Illustrated Canadian Forestry Magazine

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Black Spruce on the east side of Manitouk Islands, east side of Hudson Bay.
Photo by Frits. Johansen.

Larch and Spruce trees in the valley of Second River, east side of Hudson Bay.
Photo by Frits. Johansen.

CIRCULATION: 13,000 COPIES MONTHLY. ROBSON BLACK, Editor

THE ILLUSTRATED CANADIAN FORESTRY MAGAZINE

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Address all communications to Suite 224, Jackson Building, Ottawa.

Meagre Forest Resources Bordering James and Hudson Bays

By Frits Johansen, Ottawa, Can.
Geological Survey

THE "Canadian Forestry Magazine," for November, 1920, contains an article by Dr. W. T. Grenfell about the forests of the Labrador Peninsula. It treats mainly the east coast and tributary rivers, though there is a short reference to the observations made by Dr. A. P. Low and others in the western half of the peninsula. From the point of view of the northward distribution of the different trees making up the forests in the northland of Canada the east coast of James and Hudson Bays is particularly interesting; and as I made a four months trip here, to beyond lat. 56°N., in the summer of 1920, a short article about this region may be of interest to the readers of this periodical.

As the main purpose of my trip was marine investigations, on behalf of the Biological Board of Canada, and I therefore spent most of my time upon the sea, the observations of the forests made were more of a general nature, supplemented by the collecting of forest-insects and a number of photographs, some of which are reproduced here.

First as to the different species of trees occurring there:

While the Cedar (*Thuja occidentalis*) does not reach the shores of James Bay, and has its northern limit just south of the mouth of Rupert River, the two species of poplar occur all the way north to the neighbourhood of the boundary between James and Hudson Bays, Cape Jones. One of them, the Balsam Poplar (*Populus balsamifera*) has its northern limit at "Bishop Roggan River," and is limited to the heavy, marine clay-soil in the river-valleys, until about 100 miles from the coast. The other the Aspen (*P. tremuloides*) extends north to the vicinity of Cape Jones, and inland to between the upper and lower parts of Big River. It is mainly found as second growth, together with the white birch, or in clumps in the original forest.

The Jack Pine (*Pinus banksiana*) does not come down to the coast, but is found in the interior north to the south branch of Great Whale River.

The Canoe Birch (*Betula papyrifera*) occurs along the coast north to near the mouth of Great Whale River, and is found inland at the head waters of the south branch of the same river. The most northern representatives of it are clumps of small trees, and north of the vicinity of Lake Mistassini they are not big enough for canoe-making, so birch-bark has to be imported from farther south, for the use of the Indians there.

The Balsam Fir (*Abies balsamea*) is the typical tree around the larger streams and lakes, and extends north to the vicinity of Great Whale River.

The three other species of trees occur throughout the wooded part of the peninsula.

Of these the White Spruce (*Pica alba*) seems to depend, for its occurrence, particularly upon the marine deposits, whether sandy or clayey soil, and is not nearly so dominant a tree as in the western part of the subartic Canada (see "Can. Forest. Journ.," for July, 1919).

Balsam Fir Prevails.

The Black Spruce (*Picea nigra*) is extremely common upon both sandy, hilly, or swampy soil, and it has been estimated, that it forms about 90 per cent. of the forests, up there. To the south its growth is very thick, but farther north more open, and the trees are better developed, with the branches spreading, as in the case of white spruce. It will be seen from the accompanying pictures, that even near its northern limit the trees reach a considerable size, on protected places of the mainland and large islands. Its insect-pests, however, follow with the tree all the way north, as proved by the several species of bark-beetles I collected from it at various localities from Charlton Island in south to lat 56°N., and which have later been kindly identified by Dr. J. W. Swaine, of the Department of Agriculture, Ottawa. Along the coast the most northern spruce-trees are represented by a scattered growth of perhaps 50, more or less dwarfed trees at the foot of the cliffs on the north-side of the entrance to Richmond Gulf, but a little inland in the same vicinity the growth becomes much more extensive, and the trees better developed.

Finally the Larch (*Larix americana*) extends as far north as the black spruce, though mainly in swamps and along the rivers, and the trees are surprisingly well developed, even at their northern limit. They generally grow more or less single, scattered among the black spruce, or flung out over the river-valleys and islands, so that the lovely shape of each tree and its delicate, light-green needles stand out. Unfortunately it is in the southern part of the peninsula almost totally destroyed by the ravages of the imported, European Sawfly (*Nematus Erichsonii*), which seems to be spreading north and east-ward. Particularly the large trees are also attacked by bark-beetles (*Dendroctonus simplex*, etc.)

Fires From Careless Indians.

It may be said in general that no commercial timber occurs in Hudson Bay, and even in James Bay the lumber for the small saw-mills found at Fort Albany, Moose Factory, and Rupert House, is cut some miles up the river each place. There is however any amount of trees suitable for spruce-deals, not to speak of pulp-wood, much farther north along the east coast of James Bay, but it should be remembered that the rivers here present many obstacles for transportation, and their upper reaches are largely unknown, except to a few Indians.

During the last fifty years or so, very extensive forest fires have destroyed almost half of the trees in the interior of the peninsula, springing up every summer, largely owing to carelessness on the part of the Indians making fire-signals or leaving camp fires behind. Much valuable timber has thus been destroyed, without anybody benefiting by it, the second growth of black spruce, jack pine, birch and aspen not being nearly so good as the first. There is no fire protection nor representatives of the provincial or federal governments in the whole area of James and Hudson Bays treated here.

A characteristic feature of the forests along the rivers and lakes up there is the dense undergrowth of shrubbery, composed mainly of willows, alders, viburnum, etc., with "Labrador Tea," "Laurel" and other smaller bushes in the open glades further into the woods. In the southern part these bushes also occur at higher elevation, above the tree-line, and are accompanied by the dwarf-birch on open places towards the north. Particularly in Hudson Bay, where the woods are more open, and often are found only on swampy places, the bottom between the trees is covered by a thick mat of *Sphagnum-mosses*, with at least as heavy a coating of reindeer-moss (*lichens*) on the open stretches. Beyond the limit of trees, in the northern part of the peninsula the shrubbery is made up almost exclusively of the artic species of willows and birches, well developed on protected places, but dwarfed and with a prostrate growth where exposed to the wind.

While along the east side of James Bay the woods are practically continuous from near the beach inland, they become northward, in Hudson Bay, more and more scattered, and the trees are found mainly in "pockets" here and there. Of the larger islands in James Bay those centering around Charlton Island are heavily wooded, but the Twins and the smaller islands farther north have only a few, scattered and dwarfed

spruce-trees, similar to those found upon the islands in close proximity to the eastern shore of the northern part of James Bay.

Birds in the Far North.

Certain species of birds characteristic of the woods are found as far north as the trees go; and even where the latter are dwarfed song-birds will build their nests in them. Beside their great importance to the natives and other travellers in the region in question, by furnishing material for camping and implements, the trees have an aestetic value which cannot be overestimated. They give colour and relief to an otherwise dreary coast; and I have seen few more beautiful sights than the wide expanse of Richmond Gulf, bordered by many-coloured rocks, with groves of dark green spruce growing in pockets along bays or on protected points, and reflected in the clear, blue water. There is here a scenery which has evoked the enthusiasm of the comparatively few white men who have visited it; and which might very well in the future be made a reservation for the benefit of all those who love outdoor life. Its protected location, wealth of marine life, and possibilities for hunting are fully appreciated by the Eskimos living here all year round, and who know far better than many white men how to utilize their country.

Along the east coast of James Bay the forests exhibit in the fall a riot of colours impossible to describe. The dark green of the conifers, the orange-yellow of the birches and poplars, and purple shrubbery are only the extremes and dominant colours along a coast which with its innumerable islands and inviting bights makes a passer by feel like in fairy-land. It was my good fortune, by going down the Missianibi, and back up the Abitibi Rivers, to follow from day to day the transformation of the woods through the summer to their defoliating in the fall.

But most often do I like to recall those brave, little, shrubby trees on the many islands and windswept coast of Hudson and James Bays, standing up, firmly rooted, and of so fantastic a shape, against a clear sky at sunset. May they be spared, as monuments of endurance, during any development of the country, which may take place in the future!

Ottawa, Can., March, 1921.

This looks like a real national asset—Spruce on the shores of Highwood River, Alberta.

A roadway glorified! Ontario will in a few years possess 1,800 miles of such highways. Room for wires but no mutilation of trees.

Beautifying the Provincial Highways

By Henry J. Moore, Forester, Public Highways Branch of Ontario

IN conjunction with its policy of good roads, the Ontario Government have established a policy of Beautiful Roads. Good roads are an absolute essential from the view point of national progress which means the development of our natural resources. The creation of industry. Better homes and better living conditions, thus, fewer homes for the destitute to be maintained, lower tax rates and better financial conditions. Beatuiful roads are an absolute essential from the viewpoint of spiritual progress. The development of beauty to inspire the soul, to fill the minds of men and women with lofty thoughts, to make them forget their selfishness, to drive out sordid thoughts and to educate the children who will be the citizens of the next generation.

Beautiful roads mean increased farm and suburban property values, more valuable on account of the asset of beauty which previously did not exist, more desirable as residential areas on account of the refining influence of their beauty, more attractive to tourists than roads that are not beautified, and thus altogether more desirable. Beautiful roads are essential if for no other reason than for the fact that men and women live their lives upon them and the expense of beautifying them is justified for this reason alone. What a world this would be were there no beauty along the main arteries of life, along the great human highways. No trees, birds or flowers to cheer and to gladden? What a calamity it would be were all of us to consider the road merely as a medium for making money, as a means of getting quickly between two points, forgetting that it should be the thing we live. Beautiful roadways in Ontario will be an asset, the value of which cannot be comprehended in terms of money.

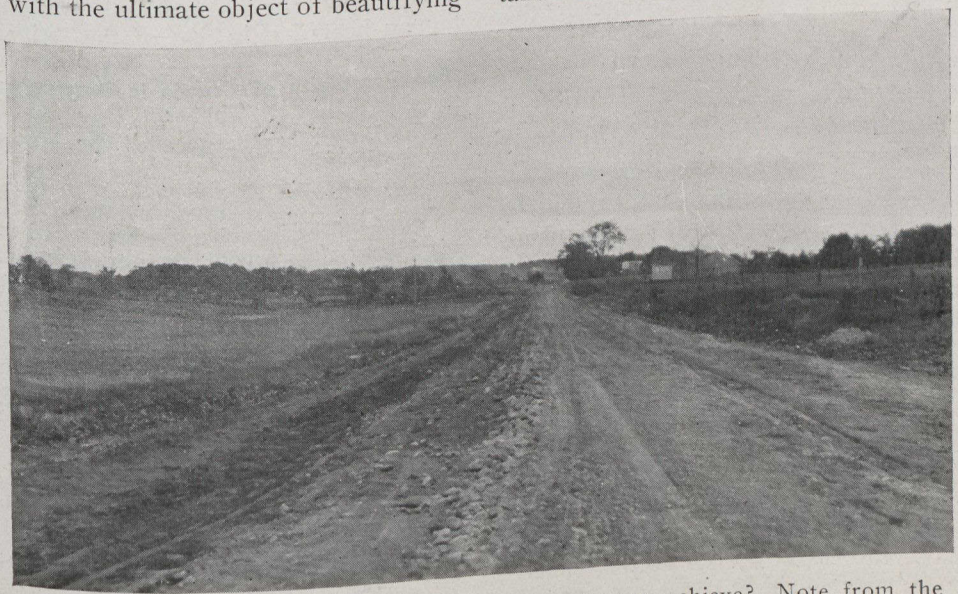
Treeless Roads Mean Dreary Travel.

Why should not the main roads of Ontario be beautified. Why not those of every province? To-day less than 25 per cent. of the total length of the 2,000 miles of Provincial Highways in Ontario are tree lined, 15 per cent. of these trees are diseased or are out of proper alignment,—leaving only approximately 10 per cent. in good health, and in satisfactory positions. To align beautiful trees along these main arteries, or to lay out park spaces at intersections will cost the Province a comparatively small sum, and as this cost will be distributed over many years

Good roads and beautiful roads are essential to civilization. Tourists who pass along this road cannot help but be impressed with its grandeur.

it will be negligible when considered in the light of what has formerly been said in this article.

The actual work of beautification started during October of last year (1920) when planting operations were commenced on the Kingston Road between Toronto and Port Hope, thirteen miles of trees being set out, and a small park area near Port Hope known as Welcome Corner was beautified with trees and shrubs. During the present year planting will be resumed on this Highway with the ultimate object of beautifying it entirely between Toronto and the Quebec border, a distance of approximately 280 miles. A small area at an intersection near Cobourg is to be beautified during the year. Planting will also be undertaken along the Queenston-Hamilton Highway, another gateway into the Province, and will be continued through the various years until the distance of approximately 50 miles is completed. Along the Niagara-Falls-Windsor and western branches of the Provincial Highway system planting will be undertaken as the sections are completed.



Is this the best in road-making that a prosperou s county can achieve? Note from the other pictures the difference made by tree planting.

The provincial Highway leading to northern points will receive attention in due course but little beautification will be attempted during the present year as the construction of these has not reached the stage at which the work may satisfactorily be done. The approaches to one or two towns and cities will however be given attention. Sarnia, an extreme north western city, having expressed a desire to co-operate in the work, the approach will be planted. Chambers of Commerce, Municipal Councils, Horticultural Societies and other prominent and influential bodies have entered heartily into co-operation in the scheme of beautification, and are rendering splendid aid to the Department.

Will the necessary work of maintenance be very expensive? No not so great. Trees once established do not require exceptionally great care if they are properly pruned when planted, and sprayed when insects menace. Much of the work of cutting grass and any weeds along the beautified roads it is hoped will be done by adjacent residents. Community organizations are being formed and men and women have offered to undertake the supervision of the maintenance in their particular localities. If each resident will cut the grass along his or her frontage, much will be accomplished, and considerable expense be saved the Government.

Helping the Householder.

What is the Department of Public Highways prepared to give in exchange for this service? It will plant the necessary trees and shrubs along the road side, and to every resident along such highways who cares to ask for a plan to make possible the beautification of their own property, that is, the frontage between the houses and the fence line along the road, such a plan will be given. In this way not only may the planting strip along the road be beautified but the front lawn of each farm or suburban home be beautified. The resident will, however, have to purchase the trees or shrubs to plant on the private property.

Will cattle be allowed to stray on the roadways and be allowed to injure the trees? No, the law to prevent such a possibility will be put into effect so that no injury may accrue. Neither will the pruning of trees, cutting, mutilating or injuring in any way be permitted. The Resident Engineers have received instructions to warn any one who attempts to harm or to interfere with the trees and shrubs, to desist. Failure to comply will result in the law taking its course. There already being a law in force, and a penalty will be inflicted. In this matter as in all others Municipal bodies may be of great service to the Department of Public Highways, which is really their Department and which is exercising its help and influence to change the places in which they have their being, into places of beauty.

In the choice of trees permanency will be largely the deciding factor. Trees of long life and of great durability will largely be planted. Red and white Oaks, Black Walnuts, Hard Maples, Elms, Native Planes and White Ash, will grace the roadsides away from the towns and cities. Those which are largely indigenous to a particular locality will be used. At the approaches to cities where an air of artificiality pertains many of the exotic shade trees may be planted such as Norway Maples and Oriental Planes to supplement the native trees, but in no case will exotics be planted out in the country along the roads.

The Canadian Highways should be beautified by Canadian trees and when so beautified will stand as examples of national usefulness and of national beauty, typical, unique, and worthy of a great country now throwing off the cloak of apathy and responding in the fullness of its great soul to an inspiration. Surely the fruits of this inspiration will be such as to inspire those who follow, for its source is not in the human heart but in that of the Deity.

The Prosperity of Canada is Propped up on Timber.

The Forest has been called the Mother of Civilization.

At whatever point you make a contact with Canadian industry—whether the farm, the mine, the fisheries, manufacture, whether the machinery of production or distribution, whether you build ships, grow peaches, or read a newspaper you establish your dependence upon the Canadian Forest and the materials and services rendered by it.

Every reader of this is a shareholder in Canada's forest resources and a responsible partner in their protection against fire. Therefore:

This is a good thing to keep in mind next time you are in or near a timbered area:

No forest can resist your unextinguished campfire, your tossed-away match or lighted tobacco.

Put out every form of fire in a forest—Dead out!

Not because it is the Law, but because it is Right.

How A Prairie Town Built Itself A Park

THE treeless prairie towns and villages suffer a handicap in the establishment of parks through the lack of any wooded areas where a start might be made. While the value of parks is generally recognized and land is frequently available the first cost of the improvements and the annual cost of maintenance, generally unknown quantities, stand in the way of the ambitions of the community.

The experience of the Town of Davidson related below will show one method how, at a relatively small outlay, a small central park can be established and maintained.

According to Mr. H. G. Arnold, Chairman of the Parks and Streets Committee, a new park of nearly one and one-half acres in area was laid out last year adjoining the site of the town hall. The land was bought up at a tax sale, and the cost of the same, outside of the value of the land, has been about $650 made up as follows.

Fencing two strands of smooth wire	$ 36 00
Ploughing, etc.	20 00
Cinder walks	18 00
500 six to seven foot trees	175 00
400 shrubs, 4 feet	160 00
80 pounds lawn grass	33 00
One pound Caragana Seed	6 00
Upkeep for one year	200 00
	$648 00

The trees planted were chiefly Manitoba Maples, Elms and Ash, and the shrubs used were Lilacs, Spireas, Honeysuckle (*Lonicera*), Alders, Russian Olive, Amorpha and Flowering Currant.

The cost of the work has been borne by the parks fund and the town together, the parks fund being derived from the proceeds of an annual concert.

This unique method of providing for the annual upkeep has again proven a success as at a Burns' night concert recently held, the sum of $220.50 was cleared. As Mr. Arnold says: "This year the ratepayer has already paid for the upkeep by patronizing the concert and he had a good time as well; also largely helped by the country people who take as much interest in it as we do if one puts the matter up to them in a proper manner."

FARMERS USE 46% OF NATION'S WOOD PRODUCTION

"AGRICULTURE is the greatest wood using industry of the United States," said Colonel W. B. Greeley, Chief of the United States Forest Service. "Forty-six per cent. of all the wood which the country consumes annually is used on its farms. The yearly lumber bill for farm structures and improvements aggregates six and three-quarters billion board feet! Farm requirements for boxes, barrels, and other articles manufactured from wood call for nearly four billion board feet additional each year. Add to these requirements the eighty million cords of fuel wood consumed annually by farmers and over a billion cubic feet of fencing material and it is easily seen that farmers have a greater interest in an assured supply of timber at reasonable prices than any other class of American citizens.

"The farmer is the most independent of anyone in the nation when it comes to food. He might be equally independent in the matter of timber. He owns, in the aggregate, more feet land than the lumbermen and all other private owners combined. Farm woodlands reach the enormous total of one hundred and ninety-one million acres and comprise two-fifths of the forest area of the United States. East of the Mississippi River they cover one hundred and fifty-three million acres, or forty-five per cent of all the forests. A rough estimate places the timber standing in the farm woodlots of the Eastern States at three hundred and forty billion feet, or forty per cent. of the timber in this region. And this quantity includes over half of our remaining hardwoods."

North China and Its Wasted Forests

Two years ago, writes Mr. S. R. Thompkins, of Lethbridge, to the Forestry Magazine, I had the opportunity of a journey through North China from Harbin, in Manchuria, as far south as the Hoang-Ho, and during that time the one thing that struck me most forcibly was the imminent peril in which humanity lives in this corner of the world as a result of destroying the original forest cover. From Shanhaikwan, where the railway pierces the Great Wall, the traveller sees at varying distances to the west mountain ranges standing up gaunt and forbidding and grey against the sky, while at every stream he crosses there is abundant evidence of the destructive forces let loose over the land by these same mountains after every rain; in the intervals between the river beds are practically dry.

A great waste of sand at the mouth of one of China's dry rivers. In Manchuria great areas south of Mukden are covered with sand-dunes—the sand necessitates the employment of special gangs of coolies to keep the tracks clear. Around Pekin and Tien Tsin in spring before vegetation is advanced, the soil being dry and fine, responds to every breath of wind, and for days the air will be filled with dense clouds of dust—soil drifting far worse than anything in Western Canada.

Not China, but Canada. We have about 1,000,000 square miles on non-agricultural soil turned into a waste like this.

DEFORESTATION AND CHINA'S TROUBLESOME RIVERS.

A picture of a river in April taken to the north of Tien Tsin. This river has a trickle of water in it, but many are absolutely bone dry at this time of year.

The other side of the picture shows the result of a previous year's inundation along the Haong Ho. The view was taken looking along the dykes. It is almost impossible to confine the tremendous volume of water that descends during the wet season from the mountains, and a flood is liable to be attended with disastrous results.

That China will support trees is quite apparent from the number of sacred trees everywhere in evidence. The picture shows a sacred grove in one of the very numerous graveyards. These trees would long ago have succumbed had they not been protected by their religious associations. The area covered by these groves is of course infinitessimal as compared with the total land under cultivation.

Precautions in Planting Shade Trees

By John Mackintosh, Acting Parks Sup't of Regina

"THE hole or pit which is to receive the tree," advises Mr. Mackintosh, "should be dug to the depth necessary according to the size of the plant. It should be large enough to get all the roots spread out and not closer to the edge of the pit than four to six inches.

"The general practice is to dig a hole about four feet in diameter to the depth of one foot six inches. The soil in the bottom is then broken up to a depth of another four to six inches to provide drainage in case of excess moisture, the rootlets being very susceptible to either excess moisture or excess drought.

"The material from the pit should be well broken up as it is thrown out, so as to get well aerated and release the plant food on which the rootlets will rely for future development.

"Having selected the variety of tree to be planted it is important to ensure its being planted in the best possible condition. The tree should not have been dug so long that its roots have become dried by the sun. Before planting immerse all the roots in a barrel of water for ten minutes or so. Examine the roots for shattered ones, which should be cut clean across. Reduce the top so as to have only as many branches as will give the tree enough reserve sap to supply the newly-formed roots.

"In planting or setting, the tree should have the very best of care. The pit should be refilled to such a height that the tree will be planted not more than six inches deeper than it stood in the nursery. Too deep planting must be carefully avoided especially in the case of elm or ash.

"The roots should be evenly spread out across the surface of the soil dipping them slightly towards the edge of the pit. They should then be covered to a depth of six inches with the finest of the excavated soil. From this depth up to the level of the surrounding earth, the soil should be firmed with the feet. The remaining soil loosely placed over the top of the pit will form a basin.

"If the weather is not too dry, the basin filled with water twice at time of planting should provide sufficient moisture. Spraying the tree every evening at sundown and in the mornings before sunrise should ensure a successful job."

The Loyal Spirit of Our Members

A Few Typical Letters from the Canadian Forestry Association's Mail

I feel that the Association has a distinct place in our national life and ought to be supported. JOSEPH N. SHENSTONE, First Vice-President, the Massey-Harris Co., Toronto.

We appreciate very much what your organization is doing and are heartily in sympathy with the work carried out by the Canadian Forestry Association. NICHOLSON LUMBER CO., Burlington, Ont.

I am delighted with the Forestry Magazine and am pleased to be a member of the Forestry Association. Being a woodranger myself, you can imagine how these articles appeal to me. H. J. D. HAMMOND, Dryden Ontario.

I have been greatly interested in the improvement made in the Canadian Forestry Magazine and to learn through it of the excellent work you have been doing in the interest of forest conservation. I wish you a very successful year in your arduous and uphill work. W. G. CLARKE, Bear River, N.S.

It is the best value of any publication I receive. You are doing a splendid work in endeavoring to educate Canadians in the value of their timber heritage. L. A. GREEN, Sault Ste. Marie, Ont.

I must thank you very much for being so kind as to remember us boys down here in bed with your wonderful paper. We all join together to thank you as we appreciate it beyond expression of words. GEORGE T. WATCHORN, Ward E 2, Bed 6, Military Hospital, Ste. Anne de Bellevue, P.Q.

I feel you are leading in a grand and noble work, because you are doing it for the future generations of Canada. May you never become weary in well doing. DANIEL T. HEISEY, Kitchener, Ont.

I take a great deal of pleasure and instruction in reading the Forestry Magazine. I admire the good work you are doing for Canada. L. R. JARVIS, Toronto, Ont.

I am pleased to continue as a contributing member, knowing something of the good work that the Association has done and how necessary it is in the interest of our common heritage that it should be continued. MARK BREDIN, Toronto, Ont.

I may state that I enjoy the Forestry Magazine and derive a lot of benefit and valuable information from it. A. J. WASKETT, Revelstoke, B.C.

I very sincerely congratulate you upon the wonderful success of the Association during the past year. It certainly reflects the greatest credit. PERCY B. WILSON, Sault Ste. Marie, Ont., (President Can. Pulp and Paper Assoc.)

The Association is doing magnificent work and is deserving of the strongest support possible from all Canadian interests. COL. J. S. DENNIS, Montreal, (Chief Commissioner of Colonization and Development, C.P.R.)

Great Results from Jack Pine Planting

By M. J. Stevenson, Morris, Manitoba

THIS tree is found growing over a very wide range. It represents the extreme limit of hardiness of all the pine family. It grows from northern Quebec to well within the Artic circle down the McKenzie river almost to the limit of tree growth. No evergreen grows faster while young, than this. The white and Norway pine will overtake it sooner or later, but for the first 25 or 30 years of its life I have never seen an evergreen that will equal it. This tree has been called the fire pine, from the fact that a great many of the cones hang on the tree for years unopened until a fire sweeps through the forest melting the pitchy covering allowing the cones to open. The seeds are scattered by the wind and an even aged stand is the result. It starts to bear cones while very young. I have often found young trees 3 feet high loaded with cones. It seems to grow with equal vigor on sand or clay and will grow on sandy sterile soil where another evergreen could not exist. It is easily grown from seed. I have grown a great number from seed with good success under prairie conditions.

Rate of Growth.

In 1888 in eastern Manitoba a jack pine forest about a section in extent was entirely killed by fire; not a green tree was left over the whole area. This was an even aged old growth stand one hundred and thirty years old, apparently having come in after an Indian fire. These trees were from 10 to 20 inches in diameter and from 80 to 90 feet high. This timber was all cut within 4 years. By this time the young jack pines seedlings were as thick as wheat over this area. These trees got leave to grow till 1897 when they were again entirely destroyed by fire. This fire was an intensely hot one owing to the amount of tops and debris left from the former forest most of the young trees were entirely consumed and I thought as I walked over the blackened waste this is the last chapter in the history of this jack pine forest. But no! Going over this area 4 years after the last fire I was agreeably surprised to see millions of the young hopefuls again sticking their heads up through the snow. The last time I saw these trees was in 1908. What a revelation! Many of them were from 18 to 20 feet high by actual measurement and from 3 to 5 inches in diameter. They had far outstripped the birch and poplar growing with them and these trees had the advantage in that in nearly every case they were found growing from old roots. Even on the heavy clay loam of the Red River valley their growth while young is remarkable. A plantation of this species set out 8 years ago are now 12 to 16 feet high. Some White and Norway pine set out the same time under the same conditions are not more than half this height.

At least two thirds of all the tie-timber used by the railroads in Manitoba is jack pine. It makes a good tie, lasts fairly well, especially the old growth. It will grow to tie-timber in from 50 to 75 years. It makes good lumber; a great deal of it is sawn and sold as Norway and White pine in the west. The old growth makes excellent fuel being as a rule very pitchy. And now since it is known to make good paper great inroads will be made on the jack pine forests to supply pulpwood, as it will grow to pulpwood size in about half the time it takes the white spruce. In the early days there were splendid stands of this species but repeated fires have almost exterminated it where it once reigned supreme. In eastern Manitoba we have vast areas specially suited to the growth of this species which today is producing nothing but grass and useless brush. Now when our timber supply is on the wane we find a tree so desperately eager to help us out we ought at least to protect it from fire.

UNITED GRAIN GROWERS

Winnipeg, April 5, 1921.

"The Directors appreciate the splendid work which is being done by the Canadian Forestry Association."

E. J. FREAM,
Secretary.

A promising forest of fir killed by a single forest fire. The next step is an invasion of insects, then a harvest of windfalls and after that stage, a few fires and then—desert.

Importing Tree Seeds--A Question?

I AM a very interested reader of your Forestry Magazine and have seen in your last number under the annual meeting of Forest Engineers that at this meeting, a resolution was passed advising that the duties on seeds and nursery stock for forest planting should be removed. Allow me, in connection with this, to sound a note of warning which I should like you, if you find it advisable, to print in your magazine.

I am a Forest Engineer, a graduate of the University of Copenhagen (1904), and since my seventeenth year have been occupied with forestry work in Sweden and Denmark. I am at present in charge of the forestry work of Price Bros. & Co., Lt., on the limits supplying their pulp and paper mills at Kenogami and Jonquiere.

During my practice as Forester, I was for four years the owner of a private forest nursery which mainly supplied the Danish Government forests with seeds, and nursery stock. At this time I got in connection with most of the European seed merchants and nursery owners. It might be of interest to your readers to know from where the European seeds and nursery stock is mainly supplied.

Nearly all the seeds for the nurseries are sold by two big firms, Helms and Sohne, Thuringen, and J. Rafn, Copenhagen, Denmark. They are both very big firms who supply a number of smaller firms, who themselves might collect some few species of local seeds, but mainly depend on these two big firms for all their American, Siberian, and European seeds. If required, these firms will supply you with seeds from any locality and race you might want, but generally speaking, the most common species are either collected in Germany or in Scandinavia. The Scandinavian seeds are mostly from the South of Sweden and the coast regions of Scandinavia; the German seeds from Southern Germany.

These seeds are then, mostly without any specification, sent out to the nurseries and seeded. The nurseries in Europe have specialized. Most of the young seedlings are made in Belgium, Holland and Northern France, especially in the Department Calvados. The climate here is mild, the loam black and very rich, of a swampy nature, where water is always found very near the surface. The watering is most often done by opening or closing ditches running in a draining system through the

marshy land. These nurseries themselves often collect the seeds of the most common species for their own use. On account of these very favorable conditions, the nurseries are able to produce a beautiful even-looking product of an uncommonly rapid growth. These young seedlings are then either sold or transplanted for further cultivation. Most of them are sold to the other big nursery centre of Europe, Halstenbeck in Holstein, who transplant them and sell them as four years old. The soil in Holstein is very sandy without rocks. The country is flat and very easily cultivated. For miles and miles you can drive through nurseries all cultivating young forest trees, hedge-plants and roses. The ground is very valuable, and divided into a number of small nurseries. On account of the valuable ground, the nursery owners are obliged to transplant their young trees with exceedingly close spacing, often with not more than three inches between the rows, and one inch between the plants in each row, thereby forming a plant of a very stringy appearance. In order to push the plants from this sandy soil, the nurseries are using a great amount of fertilizers, often, per acre, a thousand pounds of superphosphate, four hundred pounds of kali, and six hundred to a thousand pounds of chili-salpeter. These nurseries in Holstein have also big seed-beds, especially of conifers, but as a rule the seedlings are made in France, Belgium and Holland and are transplanted in Holstein. From these two plant centres is supplied nearly the whole world. Immense quantities have been sold to England and to the United States. In Denmark, Scandinavia, and Germany, a forester who has to buy plants from the nurseries is looked upon as a failure. It ought to be the same here in Canada.

Suppose you buy seeds from the mild misty climate of Norwegian fjords or from the super-cultivated marshes of Holland or Belgium or from the Baltic shores of Northern Germany or plants which have passed their first stage of life in the hot beds of Holland or Belgium, or in Holsteins sands, unnaturally fed on fertilizers, and transplant these in your nearly Arctic climate, in your dry inland air, what result do you expect? In those nurseries, all kinds of fungi and parasites are in abundance. You have already imported the white pine blister rust. If you buy plants to any extent from Europe, you will import all kinds of diseases, both fungi and insects. You will not advance the cause of Forestry in that way. Allow me, in this connection, to point out that you have been importing a number of white spruce seeds and plants from Europe, especially from Sweden.

The mother tree is *Picea alba*, a species of spruce very inferior to your beautiful *Picea Canadensis*. The tree, *Picea alba*, originated from North America. It was imported to Europe about the year 1700. It has degenerated to a small poorly-tapering tree, which is never used except as a wind break.

In forestry, as in farming and stock-raising, the hereditary principle is of great importance. A tree from a coast climate will not thrive in an inland climate. In Europe, we have seen, that if we try to force nature, by planting trees in climates where they are not at home, they will be destroyed by all kinds of parasites. In Denmark, which has a coast climate we imported Austrian Pine from the inland climate of Austria, and planted it in great quantities on the moors of Jutland, thousand of acres. You will now hardly find one acre with Austrian Pine. They have all been killed by *Lophodermium*. We planted thousands of acres with larch (*Larix Europea*) from the inlands of Europe. They were all killed by larch cancer (*Dasyscypha Willkommii*). It seems that the later imported Japanese Larch (*Larix Leptolepis*) from an island climate will go free of the parasite. We tried your white pine, they are all killed by blister rust (*Cronartium ribicola*). We have imported *Pinus Murrayana* and *Pinus Contorta* which in reality are the same specie (lodgepole pine) the former growing on the coast of British Columbia, the latter on the other side of the Rocky Mountains, in an inland climate. The first thrives well the latter is killed by *Lophodermium*, and a moth (*Tortrix buoliana*). I could continue naming examples showing the importance of this question.

The best thing for Canada to do is to collect its own seeds from its own trees, from the same locality where the trees are to be planted or seeded, but collect them from the finest and best specimens of the race. Try to improve your poor race of Black Spruce; avoid cultivating your poor

race of Grey Spruce; collect seeds from White Pine which show the strongest resistance to blister rust. In other words, select your seed-trees with the utmost care. You will thereby avoid making all the mistakes we have made in the old country.

Hoping that this article may prove of interest, I remain,

Yours truly,
OTTO SCHIERBECK.

Can. B.C. Forests Stand Coming Strain?

By R. W. Hibberson
(for 17 years a British Columbia timber estimator and surveyor)
in an address before Associated Boards of Trade, Vancouver

Within ten years our coast forests may be subject to treble present demand

"To the average man in the street," said Mr. Hibberson, "British Columbia is all timbered. He travels by train through the interior of British Columbia, or by steamer up the coast, and everywhere looks green; therefore it must be timber. If you told him there is every danger of timber famine in British Columbia within fifteen years, you would be ridiculed. But there is a very decided danger of a timber famine, and before many years lapse we will all begin to feel it.

"Ten years ago the centre of the logging industry was within a radius of fifty miles of Vancouver. To-day it is from one hundred and fifty to two hundred miles from Vancouver, and in some cases operators are towing logs as far as six hundred miles to their mills, and an average tow of two hundred miles is quite common. Ten years ago the average cost of logging was $5 per thousand feet; today it is nearly $20 per thousand feet, and in some of our cedar camps last year the cost was over this fig-

"Nineteen-nineteen figures give lumbering production as $70,000,000, one-third as much again as mining and fishing combined, which only total forty-eight millions. There are many other industries dependent on the lumber industry. Our wire rope plants, iron works, food supply houses and farmers will all feel the loss. Our salmon canneries, mines and railroads are large consumers of lumber, and will keenly feel the loss of our timber, which will increase their operating expenses enormously.

Not an Alarmist.

"I have no doubt that you think I am painting a very harrowing picture and one that can never come about, but it has come about in other parts of this continent and will certainly come about here unless we can take measures to prevent it. The fact that we can ship lumber across the continent by rail into New York State, to keep the wood-using plants there alive, proves it. New York State once was heavily forested, like British Columbia. Her requirements today are 300 board feet per capita. She can only get from her forests thirty feet per capita; the balance of ninety per cent. she must import from Canada, the Pacific Coast and the Southern States.

"Less than five per cent. of the original forests of the New England States remain. The original pine forests of Michigan, Minnesota and Wisconsin, estimated to contain 350 billion feet, talked of as inexhaustible, are now reduced to six billion feet. These densely populated States are now dependent on timber grown and manufactured elsewhere, and in a very few years will be absolutely dependent on Pacific Coast timber.

"The bulk of the timber used in the Eastern and Central States during the past fifteen years was grown in the pine forests of the South, but these forests have been so heavily cropped that they have now been reduced from 650 billion board feet to 150 billion board feet. Much of this is small

timber on cut-over land, and within seven years these States will cease to be a factor to reckon with in the export business, for they will require their timber for their own domestic use.

Can't Check Demand.

"We are only in our infancy as producers of lumber, but within five years the lumber business of British Columbia will have grown enormously. We should be cutting at least five billion of feet by 1926. The demand is coming, and nothing can stop it. It has now come down to a matter of mathematical calculation.

"Mr. A. L. Clark, president of the Vancouver Lumber Co., some time ago had courage enough to state that we had not nearly the amount of timber in British Columbia that we were credited with. He estimated our resources at approximately 150 billion feet. Dr. Judson Clark, a well known authority on timber in British Columbia, estimates the total stand of accessible merchantable timber to be approximately 100 billion feet. Personally, from seventeen years' observation and examination of the timber in British Columbia by our firm, I incline to the figures as given by Dr. Clark.

"Of the forty thousand square miles of commercial forest in British Columbia, only fifty per cent. can be seriously considered as containing accessible loggable timber, the balance being on rocky, steep ground, where the cost of logging and the breakage would be so great that it would not tempt a logger to operate for many years to come.

"The virgin growth of timber in British Columbia is steadily decaying and should be cut and marketed, but the young second growth, on which we depend for our future supply of lumber, should be jealously preserved. At present we are recklessly cutting it for tie timber, poles and mining timber, destroying fully thirty per cent. of it during the operation. It is common practice to leave twenty to forty feet of good, sound butt logs in the woods, because it is too large to hew into ties. The same condition applies to operations where mining timber is being logged. This should be checked and without waste of time. Depletion of our forests in British Columbia within twenty years, with a resultant slump in all enterprise that depends wholly or in part on forest products, can only be averted if action is taken without further delay.

"The action we would propose is that private timber land owners adopt logging methods that will protect and preserve young growth, and leave logged-off lands in condition for forest renewal; then the young trees of today will be of merchantable size when needed. This is dependent on keeping fires out of the forests, so that young trees will have an opportunity to grow.

Job for the Government.

"It has been shown on examination that unless logging slash is burnt over the reproduction is very poor, the heavy slash shading the young seedlings. It is necessary for a fire to follow logging operations in order to prepare the ground for seeding. This should be undertaken by the Government, which can take every precaution to avoid disastrous fires.

"It takes approximately 80 years to produce trees of commercial size that will make ties and piling for the Coast or saw logs for interior mills. Eventually our Coast mills will have to adapt their cutting machinery for small logs, for the virgin timber, once gone, can never be replaced. It takes from 200 to 400 years to produce our large fir timber, and double that to produce our big cedar. The fortunate owner of a tract of virgin cedar and fir will, if only he can afford to hold it for a few years, reap a rich reward.

"The reforestation will have to be undertaken, in the main, by the Government. It is not practicable to enforce the practice of forestry on private timber lands, for the growing of timber of saw log size is an operation too long in time and offering too low a rate of return to attract private capital, always excepting pulp and paper companies, who can use timber long before it becomes saw log size.

"The price of logs governs the price of lumber, and with the consumer demanding cheap lumber the millman naturally is demanding cheap logs. The logger, in order to get his logs as cheaply as possible, is devastating our forests, cutting only the timber that can be cheaply handled, smashing down all the smaller timber in the process of logging, and leaving in the woods, to rot or to be burnt, some thirty to forty

per cent. of the volume of the timber on the ground. He cannot afford to attempt to log much of the timber on the high elevations or on the rough ground. Broken timber is left, and on most operations on rough ground fully half of the timber stand never reaches the mill, it being broken up and left on the ground.

Forest Devastation.

"There is no country in the world that would tolerate the wasteful logging methods practised on the Pacific Coast of Canada and the United States. It is not logging; it is forest devastation. Who are we to blame? The logger, in order to make a fair return on the investment and log all the timber on the tract, carefully taking off first all the small timber, and then logging the heavy timber, must have an increased price from the mill for his logs. Therefore the consumer cannot look for any cheap timber in the future, as the cost of operating is continuously climbing.

"We have been credited in British Columbia with having 350 billion feet of standing timber. Of this I have no hesitation in saying that there will not be 100 billion feet actually taken to our sawmills in the form of saw logs. This figure, of course, refers to our virgin timber. Our present output is approximately two billion feet per year: this figure will be more than doubled within five years, and by 1930, British Columbia will be called upon to supply at least six billion feet per year, possibly more.

"As is well known, the Eastern United States is almost denuded of timber. Americans are already dependent on Eastern Canada, the Southern States and the Pacific Coast for ninety per cent. of their domestic requirements in lumber. The Southern States, which now cut approximately twelve billion feet per year, will, within seven years, cease to be an exporter of lumber, and the Pacific Coast will be called upon to supply the deficiency.

Prepare for Famine.

"Already the people on the other side of the line are preparing for a timber famine. Reforestation is practised in many of the Eastern States. The pulp and paper companies, which formerly were self-supporting in pulp timber, now obtain eighty per cent. of their pulp and pulp wood from Canada, and if, as is quite probable, Canada prohibits the export of pulp wood across the line, most of these companies will be put out of business, and investments totalling hundreds of millions of dollars will be wiped out.

"In British Columbia, in the Coast district, we waste most of our small timber. Hemlock 12 to 20 inches on the stump is not considered to be worth logging. In almost any logging operations on the Coast you will see the small hemlock left on the ground, literally on the ground, for the high lead method of logging breaks down practically all the small timber on the tract, and when the operation is completed it reminds one of a scene in a Belgium forest after it has been devastated by the Huns.

"The average timber license on the Coast carries approximately twelve million feet of timber; the average amount logged off a timber license during the past fifteen years is five million feet. Government licenses have logged as high as eighteen million feet, but a great many have only yielded three and four million feet.

"Only the timber on the lower elevations has been logged off, the balance being left a prey to fire and wind storms which every year claim millions of feet. What is the remedy for this? We cannot force the logger to take off this lumber if by doing so, he cannot make a profit. The average consumer of lumber says he cannot afford to pay fancy prices for lumber in order that the timber can be protected and logged clean. But what will be the ultimate result if we do not stop this waste? Our virgin timber gone, all our wood working plants, or the majority of them, will be forced to close, and, as lumbering is the chief industry of British Columbia, we shall suffer a great loss.

A heavy litter of logging debris—a natural incubator of destructive fires.

Effect of Forests on Flow of Streams

THE evidence in support of the contention that forests exercise a distinct and beneficial influence upon stream flow and springs is gradually accumulating, and it seems that what was at one time little more than an improved theorem is assuming the status of an ascertained and well-proven fact. The theory has in the past been seriously disputed, or has been accorded only a tentative and guarded acceptance. But a careful examination of the conclusions, and the reasons for arriving at them, of those who declined to commit themselves to definite acceptance makes it clear that most of the dissentients had arrived at a decision from a consideration of purely local conditions, and had not made themselves fully conversant with the results of long and careful observation elsewhere. Strangely enough, foresters of the first half of the nineteenth century, few of whom employed methods recognized as sufficient by scientific investigators, were, take them all round, more inclined to adopt the theory that forests do influence climatic conditions and the flow of water than were those of the second half of the century. The modern forester, however, if he does not arrive at a definite standpoint, brings an open mind to bear on the matter, and is ready to receive and weigh evidence that is satisfactorily supported. And, speaking broadly, foresters throughout the world at the present time, with few exceptions, admit that forests have very important functions in the matter of precipitation and conservation of water, and they examine eagerly all proofs that are advanced when the observations on which they are based have been conducted on strictly scientific lines.

French Experiments.

France, more than a generation ago, conducted an investigation into the matter, and the results, as published, strongly confirmed the view that between forests and precipitation and water-flow there is an intimate connection. And now the results of another investigation have been made known. In 1900 the Swiss Engineering Station at Zurich undertook an investigation, using two watersheds in the adjacent mountains as the scene of their operations, and making their experiments in accordance with the strictest scientific requirements. The work covered a period of eighteen years, and it will be of interest to state here the deductions from the Swiss observations that seem to be of general application.

One general fact that has been confirmed by the Swiss experiments is that a good forest cover has a very beneficial effect upon the regime of streams in mountains and hilly country. Another fact confirmed was that streams fed from a forested watershed have a more uniform discharge and carry less debris into the larger rivers to

Once get an area like this thoroughly dry and no army of fire rangers could save the surrounding timber from ruin.

which they flow than streams coming from an unforested watershed.

The Swiss experiments have conclusively shown that extensive damage from floods occurs less frequently in streams coming from forested watersheds than from streams rising in poorly forested or treeless watersheds. This is, of course, an absolute guarantee against the power of the elements.

The great importance of forests in hills and mountainous regions in feeding springs has been proved beyond a doubt in the Swiss experiments.

In general rains of variable intensity the forest cover showed a tendency to retard the amount of run-off. It was proved that the porosity and lightness of forest soil are brought about by the protection furnished by the tree crowns, by the formation of leaf mould, and by the presence of living and dead roots and an abundant soil fauna. Forest soil, it was ascertained, is much more permeable to water than unprotected soil. It was deduced from the experiments that the whole explanation of the favourable effect of forest cover upon stream flow lies in the greater porosity and permeability of the forest soil.

From Switzerland.

The Swiss experiments have discounted the opinion long held by many prominent investigators that the great water-retaining power of the forest soil is due mainly to the great receptive capacity of the leaf litter and moss cover. The experiments have conclusively shown that raw hum and moss cover have had a very unfavorable effect upon the water regime. Many evidences of damage from floods in forested regions could be directly traced to accumulations of raw humus in the forest.

The results of the Swiss experiments are fully embodied in a publication written in German and issued in 1919 in Zurich.

In this connection it should be stated, too, that in 1910 a similar project was instituted by the United States forest Service, in co-operation with the Weather Bureau in the North Rocky Mountains at Wagon Wheel Gap, Colorado. The results of these experiments are not yet published, but are expected to be made known soon, and a comparison of results obtained in Western America with those furnished by the Swiss investigators will be of the highest interest to foresters.

Loading Lumber Long Ago

C. F. S., in Punch.

If I'd got to choose alone
One of all the freights I've known—
All my cargoes live and dead,
Bacon, pigs and pigs of lead,
Cattle, copra, rice and rails,
Pilgrims, coolies, nitrates, nails,
Lima beans and China tea—
What do you think my pick would be?

If I'd got to name the best—
Take just one and leave the rest
Out of all the ports I've known—
Coral beaches white as bone,
All the hot lands and the cold,
Nights of stars and moons like gold.
Tropic smells and Spanish wine,
Whispering palm and singing pine,
All the isles of all the sea—
Where do you think I'd want to be?

Loading lumber long ago
In a ship I used to know,
With the bow-ports open wide
In her stained and rusted side,
And the saws a-screaming shrill
At the Steveston lumber mill;
Where the Fraser floods and flows
Green and cold with melting snows,
And the tow-boats' wailing din,
As the booms come crawling in,
Fills the echoing creeks with sound,
And there's sawdust all around,
Deep and soft like drifted snow;
Nowhere much a man can go,
Nothing much to see or do,
Mouldiest burg you ever know.

But I'd give the years between—
All I've done and all I've seen,
All the fooling and the fun,
All the chances lost and won,
All the memories sweet and sad,
Far and near, by shore and sea,
I would give them all to be
Loading lumber years ago
With the lads I used to know—
Loading lumber all day long
Stacks of scented deals among—
Loading lumber at the mill
Till the screaming saws were still
And the rose-red sunset died
From the mountains and the tide,
Till the darkness brought the stars
And the wind's song in the spars
Of that ship I used to know—
Loading lumber long ago.

The Economic Significance of Forestry

By Gifford Pinchot, formerly Chief Forester of the United States

CAN we look to the rest of the world for material help when American forests fail? To our very serious danger, we can not.

The destruction of our timber, and of the timber-producing power of lands valuable for no other purpose, would be far less serious than it is if there were other portions of the world from which the absolutely essential lumber supply for our agriculture and industries could be obtained. From the point of view of the gigantic needs of the United States, Canada has no great supply of lumber, and has already made it plain beyond peradventure that she purposes to keep what she has for her own development. Mexico even if the merciless exploitation of her remaining forests were permitted, could not supply us long. South America, with enormous resources of hard and heavy tropical woods, such as we use for cabinet purposes, has comparatively little suited to the needs of our industries and our people. The story is the same throughout the world. Africa, Australia, Russia, Siberia, the Phillippines and the islands of the sea offer us small relief.

Moreover, he would be a poor American who in the face of the lessons of the Great War would suggest that the United States should depend upon overseas transportation for an essential without which neither her agriculture nor her industry can survive.

We must raise what we need, or go without. Take Pennsylvania for an illustration. The industries of the Pittsburgh district alone require more timber than the total cut of the whole state. Pennsylvania, once the first timber-producing State of the Union, now cuts from her forests only one-fifth of her own consumption, and is

Ontario's "white coal" supply involves the careful protection of the watershed forests.

reproducing in new growth only one-third of that. The industries of the State therefore can go on only because the indispensable supplies of forest products can still be secured from other states at prices not yet entirely prohibitive. When these supplies fail, as they will, or when the cost of importing lumber rises too high, the industries of Pennsylvania will pay a bitter price, and the question will be no longer whether they can prosper, but whether they can survive. In that day the decision will depend on whether or not Pennsylvania has taken in time the necessary steps to raise at home the timber she must have and cannot get elsewhere.

As with Pennsylvania, so with every other deforested or unforested State in America. The exhaustion of forest supplies will threaten and very possibly destroy the life of its agriculture or its industries. It is no more than the truth to say that the forest question is vital.

What has brought this dilemma upon us? Two things: fire and destructive lumbering. These two working together have either cut down or utterly destroyed the productive capacity of vast areas of forest lands—lands which in large proportion are valuable for nothing except to grow trees and never will be, or which at this stage of our economic development are unavailable for agriculture and must produce timber or nothing.

Like the trouble, the remedy is two-fold. We must put an end to forest fires, and we must save the productive capacity of the virgin forest lands we have left. Thus we shall give the lands which are already cut over, and those which are yet to be cut, at least a chance to serve the Commonwealth by producing wood, and we shall keep lands good for nothing else at work growing trees.

Upon the continued productive capacity of the remaining virgin lands we must chiefly depend to bridge the gap between the time when what forests we still have shall be substantially exhausted, and the time when the lands now culled, cut, burned and

devasted may be expected to recover their power to produce. This is the first problem, and the key to success in American forestry.

Privately Owned.

Sixty-one per cent. of our remaining timber lies west of the great plains. Half of it is in the States of Washington, Oregon and California. By far the larger part of it is in the hands of private owners. So far has the concentration of ownership gone that one-half of the privately owned timber in the United States is already in the hands of two hundred and fifty owners, and this dangerous concentration, will, in the language of the United States Forest Service, "steadily increase as timber depletion continues, approaching a natural monopoly in character, and this control will extend particularly to the diminishing supply of high-grade material."

What is needed, then is to prevent the owners of commercially held timberlands, still uncut, from obliterating, by destructive methods of cutting, the power of their lands to keep on growing trees. For more than a quarter of a century argument and persuasion have been employed in vain. The time has come when the nation can no longer trust to the lumbermen, who have got us into this trouble, to pull us out. We know they hold the belief that their immediate pecuniary advantage lies in forest destruction, and that (with honorable exceptions) they are living up to it in practice. We cannot safely leave to them the decision as to whether our agriculture, our industries, our transportation, and the comfort, safety, and welfare of our whole people shall be protected or shall be exposed to the unthinkable miseries which must accompany a famine of one of the basic materials of our civilization.

The lumbermen have not ceased from forest devestation, although the danger to the community has been abundantly demonstrated. They will not cease from it until they are compelled. The strong hand of the community, and nothing else, can prevent the devastation of the uncut lands which remain.

Public opinion is just awakening to the vital need for the practice of forestry on private timberlands held for commercial purposes. This awakening, far more purposeful and wide-spread than the similar stirring of public opinion which made it possible to secure the national forests, offers the most promising opportunity for progress in American forestry within my experience. There is clearly before us the chance for a greate advance, an advance which may even extend within the next decade to the point of assuring a permanent and sufficient supply of American forest products.

The chance is here, but we have not yet made use of it. We must crystallize this invaluable public opinion behind a policy wise enough and strong enough to make us independent for good and all of timber supplies from other countries. Our success in doing so will depend on two or three essentials in the policy behind which the forces of forest conservation elect to throw their strength. The first of these is that we must work with and not against the underlying trend of the times. The second is that we must present a policy which can be adopted, and which when adopted will produce results.

The policy we decide on must be submitted for the approval of Congress, a national body whose members are necessarily governed not only by the interests of the Nation at large, but more particularly by the interests of the individual States which they represent.

The essential facts in the lumber situation so far as the selection of a national forest policy is concerned are three: first the United States is not self-supporting in timber, but is consuming its forest capital four times faster than that capital is being renewed; second, not only timber but the productive capacity of timberlands is being destroyed; third, the great majority of the States are unable to supply their own needs for wood, but must rely upon the forest resources of other States. Therefore, the agriculture and industries of most of the States are dependent for their essential supplies of lumber on forests outside of their own boundaries. As to a majority of our Commonwealths, this condition will be permanent.

Forced to Import.

It may be taken as basic, therefore, that the majority of the States, containing the larger proportion of the American people, will be permanently dependent for their prosperity on timber supplies produced outside of the boundaries of the States in which they are consumed.

Ontario's Self-Renewing Gold Mine

AT a very largely attended banquet of the Associated Boards of Trade of Temiskaming, held at Cobalt, Ontario, under the able chairmanship of Mr. R. A. McInnes, general manager of the Abitibi Power and Paper Company, Mr. Robson Black, of the Canadian Forestry Association, delivered an address, touching particularly upon the timber and pulpwood resources of the north and the important part they were playing in the expansion and activity of the hinterland. Mr. Black reviewed briefly the part played by the forest resources as a contributory factor to all constructive activities in the Dominion of Canada. It was impossible, he said, to operate the Canadian railways without twenty million ties for replacements each year, or to run even one telegraph system without fifty thousand poles for maintenance, or to lift from a soft coal mine one ton of coal without first putting into the mine seven lineal feet of wood for pit prop purposes. The service of the forest extended in an equally significant way to the fisheries and manufactures. "I am purposely putting into the background" said Mr. Black, "the direct utilization of forests in such substances as pulp and paper and lumber in order that we may see that if we kick out the forest-prop we not only destroy forever the wood-using industries, the towns they have built up, the vast army of their employees, but we also put beyond reach the unreplaceable materials essential to agriculture, manufacture, stock raising, fruit growing and the maintenance of life itself in this northern climate."

Timber Growing For This Land.

The speaker asserted that timber growing was the sole purpose to which over 80 per cent. of the entire area of Canada can be devoted. Of New Brunswick and Nova Scotia about 70 per cent of the total land area is non-agricultural. Even in such a prairie province as Saskatchewan fully two-thirds is a natural forest estate and useless for agriculture. Of Quebec's 250,000,000 acres, including Ungava, only about 15,000,000 acres have been put into farming and the relative position of forest land and farm land will never be seriously altered. In Ontario, more than 60 per cent. is non-agricultural and fit only for the production of timber crops.

The creed of forestry, said the speaker, is to cultivate on each acre of land the crop for which it is best adapted. If expert examination shows a township to be of good agricultural soil, let us devote that township to the annual crops of cereals, grasses or vegetables. If non-agricultural, it is the part of common sense to insist upon it producing something for the public welfare. In other words, what is unfit for farming should be made to produce timber, which, particularly in this day, is the incubator of pulp and paper and lumber industries and through them of new towns, new markets and a long chain of other important benefits. The development of the farm and the development of the forest should have no point of collision. In the kind of land each desires there is no antagonism or overlapping. On the contrary, the development of forest industries from the timber crops of non-agricultural lands supplements and stimulates the agricultural industry carried on in parallel areas. There is not a forester nor a progressive lumberman or paper manufacturer who would propose that good farm land should be retained permanently under timber.

Our Bush Whacking Process.

The speaker gave strong emphasis to the fact that, taking Canada as a whole, the bush-whacking process had gone to tragic lengths. We have more acres that have been cleared of trees and must be got back under timber in order to pay a profit than we have acres now covered with timber that can ever profitably be cleared for farming. A million square miles of Canada have been cleared of timber by the effect of forest fires on little of which a farmer will ever run a plough and make his salt. In the wake of forest destruction has come not an army of farmers—except for a few localities—but a howling wilderness in which the chimney smoke of the wage earner is never seen and not even the fur bearing animals can scrape a living.

"Month after month the ugly menace of forest exhaustion closes in on the newsprint mills of Eastern United States but the ill wind of which Uncle Sam complains has proved a 'trade wind' to the argosy of Canadian pulp and paper manufacture. From a petty cargo of $120 in value shipped to Uncle Sam twenty years ago, the Canadian paper mills put over the border last year $120,000,000 worth of pulp and

paper. Uncle Sam pays more for the things that come from the Canadian forest, than for all other manufactures combined. Bare exports alone have the lifting power of $400,000 a day in keeping exchange even where it is. Without newsprint cargoes running south across the border, United States exchange would almost strangle Canadian trade.

No Surrender of Our Timber.

"A few years ago our pulp and paper towns were all a piece with the silent wilderness. To-day we find them athrob with industry. It is one of the dividends of the forest possessions, the inevitable harvests accruing to any country that can show the world the powerful triumvirate of pulp forests, plus water powers, plus railway facilities to a near market. Not many lands have got that combination; many had, but have no longer. Northern Ontario is the present possessor of this mighty industrial magnet and from the point of view of the American business man, who sees our possessions and potentialities, perhaps in truer prospective, if we ever were commanded by some supernatural power to give up one of our natural resources we were better advised to surrender our mines than to surrender our forests. There is no need for doing either, let us hope, but it does not indicate any animosity toward the great mining industry to point out that a mine is a non-reproducible form of wealth and inevitably must face extinction while the forest, like the farm, bears a reproducible crop, giving of its wealth to-day and capable of repeating its contribution again and again and again.

"The basic difference between the extraction of forest crops cannot be stressed too much. It is true that the forests have often been treated as a mine but we are now at the edge of a new dispensation. Forest mining must cease and every area of forest on non-agricultural soil, so treated that while the axe cuts out a present crop for the use of the mill it also cuts the pattern of a future forest. Pulp and paper industries with their organized forestry departments are determined in self defense to anchor the forest as they have anchored the mill dam, to separate their timber tracts, so that any future lumbering and pulp and paper making need be no more itinerant in character, with itinerant towns and shifting population than is true of the growing of oats and turnips."

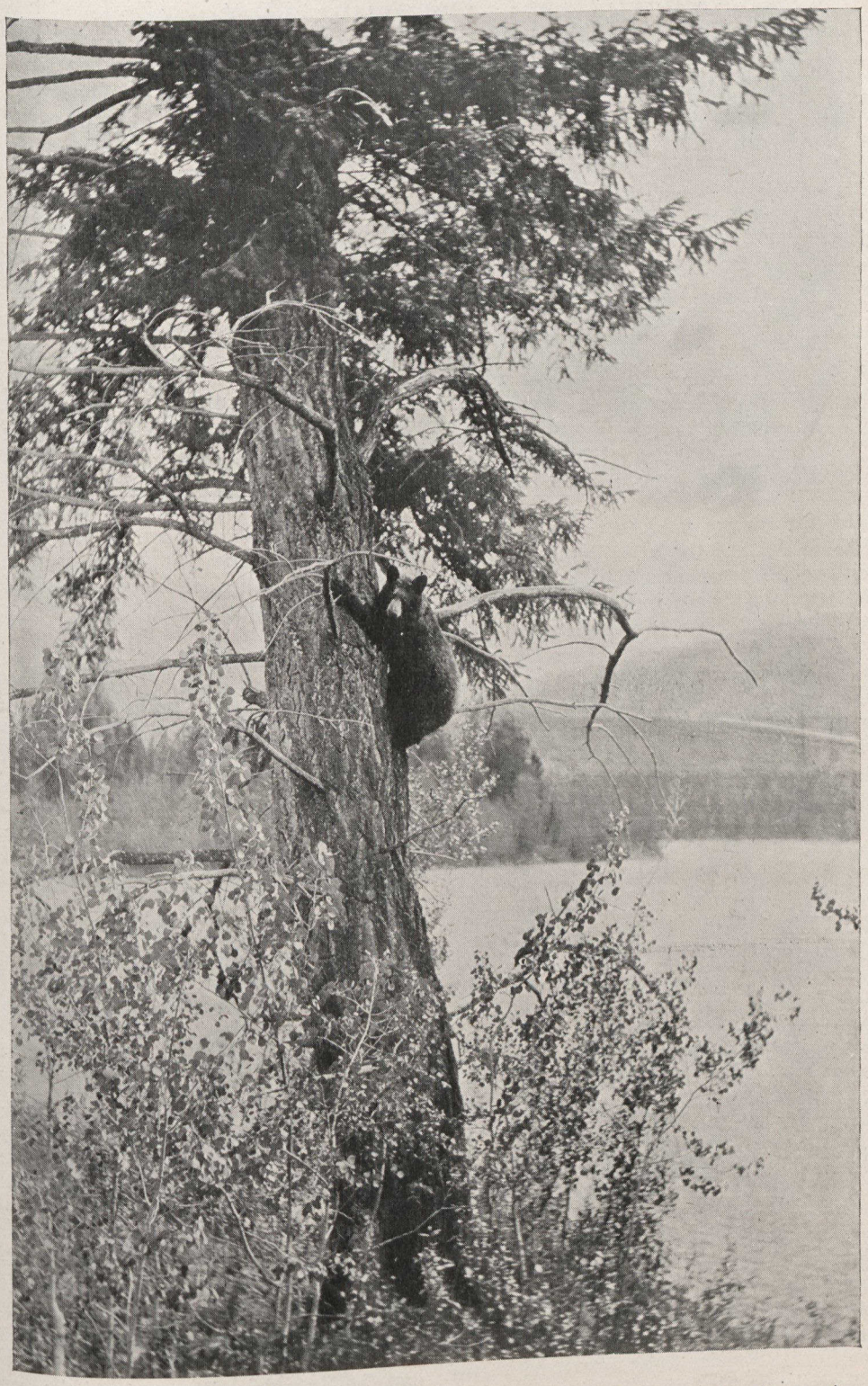
"In the head office of insurance companies may be found a card index machine of such marvelous ingenuity that when an inspector wishes to see at a glance any class of policy holder of any age or place of residence, all that is necessary is to press an electric button and the information is instantly delivered. Press on button and out come all the New Brunswick farmers, age 55, whose endowment policies mature in five years. Press another and you get all the Canadian plumbers, age 37, who are carrying $100,000 or over. Each card runs back to its nest and comes to hand again whenever desired. It is not possible that our eagerness to look over the cards of farming and mining in Northern Ontario, we have neglected to swing into public view once in a while the well furnished tray of forest assets and forest industries and forest employment?

"I have said, there is no antagonism between the job of growing forests and the job of growing farm crops. The first asks only the square mile that the other cannot utilize.

Spruce Forests—What They Mean.

"As long as free land was available near the railways of the prairie provinces, Northern Ontario was halted in its development and even yet the rivalry of the bare prairies must be felt for many years to come. Similarly, when the forests of the United States seemed to be abundant for all time to come, development of forest industries in Northern Ontario was pretty well limited to the lumber trade. Only when the threat of forest exhaustion was combined with an enormous increase in the use of newsprint on this continent, were the spruce forests of Northern Ontario translated, as under a magic wand, into great factories and armies of employees. To-day the forests of Northern Ontario stand as one of the supreme prizes of the North American continent.

Mr. Black reinforced this point by outlining the grave crisis which the newsprint and lumber industry in the Eastern United States now faces. Three thousand mills in the Southern States were certain to go out of existence within eight years because of forest exhaustion. President Dodge of the International Paper Company recently declared that in the Eastern States there were not enough spruce areas on the market to-day to justify the erection of two fifty ton pulp mills.



Apparently safe but he did not build on the presence of an Alberta cowpuncher and a handy lariat which brought him to earth angry but uninjured. The photo was taken near Banff, Alberta.

A Sky Patrol for Fire Detection

By Luther K. Bell, Manufacturers Aircraft Assoc., New York

THROUGH the operation in 1920 of a few aircraft lent to the Forest Service by the United States Army, there was saved from destruction by fire standing timber valued at more than the total Army Air Service appropriation for the fiscal year 1920-1921, or approximately $35,000,000. Between 900 and 1,000 fires were reported, most of which were extinguished by ground forces directed from the air.

The operation of the experimental aerial forest patrol service which the U.S. Army Air Service maintained during the summer of 1919 in conjunction with the Forest Service proved sufficiently successful to warrant its development.

Plans for the work to be carried out in 1920 were formulated at a conference at March Field, Riverside, Calif., between representatives of the Air Service and the Forest Service. As a result the organization of the Aerial Forest Patrol was so modified as to make it an integral part of Forest Service activities, though still operating under the direction of the Army Air Service.

The importance of adequately protecting our timberland against fire can be appreciated from statistics compiled by the Department of Agriculture, which show that some 10,000,000 acres of standing forests are burned each year. As the entire forest area of the United States is 463,000,000 acres, it follows that, at an average of 10,000,000 acres destroyed annually, our timber resources will not last long. The problem is further complicated by the ever increasing use of lumber and of pulp in the manufacture of paper and also by the fact that we have always used more timber than we have permitted to grow.

The Department of Agriculture estimates that 100 airplanes in daily service would keep the Pacific Coast forests safe from fire, an area which contains 52 per cent. of all the timber in the United States. As fires destroy approximately $20,000,000 worth of lumber each year, not counting the damage done to private property, the eagerness of the Forest Service to be permitted to use air planes is readily appreciated.

During the summer of 1920 the airplanes of the Army Air Service principally patrolled the national forests of Oregon and California.

Safety to Personnel.

The entire Army personnel was in charge of Captain Lowell Smith stationed at Eugene. A Forest Service representative was also stationed at Eugene, who acted as a liaison officer between the Air Service, the Forest Service, the State Forester, and the private owners. Each plane was nearly always in communication by wireless with the main or sub-base. The northern patrol covered daily a route of 360 miles and the western patrol from Eugene covered 326 miles, each with one landing for fuel and oil. A total of 719 fires were discovered and reported during the summer by the Oregon aerial patrols. Two forced landings were made, resulting in serious damage to the planes, but causing no injury to the occupants.

The California airplane patrol of the national forests started about June 1st, 1920. Headquarters were located at Mather Field, near Sacramento. Practically all of this work was carried on by the 9th Aero Squadron, Army Air Service. It was divided into detachments and these detachments were located as follows: one at Fresno and one at Mather Field. Each detachment consisted of about 25 officers an dmen.

Three patrols were operated out of Red Bluff: one went to Alturas and return, covering Mt. Lassen, the east half of Mt. Shasta and the Modoc region; the second to Montague and return, by way of the Coast slope, covering the west half of Shasta, the Klamath and the Trinity regions; while the third covered the California Forest, by way of Vovelo and Lakeport.

Two patrols operated daily out of Mather Field. One flew to Red Bluff, covering the north half of the Eldorado, Tahoe, Plumas and part of the Lassen forests; the second to Cooperstown, covering the south half of the Eldorado and the Stanislaus. Two planes were operated out of Fresno each day, one flying north to Cooperstown, covering the Sahara, Yosemite National Park and the Stainslaus Forests; and the second south to Bakkersfield, covering the south half of the Sahara and the Sequoia forests.

The March Field detachment protected

the entire southern part of the state. One patrol covered the Angeles and Cleveland Forests, landing at San Diego, and the second flew north to Santa Barbara.

At each base a liaison officer was located. This officer in each case was an experienced forester, detailed for this special work. All matters in connection with airplanes patrol out of each base in question were taken up with and through this officer, who also acted as a clearing house for all fire reports. At each base the liaison officer received fire reports by radio or from the pilots after landing. He in turn transmitted the report to the Forest Supervisor.

Proof of Efficiency.

Paul G. Redington, Forester in charge of the California district, states that 33 per cent. of the 196 forest fires discovered and reported by that part of the 9th Aero Squadron operating out of Mather Field this year, were accurately located. "And 'accurately,'" said Mr. Redington," in this case means that these locations given us by the airplane fire patrols, were all within one-fourth mile of the exact location as later determined by actual surveys on the ground.

"This record, when supplemented by the further facts that an additional 19 per cent. of the fires discovered were reported within one-half mile of their actual location, that 10 per cent. of the total numbers were discovered by the air patrol before the rangers knew they even existed; and that 42 per cent. or 83 of the fires were reported by radio, while the ships were in flight, demonstrates without a doubt that airplane fire patrol in California has been successful.

"Besides acting as lookouts to detect and report fires, airplanes were used this year to direct fire fighting operations and to patrol fire lines which have been established, but which needed watching to see that the flames did not get beyond control. The case of the Mill Creek forest fire, on the Lassen National Forest, where 25,000 acres were burned over, is an example. Here a special reconnaissance plane equipped with radio and with a forest officer for observer, hovered over the fire and actually directed the movement of bodies of forest fighters by wireless messages received right on the fire line. In addition this plane patrolled twice each day some fourteen miles of completed fire lines, from which all men had been removed. If reports from the air showed the line to be clear, the fire fighters were kept at work elsewhere, but if the observer wirelessed in that the fire had broken away, then a force of men was rushed to the spot and the fire coralled again."

The Use of Wireless.

At each base of operations of the airplane forest patrol there is a sending and receiving radio set and a wireless telephone attachment. There are also maps, covered with bright-colored pins. For every fire reported a pin is inserted in the correct location. When the fire is a day old a pin of a different color is put in its place. When the fire is extinguished the pin is exchanged for one of black. Fires reported from other

sources than the forest airplanes are marked with another color pin. Thus the map is an up-to-date and accurate history of the season's airplane patrol.

During August the height of the forest fire season, the air over the Oregon forest was filled with smoke to an altitude of 11,000 feet. The pilots were compelled to fly at least 12,000 feet in order to be able to look down through these smoke screens. While ordinarily able to detect a fire and accurately locate it for a distance of forty miles where there is much smoke, the observers' vision is limited to within twelve miles.

But if the observer in the airplane is handicapped by the dense clouds of smoke that drift up from the blazing forest, the lookout on mountain tops and at the head of ravines, is rendered helpless. He cannot locate a fire accurately, and in many instances cannot detect another fire springing up in a new area.

Reconstructed DeHaviland planes equipped with Liberty motors were used on the aerial forest patrol. While on patrol, the planes are throttled down to a speed of 100 miles an hour. Each plane is equipped with radio set, and at each base a receiving set is installed, with capacity of receiving up to within 100 miles under good conditions. There was considerable difficulty with the first radio set installed on the planes. The Air Service finally supplied sets which operated successfully, and the patrols were kept in constant communication with their base and with each other. This successful operation of wireless made unnecessary the use of carrier pigeons.

Chewing Gum Costs More Than Forestry

To any Canadian who protests that the allotments of money for forest protection by any Government or private interest appear excessive, let him consider some of the bills the Canadian people cheerily pay for their every-day luxuries.

As against $1,750,000, which is the total spent on forest protection throughout the Dominion in even a year of serious conflagrations, place the following annual expenditures supplied to the Canadian Forestry Magazine by the Dominion Bureau of Statistics:

Canada's Yearly Bill.

Candy	$50,000,000
Cigars, Cigarettes and Tobacco	61,000,000
Soft Drinks	28,700,000
Jewellery	9,300,000
Chewing Gum	3,688,000

We spend on face powder and perfumery. $1,000,000. The bill for ice cream cones for juvenile Canadians is larger than the total amount spent on all forms of forest protection and forestry in the province of Ontario.

The national bill for cigarettes alone is over $23,000,000, and for cigars over $12,000,000.

When any complaint is heard that the nation is paying too much for the maintenance of forestry branches, let it be considered that all such expenses bulked together barely come up to the national outlay for the single item of chewing gum.

Quebec's Timber Stands Valued at $600,000,000.

This estimate, prepared after a careful study of the reports made by explorers, cruisers and forest engineers, is based upon the actual lumbering methods for exploitation. It takes in only such timber as is merchantable and neglects totally the young stock:

The Forest Wealth of Quebec.

Species.			
White and red pine	3,750,000,000	cub. ft.	$200,000,000
Spruce, balsam, hemlock and other coniferous, except cedar	15,625,000,000	,,	250,000,000
Cedar (Arbor vitae)	2,500,000,000	,,	25,000,000
Pulpwood	12,500,000,000	,,	100,000,000
Hardwoods	4,375,000,000	,,	25,000,000
Total			$600,000,000

From the standpoint of the pulp and paper industry (that is, considering on all accessible forest lands, either privately owned, leased or unleased, the trees such as spruce balsam, poplar and aspen of 4 in. in diameter and over, which can be manufactured into pulp and paper), the Quebec forests, according to Mr. G. C. Piche's estimate, would contain 360,000,000 cords. Of this quantity about 155,000,000 cords would be really available.

The Joy of Planting a Tree

Peter Lund, Lethbridge, Alberta

WHEN a boy, four years of age, I resided with my grand parents in a small village in central Scandinavia, and one day accompanied my grandfather into the adjoining forest for the purpose of gathering dead branches and fagots for the coming winter's fuel. On our return home I insisted on taking with me a real live tree. Whereupon the venerable grandfather dug up, roots and all, a young seedling, an infant Norway Pine. On our arrival home it was planted with the usual attendant childish ceremony and pride, I owned a forest of my very own. The tree was planted in front of the little abode house, with its thached roof, near the well. Later the wood fagots were hauled from the forest and carelessly thrown on top of my "forest" because of which came the usual childish lamentation. Two years afterward the wood pile became low, and behold my tree appeared, vigorous, healthy and strong, in spite of the apparent neglect. My childish prayer for the safety of my forest had been realized. The following year my mother, myself and two younger children sailed for America to join my father who had proceded us. About 15 years later the aged grandparents followed and brought with them a photo of the old home—and low and behold, my tree had grown into a mighty pine, its branches spreading across the whole front of the house, its height far above the chimney. Imagine my joy. My tender little plant had grown into a mighty Norway Pine, spreading its protecting arms, full of endurance, life and strength over the now dead and decaying domicile that had sheltered me when a little child.

In front of a modest home in the city of Spokane, Washington, I planted two small cherry trees 30 years ago. These two trees have now grown so large that during the flowering season scarcely a glimpse of the house and premises behind them can be obtained. My father now resides there. In the spring he lives under a bower of white cherry blossoms and later in the season, under a shower of golden, luscious fruit. But these trees do not belong to us, their beauty and grandeur is the common heritage of all passers by. But greater than all is the joy because of having planted them—I was the instrument used by the great Master Mind in bringing about their existence.

There is something enduring, substantial and vigorous connected with the forest, in fact, it is a part of our physical existence. Every living creature seems to have a natural desire to hie itself to a woodlands whenever possible. Human existence on our great Canadian prairie would be very nearly impossible without timber, and very few people would care to remain here if it were found impossible to grow trees. Trees for shade and shelter are necessary in the dry area, in order to hold and retain moisture and prevent the soil from drifting. Forest growth is also necessary on our watersheds, along our rivers and streams and at their heads, in order to control their flow and provide a steady and uniform supply of water for irrigation in the irrigated districts.

The Canadian Forestry Association is the instrument through which reform can best be accomplished. I hope before many years have lapsed that every business man in the Dominion of Canada, of whatever vocation, trade or profession, will be an active member of this Association.

The B.C. Forest School.

At the new Department of Forestry in the Faculty of Science, University of British Columbia, under Prof. H. R. Christie, a five-year course will be given, during the first two years of which the instruction will consist of general arts and science subjects, as in the courses in chemical, mechanical, mining and civil engineering. During the last three years, the student will specialize in forestry, this being definitely recognized as a branch of the engineering profession. Prof. Christie was for a number of years in the British Columbia Forest Branch, also with the Canadian Engineers in France. He is a graduate of the Faculty of Forestry, niversity of Toronto. The establishment of the new School of Forestry at Vancouver should mean much in the future development of forestry work in the western provinces, particularly British Columbia, which has had to bring her forestry experts from outside the province. The existence of progressive forest faculties is largely responsible for the progress of the forestry movement in Canada.—*Clyde Leavitt.*

The Record of a White Spruce

EVERY tree write its history as it lives. This white spruce grew on the north slope of a little knoll in the Agawa river valley in Ontario.

The casual visitor would not have seen any difference between it and the other spruces around it. It stood among spruces and balsams with scattered white birches to brighten the forest.

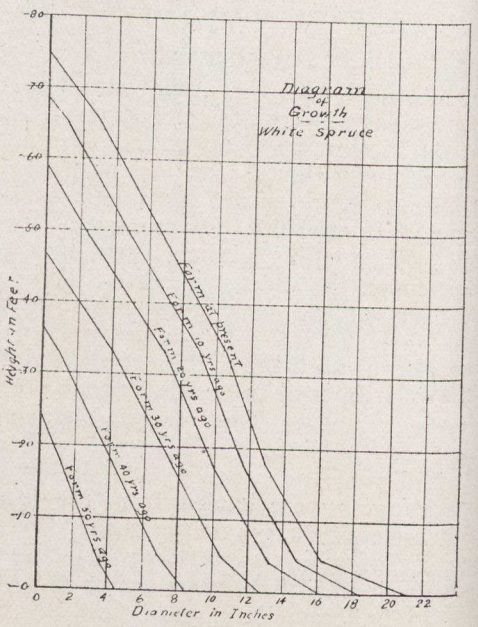
While the tree is about a hundred years old, it has grown to its position of command in the forest in fifty years, having made 98 per cent. of its growth in that time. Many trees of its age have grown larger but none were found that grew faster for the past five decades.

Money in Waste.

(By James D. Lacey.)

The problem of utilizing waste material is that of making its utilisation profitable. This problem is being rapidly solved, in the case of timber waste, by the work of chemists; for chemistry affords the chief key in this instance. The enhanced value of timber today is making profitable the conversion of waste into merchantable products—hence the activity of those who are studying those products. Not impossibly the by-products of the sawmill will outvalue, in the near future, the finished lumber. Alcohol, tanning extracts, turpentine, pine-oils, fibre for all sorts of fabrics, "wall-board," insulating materials—these are but a few of the products that may be obtained from sawmill waste formerly thrown away.

It is not altogether improbable that the time may come when the by-product distillates of wood will rank in value with the product of the co-ordinate sawmill operation. No one knows just when the production of petroleum may begin to fall below the tremendous and constantly-increasing demand for oil. Whenever a serious shortage sends oil prices above a certain point, however, ethyl (grain) alcohol distilled from wood will afford an efficient substitute for many purposes for which oil products are now used, including the operation of internal combustion engines for the automobile and other automatic machinery. Grain-alcohol may be produced from any wood at relatively low cost and by a process which yields other products of value as well.



Wood-alcohol, produced by destructive distillation, is one of the pioneer by-products, but one for which the demand is increasing rapidly, both for direct use and to serve as a denaturing agent for grain-alcohol distilled for industrial use.

Relatively few of the important chemical by-products can be produced from any one wood. Tanning extracts, for example, are obtained chiefly from the bark of oak and hemlock. Turpentine is reclaimed from those woods possessing the necessary resinous content. Pine-oils, as the name implies, are produced from the pines. But chemical scrutiny demonstrates that practically every wood possesses important by-product possibilities that may be greatly magnified as experts explore further the field of organic chemistry.

During the war the range of by-products was greatly increased. In Germany fabrics of many varieties were developed and manufactured from wood. Wood-fabric rugs and carpets of serviceable character were produced. Bags and sacks, fibre silks, imitation leather, and many other articles of utility found market as substitutes for materials that were no longer obtainable. In the United States, too, recent years have seen remarkable development in the use of wood in manufacture of wall-board, an industry of great and growing size, and in the production of linoleums, heat-insulating

materials, etc., thus creating important industries that are totally dependent on our forests for their primary raw material.

Progress is dependent upon the chemist's pioneer work, plus commercial development and exploitation that create demand and find markets. Until these things began to be done, the lumber manufacturer necessarily limited his utilisation to the conversion of his raw material into lumber and other primary products which he could make and sell with profit.

Much of this chemical pioneering has been done, but far more is coming, and as it comes it will steadily cut down the percentage of waste. Less of the tree will be left in the woods to rot. Less will be discarded as valueless at the mill. And a constantly increasing volume of other products than lumber will develop out of the sawmill industry, with resulting increase in the profits of sawmill operation and proportionate enhancement of the value of timber.

It is not unreasonable to suppose that eventually the value of chemical by-products may very nearly equal the value of the direct products of the sawmill.

Pennsylvania's Free Trees

The Pennsylvania Department of Forestry will distribute free this spring about 3,500,000 forest tree seedlings to private land owners in the State, according to a statement issued by Gifford Pinchot, the Chief State Forester. Last year 2,748,120 seedlings were given without cost to 792 private planters.

Since 1903, when the State nurseries began producing young trees, the total output has been 45,909,309 seedlings. About 34,000,000 of them have been planted by the Department of Forestry on State forest lands, and the remainder have been planted by individual land owners. Some of the largest plantations have been established by coal mining, water and lumber companies. Scores of farmers, however, have planted thousands of seedlings on waste and idle land that is not suited for growing agricultural crops.

The Department's supply of black walnut, white ash and Jack pine seedlings is completely exhausted. The output of Norway spruce and honey locust is being applied for in such quantities that it soon will be gone. There is available for future applicants, however, a large supply of white pine and pitch pine seedlings.

Conservation Commission Ceases

ACCORDING to an announcement contained in the Speech from the Throne at the opening of Parliament, it is the intention of the Government to abolish the Commission of Conservation, and to transfer its essential functions to the regular departments of the Government. The bill for the repeal of the act establishing the Commission had not been introduced in Parliament at the time when copy was being prepared for this issue of the Magazine. The Commission of Conservation was established in 1909 and has been engaged primarily upon educational work in connection with Forestry, Water Powers, Lands, Fisheries, Game and Fur-Bearing Animals, Minerals, Public Health, Town Planning and co-operating organizations.

The Big Job First.

"Keep public interest focused on the fire-prevention problem," writes P. T. Coolidge, Forest Engineer, Bangor, Maine, to the Forestry Magazine: "Do not let us get distracted by tree planting propositions or other work prematurely intensive. We want to save the reproduction that nature is giving us free."

C. R. Mills Appointed.

Mr. C. R. Mills has resigned from the forestry staff of the Commission of Conservation and has accepted a position with the Ontario Forestry Branch which will place him in charge of fire protection throughout the province, under the direction of the Provincial Forester. During the season of 1919, Mr. Mills was in charge of a working plan study on the limits of the Abitibi Power and Paper Company, under a co-operative arrangement between the Company and the Commission of Conservation. During the season of 1920, he was engaged, together with Mr. E. F. McCarthy, upon a similar project upon the limits of the Spanish River Pulp and Paper Mills, Ltd., north of Sault Ste. Marie, Ontario. This project involved financial co-operation between the Spanish River Mills, Ltd., and the Commission.

Research Possibilities of Wood Distillation

By Dr. Alfred E. Macintyre, Ottawa

(Article No. 4)

THE distillation of soft wood, spruce, pine, fir, etc., can be performed in the same apparatus as used for hardwood. The pit system, and modifications of this system, is largely employed in certain parts of Northern Europe and Southern Russia, while the retort system has found more general application in Central Europe.

Every part of the tree, including the roots, is distilled. While in general the same process of carbonization is utilized, some slight changes are made in the various operations, depending upon the species of wood and the character of its composition.

The destructive distillation of woods, rich in resins, is carried out in two stages. The soft wood is first subjected to a temperature of 250-400°F, whereby the turpentine and low boiling point oils are educted with the aqueous vapour, and collected. This is almost synomous with steam distillation. The second phase of the carbonization follows along the lines employed for hardwood, with the distillate, consisting of acid liquor, heavy oils and tar, being kept separate from that obtained at the earlier stage.

The crude products are charcoal, oils, acid liquor and tar. The liquids are permitted to settle in tanks.

Rectification

The oils and tars are each distilled separately and rectified by fractional distillation. If the original woods were rich in resinous matter, breaks in the rectification of the distillate of the light oils would be made at approximately the following temperatures:—175-300°F (rosin spirit or motor oil according to wood), 300-350°F (turpentine), 350-480°F (pine oil), 480-750°F (rosin oils), and the residuum in the still classed as pitch.

The light oils and turpentine are generally distilled with live steam. The various fractions are frequently further purified by redistillation.

The tar is sometimes sold as such, but where distilled the products are rectified in a manner similar to the oils.

The acid liquor for the recovery of the acetic acid and methyl alcohol undergoes the same treatment as the products of hardwood. The quantity and nature of the prime products vary according to the species of wood and the conditions employed in distillation. The following are the average yields, according to European retort practice, from 4,000 lbs. absolutely dry spruce and fir:

Acetate of lime	132 lbs.
Methyl alcohol	3.5 gals.
Tar and oil	248 lbs.
Charcoal	1360 lbs.

Consideration of Yields.

An examination of the yields of prime products, obtained by the ordinary commercial destructive distillation of hardwood, as shown in the previous communication, compared with that given for experimentally controlled plants, exhibits a very marked difference. But even the yields obtained by controlling the temperature of distillation are disappointing from a theoretical standpoint. The reactions which take place within the retort are the determining factors as to the quantity of prime products which will ultimately be produced from a given amount of wood. It has already been stated that in Canadian factories this part of the operation has not, in the past, been scientifically controlled, but left in the hands of ordinary workmen. That decomposition of valuable products can and does take place within the retort is a well-known fact. The degree of decomposition will depend upon a number of factors, such as—temperature, pressure within the retort, time of contact, velocity of the gases and partial pressures of the compounds concerned. The control of the temperature is one of the most important features of the distillation of wood. It is comparatively easy, with an effective temperature control, to increase, by 25 per cent., the quantities of both acetate and alcohol over ordinary rule of thumb methods, which are in general practice .

Recording pyrometers should be employed for this purpose, even if they were only installed to register the temperature of the exit gas from the retort. After a number of trials the approximate difference between the temperature of the wood and the gases, before entering the condenser could be determined and allowance made for the difference.

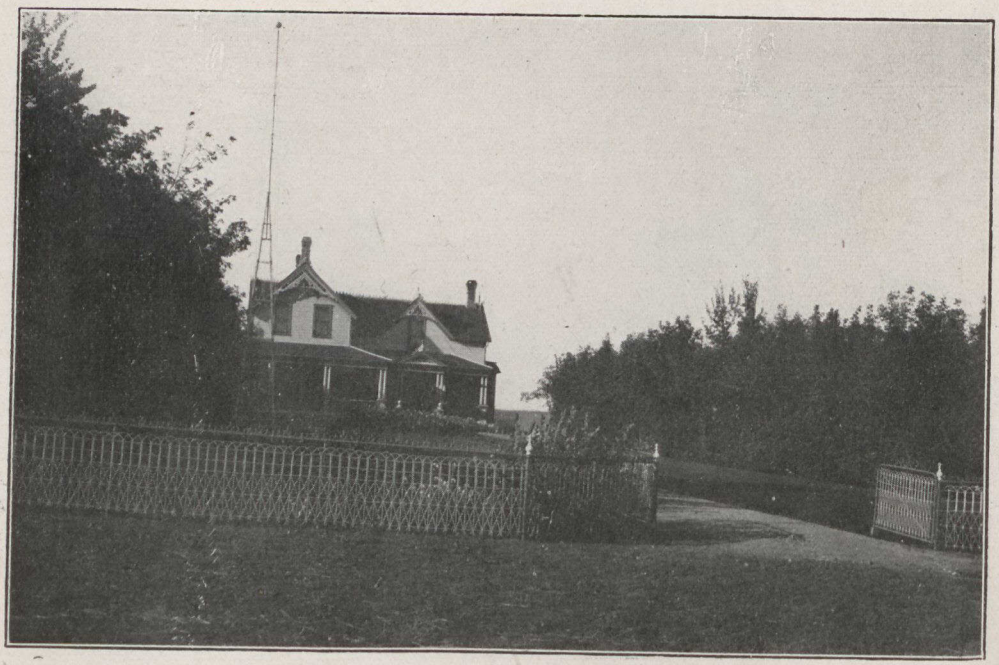
The regulation of the temperature, particularly at the exothermic point, is considered, by some authorities, upon the distillation of wood, as being almost impossible, and by others as overwhelmingly difficult. The writer does not entertain any such opinion, and considers that, were a little thought to be given the subject, cheap and efficient means of control could easily be applied. The quantity of methyl alcohol obtained in practice is, as a rule, less than 33 per cent. of the theoretical amount of the methyl content of the wood. A portion of the alcohol is destroyed in the pyrolytic distillation, while the tar and oils probably contain as much combined methyl residues as that obtained in form of pure methyl alcohol .

When the condensers were considered, in a previous communication, it was pointed out that the condensation of the gases to a liquid was not the only requirement but that the distillate should leave the condenser at a temperature not exceeding 60-65°F. Few factories control the temperature of their cooling water and condensed liquor. If the temperature of the pyroligneous acid, from the retort rises to 80F, which can frequently occur in

The commencement of a jack pine plantation in Saskatchewan.

Same jack pine plantation as above after three years of growth.

This prairie farmer has succeeded in growing a highly profitable crop of vegetables by the aid of a shelter belt of trees. The fine tree border shown in the photograph is just six years old and stands 20 feet high.



No longer the "bald prairie" for this owner. Wm. Patterson's place at Indian Head, Saskatchewan.

summer when the weather is hot and the river water employed for cooling is warm, the loss of methul alcohol can exceed 20 per cent. The greatest yield of acid, alcohol and gas is at the exothermic point when the maximum efficiency of the condenser is required. Dirty condensors are often a source of loss. The inside surfaces become coated with tar and oil which greatly reduce the conduction of the heat, the distillate therefore is delivered at a high temperature, causing loss of acid and alcohol. Equally important is the condition of the outside surface of the pipes. A scrubbing arrangement should be attached at the end of the condenser system and all the gases from the retort should pass through the scrubbers. The temperature of all the distillates, particularly those containing alcohol, must be subjected to control.

Research Possibilities

The whole process of the conversion of wood into the prime products is a very fruitful field for chemical and engineering research. The reactions by which certain substances are formed and the side reactions within the retort, at various temperatures, have never been studied. That certain substances primarly formed in the retort ,are subjected to decomposition is well known, because the decomposition products not only appear in the proliqueous acid, but with high temperatures, during the exothermic reaction, the percentages of oils and gas are increased, undoubted due to marked decomposition. There is a strong presumption that chemical condensations also occur in the retort, with the formation of aromatic cyclic compounds. An example supporting this contention is based upon the finding of para-xylo-quinone in wood tar. This substance is formed by the condensation of the ½ di-ketone-diacetyl. The so-called oils, or creosote oils, have never been thoroughly investigated, and it is quite probable that these may consist largely of mono-di-tri and olefine-ketones of the acyclic series with some cyclic aromatic compounds. Many ketones are very reactive compounds, with marked characteristic tendencies to condense with the formation of cyclic compounds. It is not known whether these so-called oils are products formed by the pyrogenetic reactions of simpler bodies, or the incomplete degradation of the original constituents of the wood. The former method of formation is more likely. If this should prove to be the case, then it would explain certain of the losses which occur. When the composition of these oils has been established, a commercial use may be found for them. Very little is known regarding the constituents of American wood tar and its formation. Tar does not appear in the pyroligneous acid, from the retort, until a considerable portion of the wood has been converted into charcoal. Why there is not a flow of tar from the moment the first piece of wood is converted into charcoal, is a question which has not been answered. It is possible there may be some relationship between the formation of the oils and tar and the passage of the heated gases over a large surface of hot charcoal. This suggests a series of exceedingly interesting problems which could be made the subject of research. The results would go far towards explaining the reactions and behaviour of the aliphatic compounds within the retort and might lead to improvements in the distillation process.

Hardwood tar forms, quantitatively, the greatest portion of the liquor obtained from the distillation of such wood, the yield being about 250 pounds per cord, so that in factories distilling 10 to 15 cords there is accumulated from 2,500 to 3,750 pounds every twenty-four hours. There is at present known no economic use for this tar excepting its utilization as fuel. Research should bring worth while results. Wood tar is probably composed largely of aromatic compounds containing phenol and methyl groups. If this assumption were found to be correct, then an investigation of the products formed by passing the tar vapours, mixed with hydrogen, through a monel metal or cupronickel tube heated to about 1,375-1,400°F might give interesting results. If proper conditions were established one would expect to obtain benzene and methane.

If successful, the former could be employed as motor fuel and other purposes and the uncondensable gas for developing some of the heat necessary for the reaction. Another possibility, along somewhat different lines, would be the passage of the vapours of the tar over a heated catalyst, with the object in view of obtaining acyclic compounds, having properties resembling the lubricating petroleum products. The proposition of a chemist to utilize the tar as an insulating pitch has suggested another investigation. Could the wood tar not be converted into a resinous substance suitable for varnishes? This might be accomplished by axidizing with air or oxygen, under pressure, in the presence of a catylst, at a temperature of 300-375°F. To the research chemist with a good knowledge of modern organic chemistry, both theoretical and applied, and a rational imagination, the processes involved in distillation of wood and the commercial utilization of its products form a splendid field for investigation.

Economical Problems

In the past many of the wood distillation plants have been paying good dividends, notwithstanding the inefficient and unscientific methods employed. The proprietors have, as a rule, been content to maintain a certain degree of conservatism and only adopt improvements very slowly. Most of the development has been along mechanical lines. On the chemical side the progress during the past thirty or forty years has not been very marked. Those interested in the industry were impatient, expecting that upon scratching the surface of what they thought was the field of research, immediately dollars would be found in abundance, and were doubtless disappointed when this superficial method produced no monetary returns, thus resulting in their adherence to the old system of inefficiency. This is not the true spirit and, in this connection the following quotation from the introduction

of the recent report of the British Ministry of Munitions upon the large Gretna factory, which was established during the war, may be interesting: "It sometimes happens that, owing to exceptional circumstances, profits are made alongside of great waste of material. Such a state of affairs is a national misfortune and, apart from the los sof materil, which is likely to cause a nuisance to other people, it is demoralizing and engenders a careless, unscientific spirit in those conducting the operations. Preventable waste of any kind should be considered a sin against mankind." This is scarcely the place to discuss industrial chemical problems, but some of the points mentioned will be found applicable to nearly all industries.

How can the cost of production of the prime products in the distillation of wood be reduced?

1. By increasing the production of cemmercial products from the same amount of raw material.

2.Economy in the fuel requirement.

3. Economy of labour.

4. Improved mechanical equipment and reduction of operations and with this must go, hand in hand, reduced capital expenditure and economy of fuel and labour.

5. Conversion of all byproducts into valuable commercial commodities.

A short discussion of these problems involved in the foregoing may indicate possible lines of improvements in this industry.

1. As already pointed out, there has been practically no scientific control of the retorting operation. The introduction of scientific control. Changes in the arrangements for heating the retort. Changes in the construction of the retort. Both of the latter with a view to reduce the consumption of fuel. With these changes a reduction in decomposition would naturally follow with the resulting increase in yield of valuable products. Where thousands of tons of wood are distilled, the increase in the output by a few pounds and a reduction in this combustion of fuel may make the difference between a dividend and non-dividend paying concern.

2. Within the last thirty years through the quantity of fuel consumed in the wood distillation factories has been reduced from 25-50 per cent., there is still a possibility of further economy. There is the heat lost in the waste products of combustion, there is the latent heat of the vapours from the retorts, of the acetic acid and methyl alcohol vapours from stills, etc., etc. The application and more complete utilization of all these sources of heat in the various distilling, evaporating and drying operations would lead to an economy in fuel and at the same time reduction of apparatus. The complete economic utilization of so-called waste heat is most desirable with present position of the fuel question.

3. By the reduction of the operations and apparatus there should be a corresponding diminution of labour requirements.

4. With the introduction of improved methods, whereby the number of operations would be reduced considerable plant could be

dispensed with, and a saving of capital accomplished. At the same time the repair, renewal and depreciation charges would be reduced by the installation of improved apparatus in the primary operations.

5. It has already been pointed out that such by-products as the wood tar and oils are substances awaiting conversion into valuable commercial products.

New Position for Mr. Edgecombe.

Mr. G. H. Edgecombe has resigned from the Forestry staff of the Commission of Conservation to take charge of an extensive cruising and mapping project for the Keewatin Lumber Company, on their lands in the Kenora district, Ontario. Since his return from overseas, Mr. Edgecombe has been assistant to Mr. R. D. Craig, who has been in charge of the survey of the forest resources of Ontario for the Commission of Conservation since his return from British Columbia, where he was in charge of the inspection of aeroplane lumber for the Imperial Ministry of Munitions. Mr. Edgecombe's headquarters will be at Keewatin, Ontario.

How Timber Lightens Our Taxes

Revenues from Crown forests are playing an increasingly important part in the several provinces. In New Brunswick, for the fiscal year ending October 31, 1920, the forest revenues to the provincial treasury aggregated $1,387,005, or more than double those of the previous year. This increase was due partly to an increased cut, partly to increased stumpage dues, and partly to a closer scale.

In Quebec, for year ending June 30, 1920, the forest revenue amounts to $2,-604,45.26, or 28.6 per cent. greater than during the previous year. It is estimated that during the current fiscal year the forest revenue to the provincial treasury will aggregate around $3,000,000, which may be increased to $3,500,000 during the fiscal year following.

In Ontario, for fiscal year ending October 31, 1920, the forest revenue was 2,684,843, an increase of nearly 50 per cent. over the previous year.

During the calendar year 1919, the British Columbia Government received in forest revenue a total of $2,755,739.

The importance of perpetuating these revenues, to say nothing of increasing them, is obviously so great that all of the provinces would be amply justified in expending larger sums than at present upon the protection of the forests from fire, insects and disease, upon reforestation, and upon an administration calculated to ensure cut-over areas being left in the best condition to produce continued crops of the more valuable tree species, so far as that may be consistent with the economies of the situation.

Pulp and Paper Facts

Paper-making in Canada began in 1803.

First mill erected in St. Andrews, Que.

Ninety-four establishments now actively engaged, including 37 pulp mills, 31 paper mills and 26 combined pulp and paper mills.

Capital employed (1920) $264,269,704.

Ranks second among Canadian manufacturing industries in capitalization.

Ranks first in value of exports, exclusive of farm and kindred productions.

Employs 26,000 persons in mills and about as many more in woods' operations at certain seasons of the year.

Pays in wages and salaries (1918) $26,974,225 yearly.

Producing provinces, in order named, Quebec, Ontario, British Columbia, New Brunswick and Nova Scotia.

In 1890 Canada's total pulp and paper exports were valued at $120; twenty years later (1910) they were valued at $4,464,197; thirty years later (1920) their value exceeded $104,000,000.

Principal destination of exports: United States, United Kingdom, Japan, Australia, New Zealand, Cuba, South American Republics, British South Africa.

Canada's pulp and paper exports to the United States in 1919 created "exchange" at the rate of more than $340,000 a day for every working day in the year.

Canada makes approximately 2,775 tons of newsprint paper daily. Four hundred tons, approximately, are consumed in Canada, the rest being exported.

The United States and Canada, together, produced 2,183,000 tons of newsprint paper in 1919, Canada's share being 808,000 tons.

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AIRCRAFT FOR FORESTRY SERVICE

Use of Aircraft in Forestry and Logging

Ellwood Wilson

Chief Forester, Laurentide Co., Ltd.

An interesting account of effective work done this year by seaplanes in Central Quebec.

The writer has been in charge of the Laurentide Company's aerial work for two seasons and gives herewith the results of the work. The first season showed absolutely the practicability of the planes for reconnaisance of unmapped or mapped areas, for transportation of passengers and of fire-fighting equipment, for looking over the work of log drives, for spotting forest fires and for aerial photography.

The winter was spent in overhauling planes and engines and in the study of the pictures, taken from the air, on the ground. This spring a photographic laboratory was equipped so that photographs could be handled well and expeditiously.

Showing the practicability of the use of aircraft in forestry service, we reproduce the above from an article in the October, 1920, issue of this magazine.

DAYTON WRIGHT COMPANY

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MANUFACTURERS OF COMMERCIAL AIRCRAFT IN THE CITY WHICH WAS THE BIRTHPLACE OF AVIATION.