of 7 inches at the stump, i.e at 3 feet above the ground. All wood goods cut in virtue of a license are subject to the following charges:

Square and waney timber per cubic foot:

Oak and walnut	4 cents.
Other descriptions	2 "

Saw-logs, boom and dimension timber, per 1000 feet B.M. of:

Spruce, hemlock, balsam, cypress, cedar, White birch and poplar	65 "
Red pine	80 "
White pine and other varieties	$1.30 "

Cordwood (firewood), per cord of 128 cubic feet:

Hardwood	20 "
Soft wood	10 "
Pulp wood per cord of 128 cubic feet, with a reduction of 25 cents per cord on timber manufactured into paper pulp in the Dominion of Canada	65 "

Rails not exceeding 12 feet in length per 100 pieces:

Cedar rails	30 "
Rails of other varieties of timber	15 "

Pickets, per 100 pieces:

Cedar pickets	15 "
Pickets of other varieties of timber	10 "

Cedar or pine shingles per thousand:

Sho	10 "
Long	15 "

Poles of all kinds of timber for carrying electric wires, per lineal foot:

Poles 10 ins. diameter or less at the butt	¼ "
Over 10 ins. diameter at the butt	½ "
Railway ties of all kinds of timber, per piece	2 "
Hemlock lathwood, per cord of 128 cubic feet	20 "
Hemlock bark, per cord of 128 cubic feet	20 "
Futtocks, knees, floors of birch and other ship-building material, and all wood goods not enumerated in foregoing list, an *ad valorem* duty on the invoice	10 p. c.

The cord of 128 cubic feet is considered, for the purposes of this tariff, to be equal to 600 feet B.M.

Perhaps the most careful estimate of the average number of trees suitable for lumber or pulp-wood, growing on the heavily-wooded areas of Quebec, is that made by the surveyors and engineers in the em-

ploy of M. Henri Menier, the owner of the island of Anticosti. It has been estimated that there are on that island about 1,800,000 acres of forest land, and from the reports made by M. Menier's employees, the average number of trees over the whole area is about 900 per acre. The forests of Anticosti differ in no essential particular from those of northern Quebec and northern Ontario, and M. Menier's figures, which are the result of an actual count on many measured acres, afford a good basis for estimating the number of trees on other areas.

The following is a summary of the forest products exported from Quebec in 1897, with their value:

ARTICLE.	VALUE.
Bark for tanning	$ 58,313
Firewood	20,747
Logs of all kinds	151,348
Lumber:—	
Deals, pine	3,280,126
Deals, other than pine	1,706,692
Deal ends	465,000
Planks and boards	2,310,480
Laths, palings, pickets, joists and scantlings	160,957
Staves and headings	38,288
Not elsewhere specified	154,261
Shingles	267,790
Sleepers and railway ties	135,730
Stave bolts	1,524
Shooks, box and other	54,193
Timber, square:-	
Oak	539,088
White pine	1,348,655
All other	380,755
Wood for pulp	536,622
Wood and manufactures of:	
Household furniture	35,331
Doors, sashes and blinds	59,520
Matches and match splints	91,167
Wood pulp	270,136
Not elsewhere specified	204,340
	$12,276,082

ONTARIO.

A much greater variety of trees is found in Ontario than in any other province, and, as a natural consequence, the number of wood-employing industries is much larger there than elsewhere in Canada. In the southwestern part of the province coniferous trees are almost wholly wanting, the forests being made up of hard woods, of which oak, hickory, basswood, maple, elm, ash and beech are the most valuable. The forests of northern and northwestern Ontario resemble those of Quebec; pine, spruce, birch and poplar being economically of most importance. Pine has long been the chief wood exported from Ontario, and though it exists in nothing like its former abundance great quantities remain uncut. Nearly all the lands upon which it grows have already been sold or licensed by the Crown. Not nearly so much hard wood is exported now as formerly, partly because of the diminished supply and partly because the available wood is nearly all in the hands of those who own or are interested in manufacturies and who prefer to hold it for their own use. Scarce as many of our hard woods are doubtless becoming, the amount yet standing is much larger than is generally supposed and the greatly increased value of some species makes it now worth the farmer's while to haul timber to mills or railway stations which he formerly would have used for fire-wood.

The increase in Canadian exports of articles manufactured from wood is in great measure in the province of Ontario, where long established concerns have enlarged their plants and new industries have been established. Recent legislation regulating or prohibiting the export of unmanufactured material from the province of Ontario has given a great impetus to home industries, the result of which is seen in the increased quantity of wood products exported.

No trustworthy estimate has been made of the timber still standing in this province, but the amount is very large and in Ontario, as in Quebec, one of the largest provincial assets is the growing wood suitable for the manufacture of pulp. Great as has for many years been the annual value of the timber cut in Ontario it will increase in the future.

In 1898 there were taken from the Ontario Crown lands 544,457,139 feet, board measure, of pine saw-logs, and 8,22[illegible],442 feet of other logs; 26,977,461 feet of boom and dimension timber, and 1,478,387 cubic feet of square timber, besides a large quantity of cord-wood, railway ties, pulp-wood, etc. No figures are available for the quantities cut on private lands.

The regulations governing the use of Crown timber lands in Ontario are, in brief, that when berths or limits are explored, surveyed and valued, they shall be offered for sale by public auction, at the upset price of such valuation, and sold to the highest bidder for cash at the time of sale. All timber berths and limits are subject to an annual ground rent of $3 per square mile, in addition to which the following Crown dues must be paid:

Black Walnut and Oak, per cubic foot	.03
Elm, Ash, Tamarac and Maple	.02
Birch, Basswood, Cedar, Buttonwood and Cottonwood, and all boom timber, per cubic foot	.01¼
Red and White Pine timber, per cubic foot	.02
All other woods	.01
Basswood, Buttonwood and Cottonwood saw-logs, per standard of 200 ft. board measure	.15
Red and White Pine saw-logs and boom-timber, per standard of 200 ft. board measure	.20
Walnut, Oak and Maple saw-logs, per standard of 200 ft. board measure	.25
Hemlock, Spruce and other woods, per standard of 200 ft., board measure	.10

The dues on other forest products will be found in the Crown Timber regulations of the province.

Ontario exported in 1897 wood products of the value of $10,602,364, of which $12,124, was foreign produce. The following are the details:

ARTICLE.	VALUE.
Bark for tanning	$ 2,752
Firewood	71,592
Logs of all kinds	1,927,480
Lumber:—	
Planks and boards	6,254,737
Laths, palings and pickets, joists and scantlings	169,910
Staves and headings	651,509
Not elsewhere specified	90,531
Shingles	303,674
Sleepers and railway ties	71,908
Stave bolts	37,110
Shooks, box and others	1,914
Timber, square:—	
Oak	1,200
Pine, white	1,205
All other	24,029
Wood, for wood pulp	173,730
Wood and manufactures of:	
Household furniture	79,873
Doors, sashes and blinds	217,813
Matches and match splints	35,172
Wood pulp	132,565
Not elsewhere specified	353,660
	$10,602,364

MANITOBA AND THE NORTH-WEST TERRITORIES.

As is well known, the greater part of the settled portions of Manitoba and the North-West Territories is made up of prairie lands, but even in western Manitoba, Assiniboia and southern Alberta trees grow in damp situations and in river valleys, so that the settler is nowhere very widely separated from wood

suitable for house-logs, firewood and fencing, and in these districts the timber regulations are especially favourable to settlers. Northern Manitoba, Alberta and Saskatchewan and practically the whole of Keewatin, Athabasca and Mackenzie are covered by the sub-arctic forest, and these districts, although at present but sparsely settled, will eventually become almost, if not quite, as valuable as the prairie region. In much of this vast area the soil and climate are good and though many years must elapse before the timber growing on it will be required for home consumption, there will very soon be such a demand for wood-pulp in Minnesota and Dakota that the wood growing in Manitoba and Keewatin will be drawn upon, indeed the consumption of paper made from wood-pulp is already so great in the northern United States and in Manitoba that were advantage to be taken of the raw material which is to be had in such abundance near the chief points of consumption, the manufacture of wood-pulp would at once become one of the chief industries of southern Keewatin and eastern and northern Manitoba, and the time is not far distant when the bulk of the wood-pulp used in the United States north and north-westerly from Chicago will come from Manitoba and North-West Canada.

Railways and natural waterways, afford at the present time adequate transport facilities towards the south, and when the Hudson Bay route to Europe has been opened Keewatin and Northern Manitoba will be the chief producers of wood-pulp with which Newfoundland and the Eastern Provinces will have to compete in European markets. The area of Keewatin alone is 498,000 square miles, much of which is covered with spruce, poplar and other woods suitable for the manufacture of pulp of the best quality.

Though the wooded area in this district is greater than in the province of Quebec the average size of the trees is not so large, but it is probable that the actual amount of the wood suitable for the manufac-

ture of pulp, is almost if not quite as great in Keewatin as in Quebec.

The timber lands in Manitoba, the North-West Territories and within twenty miles on either side of the Canadian Pacific Railway in British Columbia, are still held by the Dominion Government, and licenses to cut timber can be obtained only by public competition. The licensee must pay an annual ground rent of $5 per square mile, except west of the Eagle Pass in British Columbia, where the yearly ground rent is five cents per acre. In addition to the rent the following crown dues must be paid:

Sawn lumber 50 cents per 1000 ft. board measure,
Railway ties 8 feet long .. ....1½ cents each.
" " 9 " " .. .. .. 1¾ " "

Shingle bolts 25 cents per cord, and 5 per cent. on the sales of all other products of the berth, but in British Columbia a rebate of 40 cents per 1000 feet is allowed on all lumber exported.

Permits to cut timber from Crown lands are also granted at public competition. For timber so cut the following dues are payable: $2 to $3 per 1000 ft. B. M. for square timber and ½ to 1½ cents per lineal foot for building logs; from 12½ to 25 cents per cord for firewood, 3 cents a piece for railway ties and 20 cents per 1000 shingles. Homesteaders who may have no timber of their own are entitled to a permit free of dues for 3000 lineal feet of building logs, 400 roof poles, 500 fence posts, and 2000 fence rails.

In the Yukon territory a license to cut timber on an area of not more than five square miles may be granted to the first applicant, upon payment of a bonus of not less than $250 per square mile, and the licensee must also pay a stumpage of $2 per 1000 square feet B. M. on the timber cut. Permits to cut firewood and railway ties are granted upon easy terms.

During the year ending June 30th, 1898, the following quantities of building material were taken from Dominion lands:

Sawn lumber	39,096,467 feet.
Shingles	1,584,500 "
Laths	24,200 "

Nearly all of that cut in Manitoba and the North West Territories was for home consumption, the amount exported being very small.

There is under license from the Dominion, the following areas of timber lands:

Manitoba	659.84 square miles.
Alberta	1,134.74 " "
Saskatchewan	256,54 " "
British Columbia	304.63 " "

BRITISH COLUMBIA.

The character of the forests of British Columbia is very different from that of the other provinces. The trees are much larger, and all the more valuable species are peculiar to the Pacific coast. These are the douglas fir, the giant arbor-vitae, Menzies' or Sitka spruce, yellow cypress and the western hemlock, all of which attain a great size on Vancouver Island and the mainland in the vicinity of the coast, and, with the exception of the yellow cypress, in the river valleys of the interior. The abundance of standing timber near the sea, and the fact that most of the lumber cut at the mills was to fill large orders for particular sizes, led to very wasteful methods of making lumber, immense quantities of the smaller trees (small for British Columbia) being left in the woods to be destroyed by fire, while at the mills themselves huge slabs of great length were cut from the logs, sawn into easily-handled lengths and burnt. Better methods now prevail, but nothing like the economy which characterizes lumbering operations in Eastern Canada, is yet practised in British Columbia.

The nature of the country makes it impossible to estimate with accuracy the area of unlicensed timber lands in British Columbia, but it is probable that more than one-third has been taken up. The acreage of timber under lease in 1903 was about 1175 square miles. In 1901, 241,311,709 feet of lumber of all kinds was cut, and in 1902, 281,945,866 feet.

Under certain conditions leases of unpre-empted Crown timber lands may be granted to the person or corporation who has tendered the highest cash bonus for a period not to exceed twenty-one years, subject to the payment of a royalty of fifty cents per one thousand feet on the scale measurement of the logs cut on the leased premises and to the payment in advance of twenty-five cents per acre.

Special licenses are also issued to cut timber on Crown lands. Any person desirous of obtaining such special license must first stake out the land sought to be included in his license. He must then publish for a period of thirty days in the British Columbia Gazette and in any newspaper circulating in the district in which the lands lie notice of his intention to apply for such license. Within thirty days after the last publication of such notice the license must be applied for.

A special timber license for logging purposes shall not be granted for a larger area than 640 acres of land, which shall be in one block bounded by straight lines drawn to the cardinal points, none of which lines shall be less than forty (40) chains in length, except in cases where such a length cannot be obtained. Such special licenses may be granted for any period not exceeding five years, and the fees payable therefor shall be as follows:—

	West of the Cascade Range	East of the Cascade Range and in the Electoral District of Atlin.
For each license for one year	$140	$115
For each license for two years . .	280	230
For each license for three years . .	420	345
For each license for four years . .	560	460
For each license for five years . .	700	575

Payment for the whole period applied for shall be made, or the license shall not issue. Such license may be granted or renewed at the discretion of the Chief Commissioner, and shall be subject to such tax and royalty as may be by this Act or from time to time by an Act of the Legislature of the Province of British Columbia imposed.

There is also a tax upon all timber cut in the province, but the details of this tax are too complicated to permit of their being summarized here. It varies according to the length and diameter of the log from $2.00 per 1000 feet board measure for logs of not more than 40 inches in length and 24 inches in diameter to $5.50 for logs of more than 80 feet in length and over 48 inches in diameter. The tax on mining props and railway ties is 50 cents per cord and on shingle bolts $1.00 per cord.

The lumber trade of this province with South America, Australia and Eastern Asia will certainly increase with the demand for coniferous woods in these countries, and though the bulk of it has been so far in a semi-manufactured form, the establishment of new factories will in the near future greatly augment the quantity of furniture, sashes, doors, etc., that will be exported, while the manufacture of wood-pulp is certain to become one of the chief industries of the province.

Wood products to the value of $666.354 were shipped by sea from British Columbia in 1901. The figures for shipments by rail are not available.

List of Principal Commercial Woods of Canada, with their Distribution, Economic Value and Relative Abundance.

The arrangement of the species in the following list, though not scientifically correct, is that which is most familiar to those who will see this pamphlet, and has been adopted for that reason. The space devoted to each species bears small relation to the im-

portance of the wood economically, the most valuable species being those which are the best known, and of those little more than their distribution is given.

BASSWOOD—*Tilia Americana*, **Linn.**

The Basswood grows sparingly in New Brunswick, more abundantly in Quebec and attains its greatest size and is most abundant in the province of Ontario. It is also found in eastern Manitoba. For commercial purposes, the greatest quantity is cut in that part of Ontario which lies between lakes Ontario and Erie on the south and the main line of the Canadian Pacific Railway on the north, where it is often more than three feet in diameter and 100 feet in height. Basswood is used for a great variety of purposes, but the consumption of raw material is comparatively small when the vast number of articles into which it is manufactured is considered, as many of these are made from very thin veneers. The wood is white in colour, very light and soft and easily worked, but, though tough, it is not strong. It warps very little, not at all if well seasoned, and is on that account much used for sounding boards in pianos, and for organ stock. It enters largely into the manufacture of cheap furniture, the light parts of farming implements, carriage panels and bodies, boxes and coffins, where a light easily-worked wood is needed. Cut as veneer, it is used for fruit baskets and boxes, cloth-boards, band-boxes, cheese-boxes, and for a variety of similar purposes, and as "three-ply" for boxes and chair seats. It is the principal wood used in the manufacture of "wooden ware," and, turning easily, it is made into bowls, toys, etc. For building purposes it is not much used, except as clapboards and for light interior work. When drawn directly from the stump to the saw, the wood is very white, and, if well seasoned after being cut, it takes a very high polish.

EXHIBITS:—Sections of logs, deals, box-shooks, fruit boxes and baskets, cloth-boards, veneers, polished panels.

BROAD-LEAVED MAPLE—*Acer macrophyllum*, Pursh.

The Broad-leaved Maple is common on Vancouver Island and along the coast in the southern part of British Columbia. It is the most valuable of the deciduous trees of the west coast. Though not as hard or as strong as the hard maple of the east, the wood is much better than that of the eastern soft maple. Much of it is "curly," which adds greatly to its value as cabinet-making material. It is used in the manufacture of furniture, mantels and handles and for interior finishing.

EXHIBITS:—Section of tree, boards, and polished panels.

HARD MAPLE—SUGAR MAPLE—*Acer saccharinum*, Wang.

The Hard Maple is a common tree from Nova Scotia westward to Lake Superior, always on good soil. It reaches its greatest size in southwestern Ontario. Throughout its range it has always been esteemed the best material for firewood, and vast quantities of valuable timber are every year consumed in this way. In recent years small mills have been built in the settled portions of Canada in which it grows, and much of what was formerly used as firewood is now being cut into lumber for home consumption and for export. Where it is most abundant large factories have been established, and an annually increasing quantity of this and other hard woods being made into furniture and other manufactured articles. The wood is very hard, close-grained, tough and strong, and as it exhibits a great variety of colour and fibre arrangement, it is one of our best woods for veneering, panelling and high-class furniture.

The "Bird's Eye" and "Curly" forms are found in infinite variety, and are greatly valued by the cabinet-maker. Hard maple is used in Canada in the making of furniture and in cabinet work of all kinds, as flooring and for interior finishing, and in the manufacture of domestic utensils, handles, butchers' skewers, dumb-bells and Indian clubs, shoe-lasts and pegs, saddle-trees, mangle-rollers, and in many industries in which a hard, tough wood is desirable. It is also used for the keels of boats and ships, and is made into charcoal for smelting purposes. By the lumbermen it is used for handspikes and other implements used in river driving, and by the millwright for boxes and bearings, and for the teeth of gearing wheels. It is exported in the log, as square timber, deals and boards, and in the form of blocks and squares, as chair parts and in other semi-manufactured forms. It is from this tree that maple sugar is generally made.

EXHIBITS:—Sections of log, square timber, boards and polished panelling, blocks and squares, chair parts, kitchen utensils, butchers' skewers and other specialities.

SOFT MAPLE—RED MAPLE—*Acer rubrum*, Linn.

The Red Maple is common from the Atlantic to Lake Superior ranging a little farther north than the hard maple. The silver maple, *Acer dasycarpum* Ehrh. is not in this paper separated from *Acer rubrum* as these woods are commercially classed together as soft maple. The wood of the soft maple is soft and brittle, not comparable with that of hard maple, nor is it used for anything like so great a variety of purposes. Being soft and turning easily, many articles of domestic use, such as butter-making utensils, kitchen ware, etc., are made of this wood. It is also used for cabinet work and flooring.

EXHIBITS:—Section of tree, deals, boards and polished panels, butter-making and kitchen utensils.

BLACK CHERRY—*Prunus serotina*, Ehrh.

Not very abundant nor of large size in the Maritime Provinces nor Quebec but many fine trees are still standing in Ontario, in the southern part of which province it attains its greatest size in Canada. The quantity cut there is, however, not sufficient for home consumption and a good deal is imported for use in furniture factories and for interior finishing, for which purpose it is largely employed.

EXHIBITS:—Section of tree, square and dimension timber and polished panels.

WHITE ASH—*Fraxinus Americana*, Linn.

The White Ash ranges from Nova Scotia to western Ontario, increasing in abundance and size until its western limit is reached. This is the finest and most useful of the ashes, being frequently found 100 feet in height and over three feet in diameter. Its wood is both strong and elastic, bending easily, which fits it for a great variety of uses. It enters largely into the manufacture of agricultural implements of all kinds as well as wagons, carriages, and sleighs. Though not as good as some other woods for that purpose, very fine handles of all kinds, whiffle-trees, neck-yokes, etc., are made from white ash, second growth wood being generally used. It is the principal wood used for oars. Like all other hard woods it is employed for flooring, furniture, and cabinet work. It is one of the most valuable Canadian woods, but is no longer abundant.

EXHIBIT :—Sections of trees, square timber, deals, boards and polished panels, chair parts, handles and specialities.

BLACK ASH—*Fraxinus sambucifolia*, Lam.

The Black Ash is more widely distributed than the white ash and is more abundant than the latter throughout its range. It is found from Anticosti

west to eastern Manitoba in swamps and river bottoms. The wood is not so hard as that of the white ash, but it is tough and elastic and is, on that account, well suited for cooperage work and basket making. It is darker in color than the white ash and though used for the same purposes is not so highly valued.

The red ash and the green ash are not seperated commercially from the two preceding species; the wood of the latter resembles that of the white ash while that of the former is more like the black ash. Both range further west than the other species, growing along the Assiniboine River and tributaries of lakes Manitoba and Winnipegosis.

EXHIBITS:—Section of tree, boards, polished panels and cooperage stock.

RED ELM—SLIPPERY ELM—*Ulmus fulva*, **Michx.**

The American or White Elm is of wide distribution in Canada, being found from the Maritime Provinces westward to rivers falling into Lake Winnipegosis in Manitoba. It increases in size and abundance until western Ontario is reached, where it is often found six feet in diameter and over 100 feet in height. It also grows to a large size in the valleys of the Winnipeg and the Red rivers. The wood of the white elm is very tough and difficult to split, and on this account it is much used for wagon hubs, blocks for all kinds of tackle and for gunwales, as the driving of bolts is less likely to split it than any of our other woods. It is heavy and strong but not durable. It is much employed in barrel, chair and wheel making and for a great variety of purposes when veneer-cut. As lumber it is rather coarse but is very largely used in the manufacture of furniture, coffins and flooring. Varying greatly in color and grain, it is employed to imitate other woods, nearly all the cigar boxes used in Canada being made of elm, while practically all coffins are made of either

elm or basswood stained and polished to imitate other woods.

EXHIBITS:—Sections of logs, square timber, deals, boards, and polished panels, cooperage and chair stock, hubs, butter-dishes, lathes, strips and cigar boxes.

WHITE ELM—*Ulmus Americana*, **Linn.**

The Red Elm is not of much importance commercially in Canada and is not found anywhere in great quantity. It is more durable than the other elms, and is better suited than them for use as railway ties, fence-posts and rails. It is employed for much the same purposes as the other elms. The inner bark possesses valuable medicinal qualities and is frequently prescribed in bad dyssentry and diarrhoea cases; it is also used in the form of poultices.

EXHIBITS:—Section of tree.

ROCK ELM—CORK ELM—*Ulmus racemosa*, **Thomas.**

The Rock Elm grows in southern Quebec and west to Lake Superior, being best developed in southern Ontario, to which part of Canada it is, as a commercial wood, now confined. It is much superior to the other elms, and for many purposes is unequalled by any other wood. It is tough, strong, elastic and very heavy. Its chief use is in the manufacture of agricultural implements, bicycle rims and wheel stock, and it is well suited for any purpose for which a wood that does not split easily is requisite. It is largely used in bridge and ship-building, and for heavy furniture. When highly polished the wood is very beautiful, and repays a greater expenditure of time in polishing than is usually given to elm.

EXHIBITS:—Section of tree, square timber, deals and wagon hubs.

SYCAMORE-BUTTONWOOD—*Platanus occidentalis*, **Linn.**

Confined in Canada to southwestern Ontario, where trees three and four feet in diameter and 80 feet in height are still numerous. The wood is heavy and hard, but not very strong. It is not a good wood for out-door work, but is extensively used in the manufacture of various specialities, such as bowls, butter trays, etc., as well as cigar boxes and barrel headings. Like other woods of inferior quality, it is also employed for a variety of purposes for which better material is not available.

EXHIBITS:—Sections of trees, deals, and polished panels.

HICKORY—*Carya alba*, **Nutt.**

The Hickory is, for commercial purposes, confined to Ontario, and it is only in the southwestern part of that province that it is found in any considerable quantity. The wood is very heavy, hard, tough, strong and elastic, though it is not durable when exposed to the weather, or when in contact with the soil. As fuel, it excels even hard maple. "Second-growth" hickory possesses in even greater degree than the ordinary wood the qualities that make it so valuable for fishing-rods, handles of all kinds, axles for light but strong vehicles, and for farming implements. The nuts of the hickory are the best grown in Canada. *Carya tomentosa*, Nutt., the white-heart hickory is included with the above species commercially, and possesses the same qualities. The Bitternut, *Carya amara*, Nutt, is not quite so valuable as hickory, but is used for the same purposes.

EXHIBITS:—Section of tree, square timber, deals, axe and other handles.

RED BIRCH—CHERRY BIRCH—*Betula lenta*, **Linn.**

The Red Birch is an abundant tree from Nova Scotia westward to Lake Superior, the finest trees

growing in the province of Quebec north of the Ottawa and St. Lawrence rivers, and in central Ontario in the counties of Huron, Grey and Bruce, and in the districts of Nipissing, Algoma and Parry Sound, where it is often more than four feet in diameter. It is the best of birches for cabinet work and furniture, and is exported in great quantity for that purpose in the log, as square timber, deals, blocks and squares, and as chair and other furniture stock. The wood is very hard, heavy and strong. The yellow birch, *Betula lutea*, Michx, is seldom separated, commercially, from the red birch, and is employed for the same purposes. The wood of the red birch is, however, rose-colored, often as dark as that of the cherry, in imitation of which it is frequently used. Good hubs are made from birch, and in the Maritime Provinces, where other suitable woods are not abundant, it is employed in the construction of wagon and cart frames. Turned boxes and similar articles are also made of this wood, as well as button-moulds. Red birch is very durable under water, and is used for piles and sluice work, and being little liable to the attacks of insects is valuable wood for ship-building purposes.

EXHIBITS:—Sections of trees, square timber, boards, deals, polished panels, chair parts and turned work.

WHITE BIRCH—CANOE BIRCH—*Betula papyrifera*, **Marsh.**

The White Birch ranges from the Atlantic to the Pacific and in the north almost to the Barren Grounds. The finest trees are found in the valley of the St. Lawrence River and its western tributaries. The white birch is not as large as either the red or yellow birch nor is the wood so heavy. It is white, very hard and close-grained, and is the principal wood used for spools, bobbins, turned boxes, bowls and other wooden-ware, shoe lasts and pegs. It is

also employed in the manufacture of furniture and for interior finishing. In the more settled parts of Canada where good transport facilities are available the best white birch has already been utilized, but vast areas remote from railways yet remain to be exploited.

EXHIBITS:—Sections of trees, deals, boards and polished panels, spools, bobbins, turned boxes and specialities.

WHITE OAK—*Quercus alba*, Linn.

Though the true White Oak is *Quercus alba*, several other species are so classified commercially. The most important among these is the bur oak, *Quercus macrocarpa* Mich. The true white oak is found in western Quebec and in Ontario as far west as Lake Huron. The bur oak has the same range as *Quercus alba*, but is also found in the Maritime Provinces and in the west throughout the wooded portions of Manitoba. The wood of both species is very heavy, hard, tough and durable, that of the bur oak being the most durable of any American oak when in contact with the soil, which makes it very valuable for use as fence posts, railway ties and piles. The wood of the white oak is also largely employed in ship-building, carriage and wagon-making and cooperage, the manufacture of agricultural implements and for cabinet and furniture work, flooring and interior finishing. Quarter-cut it exhibits a great variety of grain and coloring.

EXHIBITS:—Sections of trees, square timber, railway ties, deals, boards, polished panels and flooring.

WESTERN WHITE OAK—*Quercus Garryana*, Douglas.

Though a few trees of this species grow on the mainland of British Columbia, it is practically con-

fined to the southern part of Vancouver Island, the finest trees growing in the vicinity of the city of Victoria, where trees three or four feet in diameter from which logs from ten to twenty feet long can be obtained are not uncommon. The wood resembles that of English oak and is very beautiful when made up into furniture and cabinet work.

EXHIBITS:—Sections of trees.

RED OAK—*Quercus rubra*, Linn.

The Red Oak extends from the Maritime Provinces westward to Lake Superior, reaching the greatest size in the Province of Ontario. The wood is inferior in quality to that of the white oak but is almost as hard, heavy and strong. It enters more largely than the white oak into cooperage work and, as with white oak, second growth wood is much used for handles of all kinds, wheel stock, axles, whiffletrees, etc. For furniture, cabinet making, and interior finishing it is almost as valuable as the white oak. The bark is rich in tannin.

EXHIBITS:—Sections of trees, square timber, deals, polished panels, hubs and spokes.

CHESTNUT—*Castanea dentata*, Marsh.

The Chestnut is confined to the southwestern part of the province of Ontario, and is not even there in sufficient quantity to be of great importance commercially. The wood is neither strong nor flexible, but is durable and easily worked. In Canada it is employed chiefly in cabinet work, but is also well suited for use as railway ties and in heavy construction work.

EXHIBITS:—Section of tree and deal.

BEECH—*Fagus ferruginea*, Aiton.

The Beech grows in the Maritime Provinces, Quebec and Ontario, the finest trees being found in

the vicinity of Lake Huron. The wood varies greatly in color and grain, and is much employed in the manufacture of furniture and for flooring. The white-colored wood is said to be more tough and lasting than that of red color. Quarter-cut it is very beautiful. Its principal use is for tool handles, carpenters' planes, shoe-lasts, mallets and for various turned articles.

EXHIBITS:—Sections of trees, deals and chair parts.

ASPEN POPLAR—***Populus tremuloides*, Michx.**

The Aspen is the most widely distributed of Canadian trees, ranging from the Atlantic to the Pacific and north to the Barren Grounds. In some parts of Canada it is the only wood available for fence rails and firewood, and it furnishes the material for settlers' log houses in many parts of the prairie region. Commercially the aspen is used chiefly in the manufacture of pulp, for which purpose it, like all the poplars, is well suited. At present spruce has, to some extent, driven poplar out of the market as a pulpwood, but the immense quantity growing throughout the Canadian sub-arctic forest will some day be utilized. The wood of the aspen is light and easily worked, and is used for woodenware, light barrels, such as those used for sugar and flour, and for crates and light boxes. It is also employed in the manufacture of furniture. The large-toothed aspen, *Populus grandidentata*, Michx., is employed for the same purposes as the aspen.

EXHIBITS:—Sections of trees, deals, boards and pulp wood.

BALM OF GILEAD—BALSAM POPLAR—*Populus balsamifera*, Linn.

The range of the Balsam Poplar is much the same as that of the aspen. In the North-West Territories it attains a great size, being there generally found in

river valleys, where it is sometimes 150 feet in height and seven in diameter. On the islands and banks of the Pease and Athabasca rivers it grows to a greater size than elsewhere in Canada, and large trees are found down the Mackenzie River as far north as the Arctic Circle. The wood is soft and not strong, but, with the cottonwood (*Populus monilifera*, Aiton,) it is being used in increasing quantities instead of Whitewood, *Liriodendron Tulipifera*, Linn. It is employed in the manufacture of pulp, and for the same purpose as the other poplars. *Populus trichocarpa* T. & G.—an abundant tree in British Columbia differs but little from the balsam poplar.

EXHIBITS:—Sections of trees, deals, dimension lumber and pulp-wood.

BLACK WALNUT—*Juglans nigra*, Linn.

Though once so abundant in southwestern Ontario, the old Black Walnut trees have almost all been cut down, though a few still remain, and younger trees which have been planted or preserved will soon augment the available supply for economic purposes, as the black walnut is a rapid grower. Plantations of this tree have been made in various parts of Ontario and western Quebec, one of the finest being that owned by Sir Henri Joly de Lotbiniere. Walnut is not at present as popular as formerly as a cabinet wood and for interior finishing, lighter-coloured material being now in vogue, but veneering made from the dark heart-wood is still used in considerable quantity, and the falling off of the supply is doubtless the principal reason for the change in fashion. Walnut is too beautiful and valuable a wood to remain long unpopular, and the money and time invested in walnut plantations will be amply repaid in the future.

EXHIBITS:—Section of tree, boards, veneers and polished panels.

BUTTERNUT—*Juglans cinerea*, **Linn.**

The Butternut grows in southern New Brunswick and westward to the Georgian Bay. The wood is much lighter in color than the walnut and is not so heavy, hard or strong, but is very durable. It is easily worked and is chiefly used for cabinet work and interior finishing. The grain is somewhat like that of walnut, so that when stained a very good imitation of walnut may be made from butternut. It is a tree of rapid growth.

EXHIBITS:—Section of tree, boards and polished panels.

ARBOR VITAE—WHITE CEDAR—*Thuya occidentalis*, Linn.

Very rare in Nova Scotia, but abundant throughout New Brunswick, Quebec and Ontario. It grows to a considerable height, but seldom exceeds two feet in diameter. The wood is soft and not strong and has never been much used as lumber, but is unexcelled for shingles. The white cedar is chiefly used for fence-rails and posts, railway ties and telegraph and telephone poles. No other wood is used in such quantity for telephone poles in Ontario and Quebec. It is very durable in contact with the soil or when exposed to the weather.

EXHIBITS:—Section of tree, square timber, polished panels

GIANT ARBOR VITAE, RED CEDAR,
Thuya gigantea, **Nutt.**

The Giant Arbor Vitae in next to the Douglas Fir in importance in British Columbia, where it attains its greatest size on Vancouver Island, along the coast and in the lower parts of the rivers of the Coast Range. It is rarely found in the dry interior of British Columbia, but is abundant in the river valleys on the slopes of the Selkirk and Coast ranges. Though

seldom found more than 150 feet in height, in circumference it rivals the Douglas fir, trees of from eight to ten feet in diameter not being rare, and they are occasionally found much larger.

It is chiefly used in the manufacture of shingles, for which purpose it is unequalled by any other wood. Formerly the shingles were made by hand, the wood splitting easily, but improved machinery has so lowered the cost of production, that comparatively few hand-made shingles are now used, though they are still in demand when a shingle of superior quality is desired. The wood of this tree takes a very brilliant polish and is well adapted for interior finishing of all kinds. So great is the variety of shading in the color of the wood that a large house may be finished in it without two rooms being alike. It is not only largely exported but is now being shipped in increasing quantities to Eastern Canada. In British Columbia it enters largely into the manufacture of doors and cabinet work of all kinds. Like all the cedars it lasts well underground and on this account is much used in the form of telegraph poles and fence-posts. The immense canoes made by the west coast Indians are with very few exceptions made of this wood.

EXHIBITS:—Sections of logs, deals, boards, shingles, polished flooring and wainscotting.

YELLOW CEDAR, YELLOW CYPRESS—
Thuya excelsa, Bong.

The Yellow Cypress is not nearly so abundant in British Columbia as the arbor vitae, nor is its circumference so great. Its height is about the same as the arbor vitae — 150 feet — and its average diameter about 4 feet, though occasional trees attain 5 feet. The yellow cypress is confined to the coast and the adjacent islands. In the southern parts of British Columbia it is not found at sea-level, the finest trees growing at altitudes of from 1000 feet to 2500 feet

Though valuable for many purposes, the wood of the yellow cypress is not extensively used at present, the cost of transportation to the sea-board being too great. On the Queen Charlotte Islands it descends to the coast. When lower levels have been cleared of other trees the yellow cypress will be utilized. Its wood is very close, and, as the wood takes a very high polish, it is greatly valued for interior finishing and for the manufacture of furniture. It commands a higher price than either Douglas fir or arbor vitae. The natives along the northern coast of British Columbia make many articles for domestic use from this wood.

EXHIBITS:—Section of tree, boards and polished panelling.

WHITE PINE—*Pinus Strobus*, Linn.

The White Pine is by far the most valuable of Canadian trees, and, notwithstanding the reckless waste that characterized lumbering operations until very recently, there still remains in Canada an immense quantity of growing timber from which vast quantities of lumber will be made.

The white pine ranges from the Martime Provinces westward through Ontario and Quebec to the extreme eastern edge of Manitoba. On the north but a few trees are found beyond the height-of-land separating the Hudson Bay and St. Lawrence watersheds. Large trees are not common in the eastern provinces, from two to two and one half feet diameter being there considered a good sized tree. In the Ottawa valley, however, and on streams running into Lake Huron, trees three and four feet in diameter are common, while larger trees are not rare. White pine is exported principally in the form of square timber, deals and boards. Its chief uses are in construction work of all kinds, and as the slabs and edgings are made into shingles and laths there is now little waste

of material. The wood is light, soft and not strong, but it is suited for a great variety of purposes as it is easily worked and free from resin.

EXHIBIT:—Sections of trees, square timber, deals, polished panels, box-shooks and interior finishing.

WESTERN WHITE PINE—*Pinus monticola*, Dougl.

None of the western pines are found in quantity near the coast and so far they have been utilized for local purposes only. The best of these is *Pinus monticola*, Douglas, which is little inferior to the white pine of the east. It is found in the interior of Vancouver Island and is abundant in the southern parts of the Coast Range where there is heavy rain-fall. In the Selkirk Mountains it is not very common but attains a considerable size on the mountain slopes. The wood is used for the same purposes as the eastern white pine.

RED PINE—*Pinus resinosa*, Aiton.

The Red Pine is not so widely distributed as the white pine, nor is it so abundant in the areas on which it grows. It is neither so tall nor so large a tree as the white pine. Commercially it is frequently not separated from it, though the wood of the two trees differs materially, the red pine being harder and stronger than the white pine, much more elastic and containing a great deal of resin. The red pine has very wide sap-wood which adds to its value as material for heavy construction work, piles, etc. It is used for the same purposes as white pine, to which it was formerly preferred and has again in recent years reached a value more nearly approaching that of white pine.

EXHIBITS:—Section of tree, square timber, deals, boards, dimension lumber and polished panels.

SCRUB PINE—JACK PINE—*Pinus Banksiana*, Lam.

Jack Pine is found from the Maritime Provinces north-westerly to the foot-hills of the Rocky Mountains, where it is replaced by *P. Murrayana*. It increases in height and girth as one travels westward, the finest trees being found between northern Manitoba and the Athabasca River, in which district great areas are covered with large trees. In Nova Scotia and New Brunswick it is small and of no value. Elsewhere in Canada it is not much used at present except for railway ties and locally where other pine is not to be had. As a timber for use in mines and for heavy construction work generally its good qualities are not yet appreciated. Recent experiments have proved that good pulp can be made from it.

EXHIBITS:—Sections of trees, deals, pulp-wood and railway ties.

BLACK PINE—*Pinus Murrayana*, Balfour.

The Black Pine replaces the preceeding species on the eastern slopes of the Rocky Mountains. It is abundant in the northern part of the interior plateau of British Columbia, where it covers great areas. In the southern part of the province it is most abundant at altitudes ranging between 3000 feet and 4000 feet. Though estimated of little value where other conifers grow, except for railway ties and firewood, it is much used for mine props and other construction work in the mining districts of British Columbia. It is admirably suited for this purpose, as the wood is very tough, and when not exposed to the weather does not easily decay. It is said to make excellent charcoal.

EXHIBITS:—Sections of trees and deals.

NOTE.—The other Canadian pines are of small economic value and are only used locally.

BLACK SPRUCE—*Pinus nigra*, Link.

The range of the Black Spruce is much the same as that of the white spruce, the former, as a rule growing in damp situations while the latter prefers drier well-drained soil. The two trees are not separated commercially and with them is included the red spruce of eastern Canada. The characteristics of these spruces are almost identical and the woods are used for the same purposes. The black spruce, to which the red spruce is nearly allied, is perhaps best suited for use as spars and masts. In the eastern provinces spruce is the chief wood used in house-building and for flooring. Both black and white spruce have been found to increase in value as pulp-woods the further north they grow.

EXHIBITS:—Sections of trees, square timber, deals, polished panels, box-shooks and pulp-wood.

WHITE SPRUCE—*Pinus alba*, Link.

Within the past few years the demand for pulp-wood has so increased that the spruces are rapidly becoming the most important trees in Canada. The value of the growing timber is probably already as great as that of all other trees combined. The white spruce ranges from Nova Scotia, northwestward to within twenty miles of the Arctic Ocean near the mouth of the Mackenzie River, and with the black spruce it forms a great part of the sub-arctic forest which extends from Labrador across the continent. The wood is tougher, stronger and more elastic than that of pine. It is now more used than formerly as lumber as well as very largely as railway ties, fence posts, piles and telegraph poles.

EXHIBITS:—Sections of trees, square timber, deals, boards, polished panels, box-shooks and pulp-wood.

ENGELMANN'S SPRUCE—*Picea Engelmanni*, Engel.

This characteristic spruce of the Rocky and Selkirk mountains is the most useful tree growing in the interior for trestle work and for heavy construction work generally. In the valley of the Columbia it is often more than 150 feet in height and four feet in diameter. The wood is very like that of the Black and White spruces and may be used for the same purposes. This was the chief wood used in the construction of the Canadian Pacific Railway from the Rocky Mountains westward.

EXHIBITS:—Sections of trees.

MENZIE'S SPRUCE—SITKA SPRUCE—*Picea Sitchensis*, Carr.

This spruce grows chiefly in the immediate vicinity of the coast, ranging in British Columbia from the International Boundary north to Alaska. In the southern part of the province it grows scattered among other trees, but in the north it is relatively much more abundant, growing sometimes in large clumps. Though averaging less in diameter than the Douglas fir occasional trees of great size are found: those cut for lumber are, however, seldom more than five or six feet in diameter. No other tree on the West Coast is used for such varied purposes, and as it is easily worked up by machinery there is a great demand for it in the manufacture of doors, window sashes, boxes, shelving and interior finishing. The wood is very white, is elastic and bends with the grain without splitting, so that it is much used in boat building, the making of light oars, staves, woodenware etc. It resists decay for a long time and like the Douglas fir, is not attacked by insects. The chief value of the Sitka spruce will, in the near future, be in the manufacture of pulp for which purpose it is not excelled by any other tree. As soon as pulp mills

are established in the vicinity of the large saw mills the immense waste entailed by the present method of sawing dimension lumber in British Columbia will be obviated.

EXHIBITS:—Sections of logs, rough and dressed lumber, box-shooks, and polished paneling.

HEMLOCK—*Tsuga Canadensis*, Carr.

The Hemlock grows in the Maritime Provinces, Quebec and Ontario. Though little inferior to white pine as rough lumber, a prejudice has for a long time existed against this wood which is only now dying out. As coarse lumber, it to-day commands almost as high a price as pine. It is one of our best woods for wharves and docks and great quantities are used annually for piles. The bark of the hemlock is that chiefly used in Canada and the eastern United States for tanning purposes.

EXHIBITS:—Section of tree, railway ties and tan bark.

WESTERN HEMLOCK—*Tsuga Mertensiana*, Carr.

The hemlock is abundant along the whole coast of British Columbia and in the interior of the province, wherever there is sufficient rainfall. Along the line of the Canadian Pacific Railway, in the Selkirk Mountains, it is very abundant, but seldom over 150 feet in height and three in diameter. On the coast it is much larger, averaging from 4 to 6 feet in diameter. The abundance of other wood of better quality has prevented the hemlock from coming into general use, and the same prejudice exists in British Columbia against the western tree, that prevailed until very recently against hemlock in eastern Canada. Though its grain is coarse, western hemlock is for many purposes, just as serviceable as other woods which cost more. Its bark is rich in tannin, but it is

too thin to be extensively used while there is such an abundance of Douglas Fir in the same region.

EXHIBITS:—Sections of trees, deals and boards. boards..

DOUGLAS FIR, "OREGON PINE," RED PINE, YELLOW FIR—*Pseudotsuga Douglasii*, Carr.

This is the most abundant, as it is the most valuable tree in British Columbia. Its range on the mainland is from the International Boundary north to the Skeena River, in Latitude 54° on the coast, and in the Rocky Mountains from the International Boundary north to Latitude 55°, though its northern and northeastern limits are not well defined. It is not found in the Queen Charlotte Islands. It attains its greatest size on Vancouver Island or along the shores and in river valleys near the coast on the mainland. There, trees 300 feet in height are not rare, the average height of those felled for lumber being over 150 feet. Trees of a greater diameter than seven feet are rarely cut, though those of eight, ten or eleven feet in diameter are not rare.

The fact that the largest trees are found near the coast greatly facilitates the transport of the logs from the woods to the mill, and, as the majority of the mills are so situated that the largest ships may load within a few yards of the saws, the cost per 1,000 feet of handling Douglas fir and other west-coast lumber is small.

The average cut of Douglas fir in British Columbia is over 50,000 feet per acre, though in some instances more than 500,000 feet have been cut on a single acre, no trees of less than two feet or more than five in diameter, being used. Douglas fir is chiefly valuable for structural purposes, being largely employed in ship-building, bridge-work and the construction of wharves. It is exported as dimension

timber, lumber, spars, masts and piles. Locally it is used for construction work of all kinds; fencing and railway ties, and in the manufacture of furniture. Its durability, when excluded from the air, adds greatly to its value for pile-work in the construction of bridges and wharves. The bark of the Douglas fir is largely employed in tanning.

EXHIBITS:—Sections of logs, square timber, railway ties, deals, boards, box-shooks, and dressed and polished material for interior finishing.

BALSAM—*Abies balsamea*, Miller.

The Balsam is a common tree in the Eastern Provinces, Ontario and Quebec, and is found in the sub-arctic forest northwesterly to the Athabasca River. The wood is very light and soft and is not durable in contact with the soil. It is to some extent used as common lumber and on account of its lightness is frequently made into box-shooks. Though not one of the best pulp-woods, it is and will continue to be cut with other trees and used for that purpose.

EXHIBITS:—Sections of trees, deals and pulp-wood.

WESTERN WHITE FIR—*Abies grandis*, Loud.

The Western White Fir is confined to the vicinity of the Pacific Coast and though it grows to great size the wood is very soft and not suited for any purpose for which strength is requisite. It is now used to some extent for boxes and light barrels and will in the future be utilized in the manufacture of pulp.

EXHIBIT:—Section of tree.

TAMARAC—BLACK LARCH—*Larix Americana*, Michx.

The Larch ranges from Nova Scotia northwesterly to the Peace River. The wood is hard, heavy and very strong. It is not much used as lumber, but is largely employed as railway ties, fence posts, telegraph poles and as knees for ships, and in fact for ship-building purposes generally. It is well adapted for use as joists, scaffold poles and rafters as comparatively small timber is capable of supporting a great weight. The Western Larch, *Larix occidentalis*, and the Mountain Larch, *Larix Lyallii*, replace *L. Americana* in the Rocky Mountains and British Columbia, where they are used for lumber, telegraph poles, railway ties and mine props.

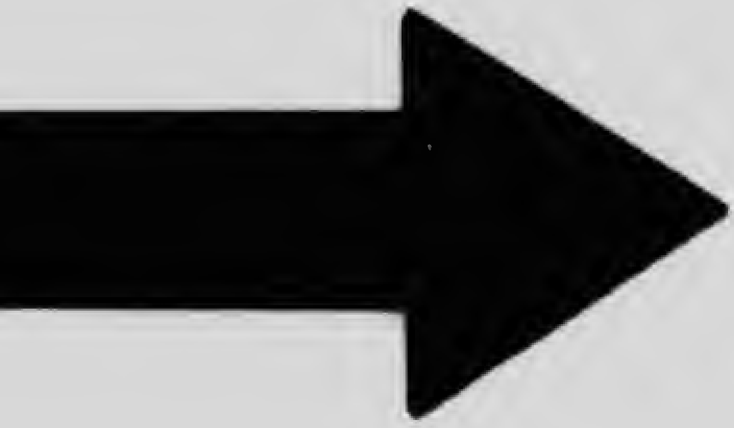
LIST OF CANADIAN FOREST TREES WITH THEIR DISTRIBUTION IN THE VARIOUS PROVINCES AND DISTRICTS.

Few other countries produce so great a variety of trees as Canada. Of the 121 indigenous species, a few are of small economic value, while others are so restricted in their distribution that commercially they cannot be taken into account. The various uses of the more important trees, with their distribution, have been given in another part of this paper, but the following list of the fifty most valuable trees, with their range, will serve for convenience of reference. The provinces or districts in which they are found are indicated by an asterisk.

No.	NAME OF TREE	P. E. I.	N. S.	N. B.	Que.	Ont.	Man.	N. W. T.	R. M.	B. C.
1	Tilia Americana, L. (Basswood)			*	*	*	*			
2	Acer macrophyllum, Pursh. (Broad-leaved Maple)									*
3	Acer saccharinum, Wang. (Hard Maple)	*	*	*	*	*				
4	Acer dasycarpum, Ehrh. (Silver Maple)			*	*	*				
5	Acer rubrum L. (Soft Maple)	*	*	*	*	*				
6	Negundo aceroides, Mœnch (Manitoba Maple)						*			
7	Prunus serotina Ehrh. (Black Cherry)	*	*	*	*	*				
8	Fraxinus Americana, L. (White Ash)	*	*	*	*	*				
9	" pubescens, Lam. (Red Ash)		*	*	*	*	*			
10	" viridis, Mx. (Green Ash)				*	*	*			
11	" sambucifolia, Lam. (Black Ash)	*	*	*	*	*				
12	Ulmus fulva, Mx. (Red Elm)				*	*				
13	" Americana, L. (White Elm)	*	*	*	*	*	*			
14	" racemosa, Thomas. (Rock Elm)				*	*				
15	Platanus occidentalis, L. (Button-wood)					*				
16	Carya alba, Nutt. (Shell-bark Hickory)					*				
17	Betula lenta, L. (Cherry Birch, Black Birch)		*	*	*	*				
18	Betula lutea, Mx. f. (Yellow Birch)	*	*	*	*	*				
19	" papyrifera, Marsh. (White Birch)	*	*	*	*	*	*	*	*	*
20	Ostrya Virginica, Willd. (Iron Wood)		*	*	*	*				
21	Quercus alba, L. (White Oak)				*					
22	" Garryana, Dougl (Western White Oak)									*
23	Quercus macrocarpa, Mx. (Overcup Oak)									
24	Quercus, rubra, L. (Red Oak)	*	*	*	*	*	*			
25	" palustris, Du Roi. (Pin Oak)					*				
26	Castanea dentata, Marsh. (Chestnut)					*				
27	Fagus ferruginea, Ait. (American Beech)	*	*	*	*					
28	Populus tremuloides, Mx. (Aspen Poplar)	*	*	*	*		*	*	*	*

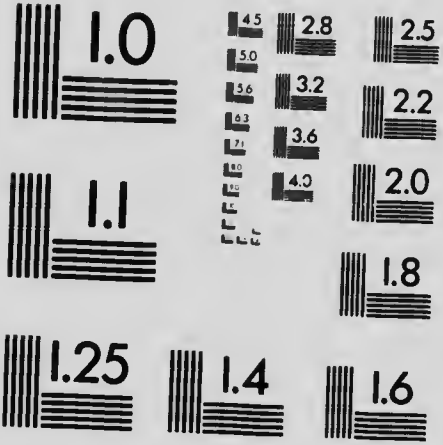
No.	NAME OF TREE.	P. E. I.	N. S.	N. B.	Que.	Ont.	Man.	N.W.T.	R. M.	B. C.
29	Populus balsamifera, L. (Balsam Poplar)	*	*	*	*	*	*	*	*	*
30	Populus monilifera, Ait (Cotton-wood)				*	*	*	*		
31	Juglans cinerea, L. (Butternut)			*	*	*				
32	" nigra, L. (Black Walnut)					*				
33	Thuya occidentalis, L. (Arbor Vitæ)	*	*	*	*	*	*			
34	" gigantea, Nutt. (Giant Arbor Vitæ)								*	*
35	Thuya excelsa, (Bong (Yellow Cypress)									
36	Pinus Strobus, L. White Pine)	*	*	*	*	*	*			*
37	" monticola, Dougl (W White Pine)								*	*
38	Pinus resinosa, Ait (Red Pine)	*	*	*	*	*	*			
39	" Banksiana, Lam (Scrub Pine)	*	*	*	*	*	*	*		
40	" Murrayana, Balfour. (Black Pine)							*	*	*
41	Picea nigra, Link (Black Spruce)	*	*	*	*	*	*	*	*	*
42	" alba, Link (White Spruce)	*	*	*	*	*	*	*	*	*
43	" Engelmanni, Engelm. (Engelmann Spruce)								*	*
44	Picea Sitchensis Carr. (Sitka Spruce)									*
45	Tsuga Canadensis, Carr. (Hemlock)	*	*	*	*	*				
46	" Mertensiana, Carr. (Western Hemlock)								*	*
47	Pseudotsuga Douglasii, Carr. (Douglas Fir)									
48	Abies balsamea, Miller. (Balsam Fir)	*	*	*	*	*	*	*	*	*
49	" grandis, Lindl. (W. Balsam Fir)									*
50	Larix Americana, Mx. (Tamarac)	*	*	*	*	*	*	*	*	*

P. E. I.—Prince Edward Island.
N. S.—Nova Scotia.
N. B.—New Brunswick.
Que.—Quebec.
Ont.—Ontario.
Man.—Manitoba.
N. W. T.—North-West Territories.
R. M.—Rocky Mountains.
B. C. British Columbia.



MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc

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Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

STATEMENT of the Value of Lumber and other Wood Products Exported from Canada between 1894 and 1903.

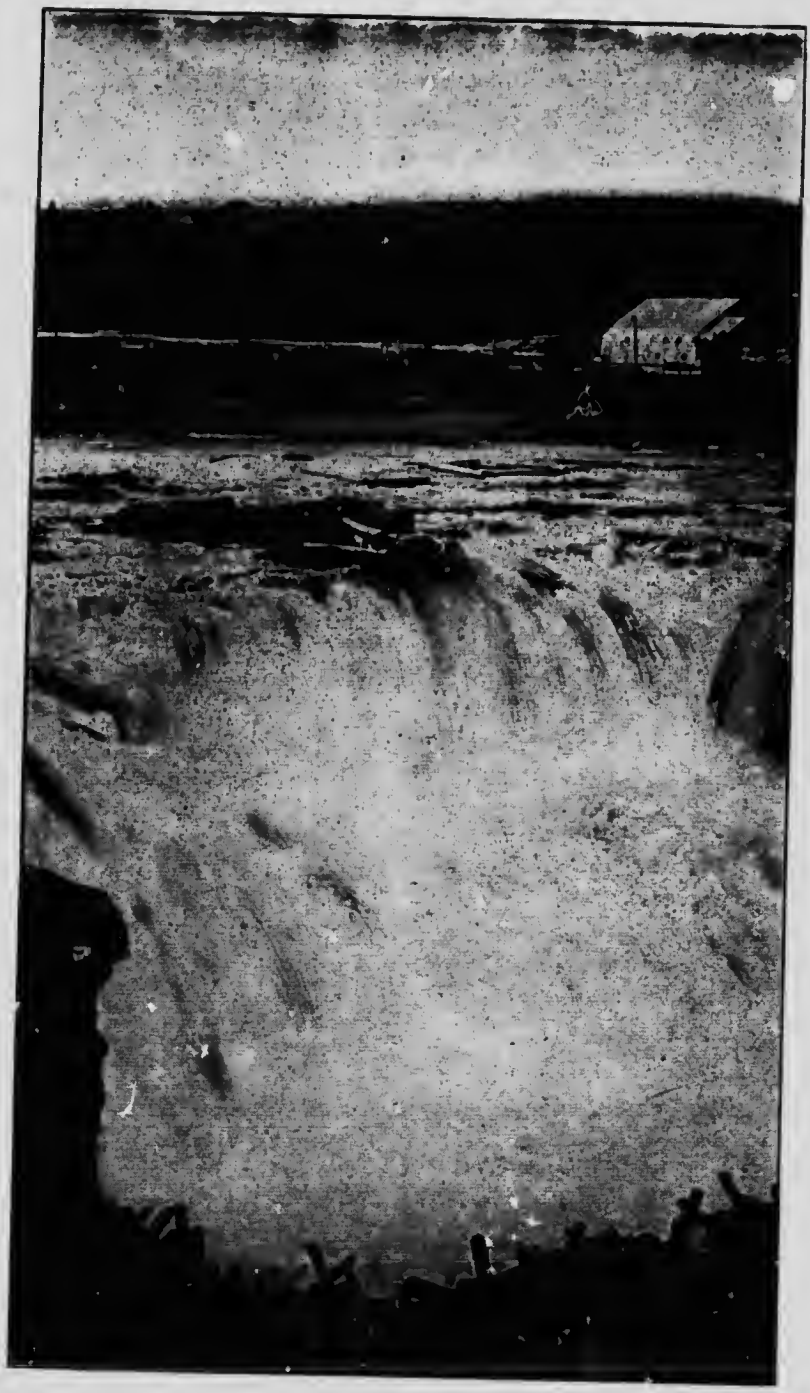
PRINCIPAL ARTICLES.	VALUES.									
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.
Wood unmanufactured :—										
Firewood	287,036	222,189	222,389	173,921	140,897	123,711	117,751	90,905	91,507	115,769
Hop, telegraph and other poles	71,789	39,730	50,503	61,232	36,126	55,182	48,872	68,720	103,981	57,910
Logs :—										
Elm	152,221	205,084	124,988	77,978	53,784	44,687	74,721	193,749	54,245	15,517
Pine	2,459,354	1,860,725	1,423,989	1,832,352	1,616,671	1,398,454	494,311	285,798	175,684	139,406
Spruce	107,282	90,990	86,075	107,073	33,885	49,769	63,078	235,826	63,555	59,781
Other	142,990	76,616	96,269	108,699	95,977	76,792	128,526	340,238	272,356	219,854
Lumber :—										
Deals, pine	2,768,238	2,369,027	3,061,537	3,313,357	3,885,448	4,193,628	3,286,598	2,857,822	3,167,383	3,653,917
" spruce and other	5,567,739	5,271,898	5,579,746	7,094,485	7,918,366	7,848,437	8,287,960	8,174,304	7,451,148	8,315,454
" ends	484,324	464,260	520,646	637,193	641,068	770,458	564,869	681,384	472,015	551,709
Laths, palings and pickets	552,171	495,860	528,395	515,276	376,281	432,323	532,106	605,603	840,714	1,041,129
Planks and boards	7,964,970	7,441,256	8,513,710	10,832,185	5,625,391	6,885,762	9,618,526	9,400,469	12,570,849	14,008,846
Joists and scantlings	187,438	284,680	402,454	437,974	246,273	234,968	235,664	389,253	367,965	451,194
Staves and headings	641,460	638,272	701,983	699,431	401,583	527,131	549,836	440,083	301,047	284,412
Shingles	754,743	689,613	899,547	1,201,562	994,438	976,361	1,131,506	1,146,150	1,525,380	1,610,143
Sleepers and railway ties	131,765	130,208	213,622	229,780	101,191	84,305	221,906	152,940	182,198	210,948
Timber, square :—										
Birch	127,591	111,305	228,876	194,080	143,623	204,180	229,554	223,380	107,861	204,690
Elm	143,809	163,866	209,409	170,689	222,529	221,663	205,131	273,579	248,296	305,090
Oak	579,557	411,476	614,028	540,288	740,502	557,592	405,608	317,286	356,913	434,141
Pine, red	74,458	34,688	108,436	52,439	62,011	61,061	65,601	143,530	30,922	219,991
" white	1,571,731	4,125,837	1,570,652	1,352,669	1,764,074	1,356,654	1,254,457	916,452	923,795	1,310,557
Other	152,606	93,603	120,999	83,948	76,343	80,584	101,694	247,747	103,818	98,764
Wood for pulp	393,260	468,359	627,865	711,152	912,041	842,286	902,772	1,397,019	1,315,038	1,558,560
Wood Manufactures :—										
Household furniture	144,702	99,150	78,607	127,752	248,317	356,490	382,623	241,826	285,276	378,093
Doors, sashes and blinds	158,196	139,402	190,004	285,161	324,610	378,206	299,359	194,168	303,687	331,976
Matches and match splints	216,038	172,159	195,987	151,276	195,779	257,981	103,961	89,130	51,704	112,048
Wood pulp	547,836	590,874	675,777	741,959	1,210,923	1,274,376	1,816,016	1,938,246	2,046,466	3,150,943
All other wood and manufactures of	1,396,958	1,743,009	1,760,306	1,312,418	1,294,956	1,587,733	1,875,185	2,115,660	1,820,454	2,027,114
Totals	$ 27,780,352	25,334,130	28,800,790	33,046,329	29,303,087	30,885,030	32,098,171	33,101,457	35,234,203	40,868,016

All other wood and manufactures of..	1,396,958	1,743,009	1,760,306	1,312,418	1,294,956	1,587,733	1,875,185	2,115,660	1,820,454	2,027,114
Totals	$ 27,786,352	25,334,130	28,800,799	33,040,329	29,303,087	30,885,030	32,068,171	33,491,157	33,254,203	30,858,016

MONTREAL RIVER FALLS, NIPISSING, ONT.

POWELL RIVER FALLS, B.C.

WABIGOON RIVER, ONT.



GRAND FALLS, ST. JOHN RIVER, N B.

PAUGAN FALLS, GATINEAU RIVER

STE. ANN'S FALLS, QUE.

MONTMORENCY FALLS, QUE.

FORT FRANCIS FALLS, ONT.

RIVIERE DU LOUP FALLS, QUE.

MANIWAKI FALLS, QUE.

HIGH FALLS, QUE.

ALBANY RIVER FALLS, ONT.

CHAUDIERE FALLS, OTTAWA.

No. 1 CHATS FALLS, OTTAWA RIVER.

No 2 CHATS FALLS, OTTAWA RIVER.

CLONHAM RIVER (Upper Falls)

CLONHAM RIVER (Lower Falls.)

CLONHAM RIVER, MIDDLE FALLS, P.Q.

AVON FALLS, WINDSOR, N. S.

CLONHAM RIVER MIDDLE FALLS, P.Q.

AVON FALLS, WINDSOR, N. S.

CHATS FALLS, OTTAWA RIVER.

WIACHEWAN FALLS, EAST COAST HUDSON BAY.

CALUMET FALLS, P Q.

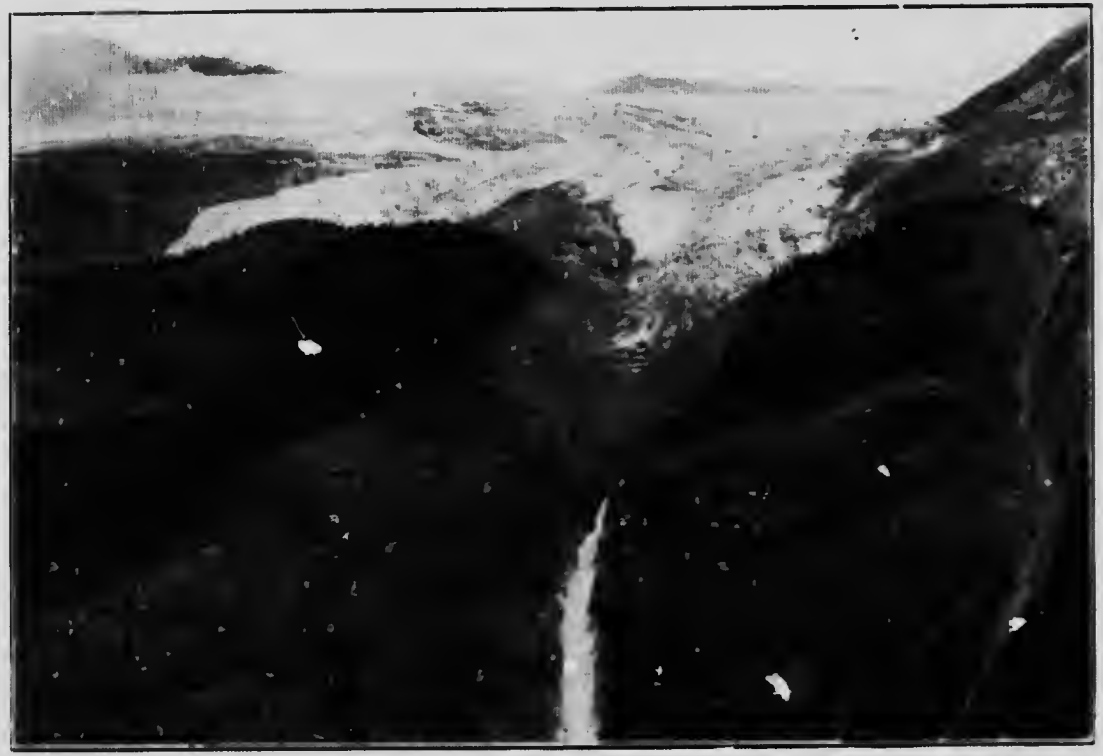
BUGABOO CREEK FALLS, B. C.

PERIBOUKA FALLS, P.Q.

SASKATCHEWAN RIVER RAPIDS

POWELL RIVER FALLS, B. C.

HUXTAL RIVER FALLS, PORT ESSINGTON, B.C.



WAPTA FALLS, BOW RIVER.

KETTLE RIVER, CASCADE, B.C., (20,000 horse power)

CHELSEA FALLS, P. Q.

56
40
56
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Four Fools

THE GENERAL COURSE OF THE PROPOSED TRANSCONTIN

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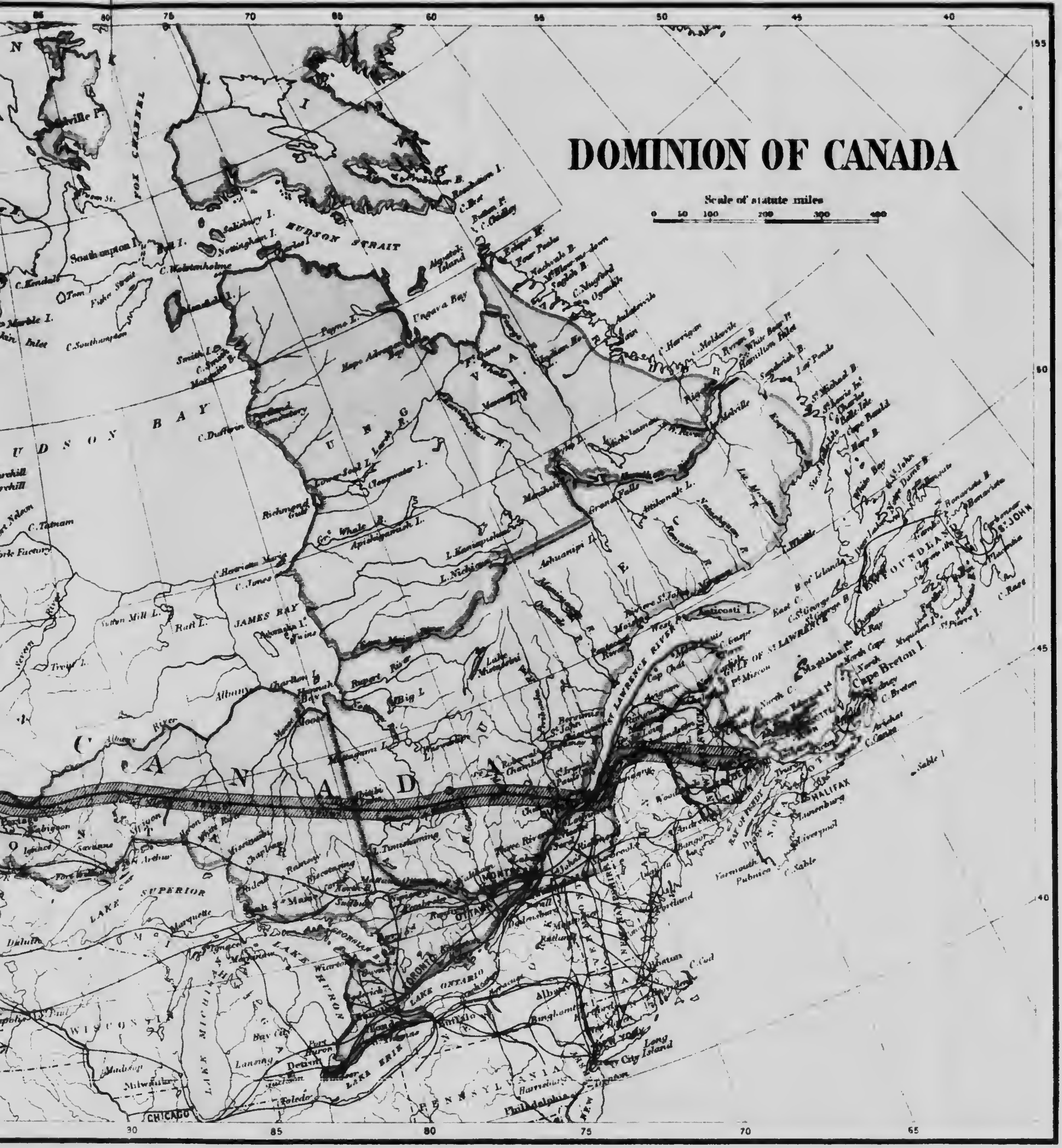

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E ROAD IS YET LOCATED.