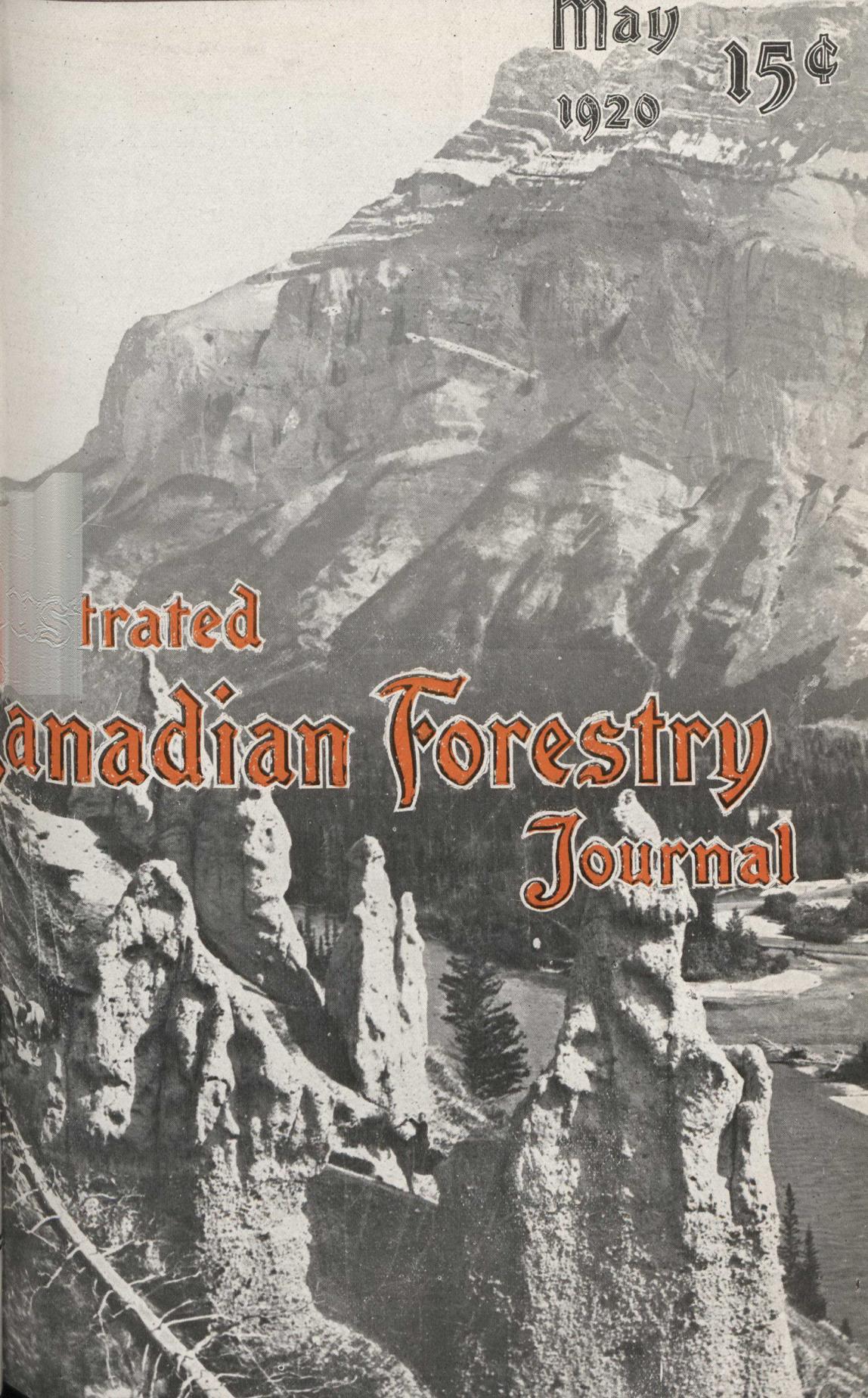


May 15¢
1920



Illustrated
Canadian Forestry
Journal

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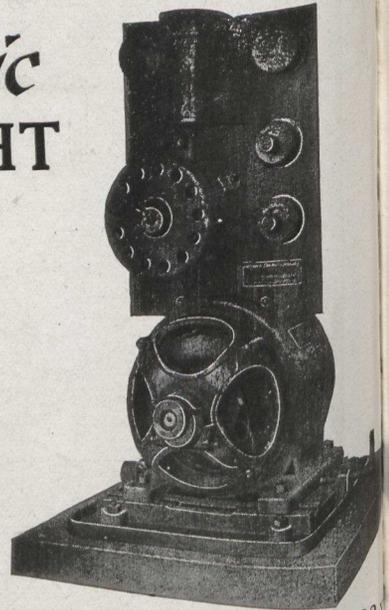
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¶ This Belt-connected Plant makes the installation of electricity in the smallest mills, practicable and economical. The unit can be driven from any power shaft. Twenty-four hour service is obtained by the use of 16 cells of TITAN storage battery.

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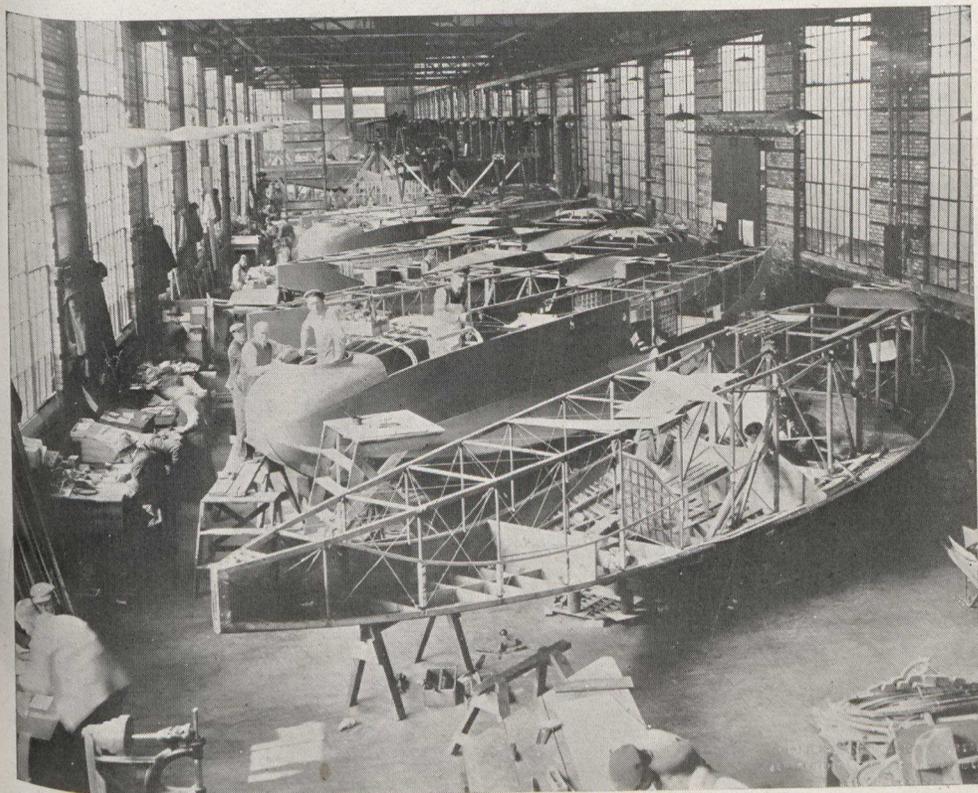
Canada's Woods for Aircraft Making

by Ronald D. Craig

Formerly Chief Inspector, Aeronautical Division, Imperial Munitions Board

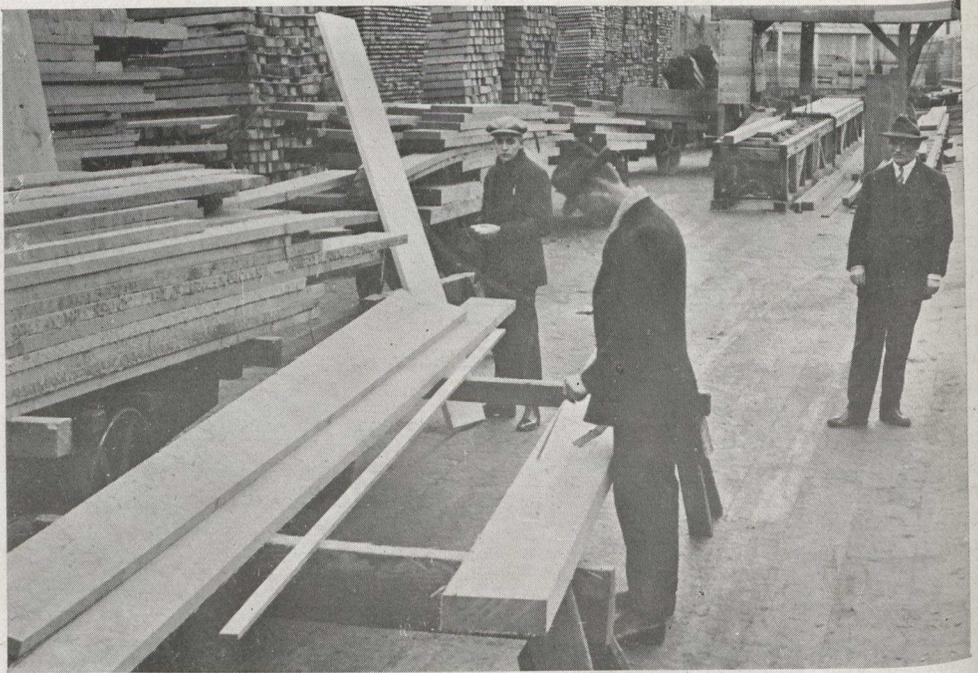


An Expert Discussion of what the Dominion Can Offer Aeroplane Building of the Future



Wood, and more wood.—What the inside of an aeroplane plant looks like.

Wood has probably never been used in any form of construction where it has been subjected to so severe a test as in the framework of an aeroplane. Usually it is possible to allow a sufficient margin over the



Inspecting lumber at Prince Rupert to determine its suitability for aeroplane construction. During the war, the high character of this inspection, on which human lives depended, won universal commendation.

factor of safety to permit some defects in the material. In aeroplane construction, however, the reduction weight and wind resistance to the minimum is of such paramount importance that the size of each component must be so reduced that only flawless material can be used. The stresses are carefully computed for every portion of the various parts, and all unnecessary wood is removed as shown in the illustrations.

In addition to the ordinary defects recognized in lumber, "angling" grain is perhaps the most serious defect in aeroplane wood. By sawing parallel to the bark it is comparatively easy to get the grain formed by the annual rings to run straight, but there is a tendency for trees to grow in a more or less spiral form which causes the fibres to angle across the flat grain or tangential faces of sawn lumber. Except where the spiral is very slight, it is impossible to correct this by any method of sawing. On account of these specially rigid requirements, the percentage of any

kind of lumber that can be used for this purpose is very small.

Civil Aviation's Wood Needs.

Though with the cessation of the war the demand for wood for aeroplane construction has practically ceased, there is no doubt that commercial aeronautics will develop into a very important industry demanding large supplies of high grade wood. A great number of kinds of woods are used for different purposes, but for the framework of the wings and fuselage, spruce has been found the most suitable on account of its combination light weight, tensile strength, flexibility and resistance to shock and splitting. Of the American species, white spruce, red spruce and Sitka spruce have been found almost equally satisfactory, but the higher percentage of clear and the large sizes obtainable in the Sitka spruce make it by far the most important species.

The difficulty of securing sufficient spruce of the required quality led to

the use of other woods during the war. Douglas fir and Port Orford cedar proved quite satisfactory, and it was found that even several of the western firs, and the various white pines could be used to some extent.

Wood Propellers and Skids.

Hardwoods are used for propellers, engine bases, skids, packing pieces, etc. Though walnut and mahogany are considered the best woods for propellers, it was found that oak, beech, maple and ash could be used where the requirements are not too exacting. Ash, especially white ash, is used extensively for longerons, bent work on wings and fuselage, landing skids and other parts of the framework.

In view of the special efforts required to secure enough aeroplane wood to meet the war demands, it is of interest to consider what the possibilities are of meeting the demands which may be made in the future.

How Much Sitka Spruce?

There is estimated to be still about 13,700 million board feet of Sitka spruce in British Columbia, 9,400 million feet in Washington and Oregon, and from 15,000 to 18,000 million feet in Alaska. A considerable proportion of this timber is so situated that it will not be commercially accessible in the near future, and most of it is so scattered in stands with other species that it cannot be profitably taken out except as the other timber is logged. Unless another emergency arises, the



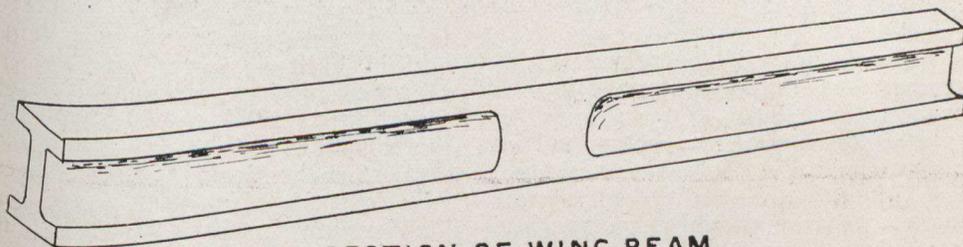
This is what is called a "spiral grain" spruce log. Because the tree grew with this defect, all such logs were discarded for aeroplane manufacture and indeed for nearly any other timber purpose.

supply will have to be secured from the ordinary annual cut. If it had been necessary to continue the production in British Columbia at the rate attained by the end of 1918, through the concentration of efforts, the available supply of aeroplane spruce that could be secured at a reasonable cost would have been exhausted in a year or so.

The United States Spruce Production Corporation opened a considerable source of supply by railway con-



INTER-PLANE STRUT



SECTION OF WING BEAM
CHANNELLED OUT TO REDUCE WEIGHT

struction, but very little development of the Alaska forests has yet taken place.

The normal annual cut of Sitka spruce in British Columbia for both pulp and lumber is about 90 to 100 million board feet; in the Pacific states 290 to 300 million. If all of the lumber suitable for aircraft construction were secured from this, British Columbia might supply from five to ten million, the Pacific states 20 to 30 million, and the Alaska forests might furnish a million feet or more if the contemplated development is realized. It requires such special care in sawing to recover all of the clear, straight-grained wood that it is not to be expected that a high percentage of it will be saved, unless very high prices are offered for it. It should be possible, however, to obtain one or two million feet of beam stock a year in British Columbia, and three or four million feet in the Pacific states for many years.

Engelmann Spruce

If Engelmann spruce is found upon further investigation to be satisfactory, British Columbia has 566 billion feet, with an annual cut of about 30 million feet, of which a small percentage would meet the aeroplane standard.

Eastern Spruce.

In the report of the United States National Advisory Committee for Aeronautics, the supply of spruce in the eastern states is estimate dto be 14,500 million feet, with an annual cut of 725 million board feet. The percentage of this which can be used for aircraft construction is said to vary from 3.9 per cent. in Maine, to 8.2 per cent. in the southern Appalachian Mountains, but it is very doubtful that this proportion could be secured.

There is no reliable estimate of the amount of saw material in the spruce of eastern Canada and the prairie provinces, but the annual cut of spruce lumber is about 1,400 million feet. If special efforts were made to secure all the aeroplane lumber from the eastern cut, it might

If thou art worn and hard beset
With sorrows, that thou wouldst forget,

If thou wouldst read a lesson that
will keep

Thy heart from fainting and thy soul
from sleep,

Go to the woods and the hills! No
tears

Dim the sweet look that Nature
wears. —Longfellow.

supply from 20 to 30 million feet, but under ordinary conditions, perhaps perhaps four or five million feet could be secured.

Douglas Fir Supply.

The total supply of Douglas fir is estimated to be about 580 billion board feet, of which 75 billion feet is in British Columbia. The annual cut in British Columbia is now about 750 million feet, and in the north-western states a little over five billion feet. During the war, when every effort was made to secure as much aeroplane lumber as possible from the commercial cut of fir, not more than two per cent. was found suitable for beam stock in British Columbia. On this basis, 15 million feet might be secured annually in British Columbia, and 100 million feet in the United States.

Port Orford Cedar.

The commercial stands of Port Orford cedar are confined to a narrow strip 20 to 25 miles wide along the coast in Coos and Curry counties in Oregon. The total stand is estimated to be only 750 million feet, and the total cut in 1917 was about 35 million feet. About 12 per cent. of the cut appears to be of aeroplane grade.

The better grades of grand fir, silver fir, noble fir and white fir may be used as substitute for spruce, especially in built-up parts, but the percentage suitable for aeroplane construction as solid wood, is comparatively small.

Western hemlock is also considered as a substitute for spruce, but it is heavier, low in shock resistance, and the percentage of clear is small, so



Photo, Courtesy Mr. E. E. Lemieux.

YOUNG LIVE CANADIAN BEAVER.

that it cannot be considered as an important species for this purpose.

White pine, western white pine and sugar pine possess certain qualities which enable their use for some purposes, especially in ply-wood.

Where for Black Walnut?

The amount of hardwood entering into the construction of an aeroplane is comparatively small, and there will probably be no difficulty in meeting any demand for this industry. The one exception in perhaps black walnut, which is considered the best propeller stock grown in North America. Estimates of the total stand are very unsatisfactory, but the best available figures show a probable stand of 850 million feet in the United States, including all trees over eight inches in diameter. The amount over

16 inches which will produce aeroplane material must, therefore, be very small. From 1914-1917 the cut was between 75 and 90 million feet annually, but it was greatly increased during 1918. Future cuts will be considerably below these figures. Extensive experiments have been conducted in splicing, lamination and ply-wood construction. It was found that wing beams can be built up so that they will have equal strength and stiffness to solid wood. This makes it possible to use inferior woods when protected by layers of stronger woods and also short clear pieces, which would otherwise be discarded, and effects a considerable saving in the actual amount of wood used. The cost of construction is higher, however, than when solid wood is used, and it is difficult to secure the same uniformity.



A particularly engaging photograph of a walk in Stanley Park, Vancouver.
Courtesy of Grand Trunk Pacific Railway.

How Fast Will My Shade Trees Grow?

By F. E. Buck, Central Experimental Farm

Relative Value of Shade Trees with Special Reference to Rapidity of Growth

The "growth tables" published in the March article indicated that as a rule the larger the ultimate size of the tree the greater the growth. This was borne out by actual results taken from growth records over a period of years.

In the same article the statement was also made that as a rule the greatest growth takes place when the tree is from six to nine years old. This statement is borne out by the growth records which follow.

Certain trees which appear in these tables are not recommended for street

or general use in spite of the fact that in the tables they occupy a conspicuous place in respect to rapidity of growth. In several cities of the United States which issue "permits" to the residents before street trees can be planted, such trees as the Manitoba maple, poplars and several others are not allowed to be planted.

In the first table the poplar shows an average growth of five feet per year for four years. It dropped out of the race, however, before the second growth table was recorded ten years later. This fact is significant.



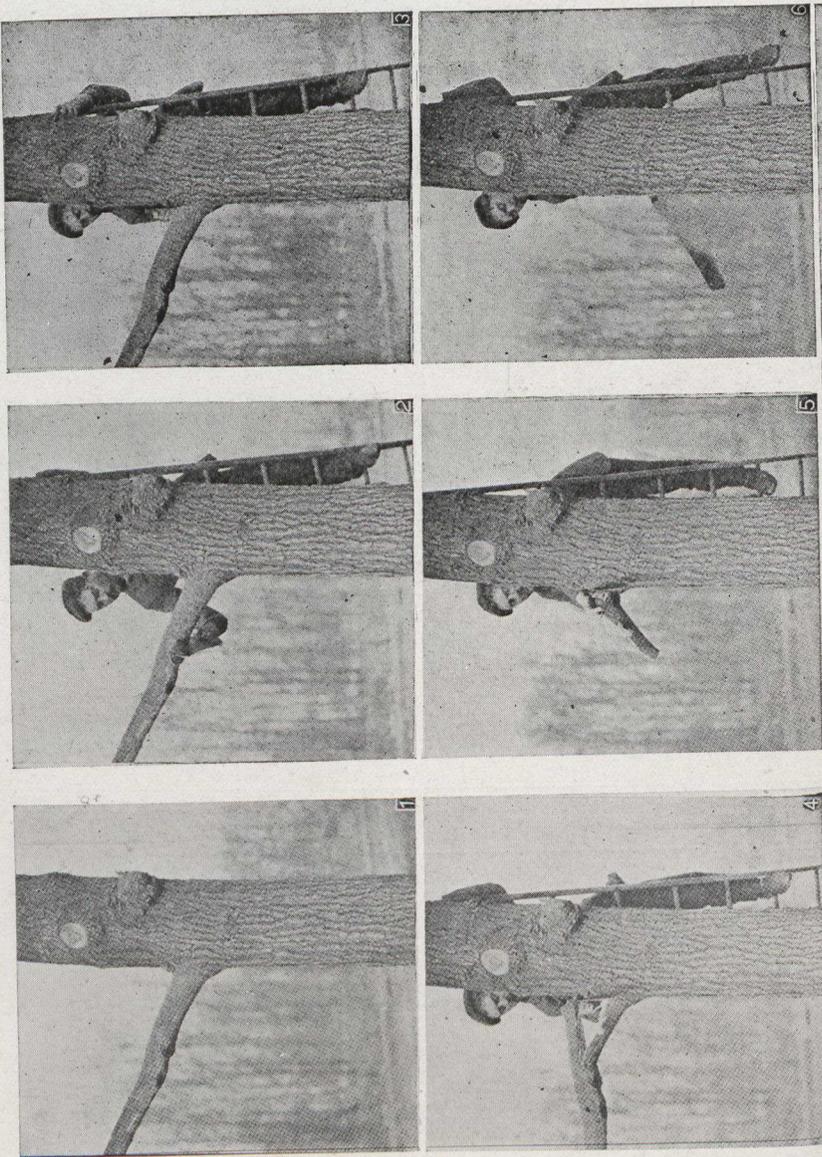
"The kindest thing God ever made,
His hand of very healing laid
Upon a fevered world,
Was Shade."

cant! Trees which make abnormal growth are generally short-lived and subject to injury and disease. Their wood also is too brittle and breaks off in storms, becoming a source of danger to the citizens.

Measurements of Trees Planted 10 Feet Apart, giving the Average Growth per Year for a Period of Four Years. Soil Conditions Very Variable.

Name of Variety	Average Growth Per year	Greatest Growth in One year	Smallest Growth in One year
	inches	inches	inches
Sugar Maple	11	24	4
Silver Maple	35	58	18
White Birch	37	60	12
Canoe Birch	28	59	15
Yellow Birch	32	55	15
American Elm	29	52	10
White Ash	38	60	20
Black Ash	22	49	7
Green Ash	25	29	11
Red Ash	29	48	10
Manitoba Maple	30	44	18
Plane Tree or Sycamore	30	30	14
White Poplar	60	81	45

HOW TO PRUNE A TREE



1. The branch. 2. Start with an undercut, saw about half way through. 3. Then saw close to the shoulder. 4. Branch will split horizontally and fall off. 5. Finish cut. 6. Branch is removed.

From Solataroff's "Shade Trees in Towns and Cities."

NOTE.—This period was from 1892 to 1896, the trees in most cases then being about five to seven years old, and planted three or four years previously. This is the age when trees make most rapid growth.

Another Four Year Period of Growth 10 Years Later, Giving Average Height in 1910. The Trees in 1910 Averaged about 22 Years Old.

Name of Variety	Average Growth Per year	Greatest Growth in One year	Smallest Growth in One year	Average Height in 1910
	inches	inches	inches	ft. in.
Sugar Maple	6	12-18	2	19 6
Canoe Birch	7	12-14	no growth	36 3
Yellow Birch	9	12	4	32 2
American Elm	7	23	5	26 7
White Ash	8	23	5	33 4
Black Ash	17	27	2	30 2
Green Ash	7	12	2	29 9
Red Ash	12	14	8	33 9

Comparing the two tables it is interesting to note that the amount of growth in the first of the two "four year periods" was double or more what it was in the second period. At the end of the first period the annual growth became less and less until it reached an average annual growth of about twelve inches.

The kind of season has a great deal to do with the amount of growth. In some seasons a tree may grow only a few inches, and the next year its growth may be four or five times greater.

The soil has a most important influence on rapidity of growth. Unfortunately the trees listed in these tables are not grown in the same type of soil, consequently the results in some cases are apt to appear to conflict with the general statements. The soil around the Experimental Farm on which these trees were grown, varies in character from a light sand to a heavy clay, with several intermediate types.

On other parts of the Farm many other varieties of trees are growing under experimental conditions. While very few are really suitable for street planting, a few should be mentioned

which can be highly recommended for use around the home.

(1) The fastest growing and of large size:

Laurel-leaved Willow (the best of the Willows).

Cut-leaved White Birch (in some localities).

Lombardy Poplar (for special effects).

Black Walnut (in some cases).

(2) Medium fast growing and of medium size:

Pin Oak.

Mountain Ash.

Catalpa (not very hardy).

Butternut.

Purple-leaved Norway Maple.

Flowering Crab Apples.

Maiden-hair tree (suitable for streets, but rather slow growing).

Kentucky Coffee Tree.

Please send in your membership fee promptly.

The members are responding splendidly to our new plan of a Two-dollar Annual Fee, including subscription to the Forestry Journal.



Wild geese on premises of Mr. Jack Miner, Essex County, Ontario.

Wild Life Sanctuaries and the Game Supply

By Jack Miner, Kingsville, Ont.

I have camped out in Canada for thirty-four falls in succession, remaining in the wilderness places from three to nine weeks each trip, and have hunted at nearly every dropping-off hamlet between Lake Temiskaming and Fort William. Here we have fully a quarter of a million square miles of the most substantial Red Deer country in America, lying practically idle because of the devilish timber wolves that devour the deer before they acquire an adequate start. Why do I say this is the best deer country in America? Because this same little game animal in the Southern States seldom weighs one hundred and twenty-five pounds. Here in Southern Ontario it was a large one that weighed one hundred and seventy-five pounds. But in

Northern Ontario I have often shot Red Deer that weighed two hundred and forty pounds, and as high as two hundred and fifty-three pounds. Better still, I never observed a deer in Northern Ontario that was not in the pink of condition. Therefore, I know from experience that this vast area of country is ideal for Red Deer. Time and again have I known a family of Red Deer to start up near the railway track between Chapleau and Fort William, and, possibly, there would be six or eight together previously to discovery by the wolves. After that this band of deer would not survive two nights, and these conditions have been going on for the past twenty-five years, and today the purchasing value of the bounty paid on one of these Red

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Deer exterminators is not half what it was ten years ago. Kill off the wolves and within ten years our present scattered remnant of Red Deer will increase into millions. Then only will all of us realize and appreciate that our wild mutton is well worth conserving. Our deer are only one of the many wild life assets of Ontario that has received little or no attention.

At the present moment there are at least two hundred and fifty beautiful white swans and thousands of wild geese and ducks resting within three miles of where we now are sitting; all contented and resting under the sand-bar along the north shore of Lake Erie, where twenty years ago it was hardly safe for a sandpiper to alight. On the Kingsville Game Reservation, Bob-white, the farmers' most loyal and beneficial friend, can be heard plainly in increased numbers. Better education and a public sentiment brought about by the Essex County Wild Life Conservation Association, has made this wonderful change possible.

Every county in Ontario should organize an interested and enthusiastic Wild Life Conservation Association to co-operate with the governments. Then, and then only, can we hope to hold a representative annual convention near the centre of the Province, probably in Sudbury, or better still in Toronto, where the convention could be attended by all of our representatives to the Legislature. This undoubtedly would draw out and bring together the trappers, guides and sportsmen (the men who know from experience), and put us in touch with one another. We could hold round-table or camp-fire talks, and square heart to heart conversation which, I believe, would bear fruit. We could consider the possibility of introducing among the wolves a contagious disease; also the advisability of introducing black foxes through the establishment in

Ontario of black fox ranches for the purpose of re-stocking Northern Ontario with something worth while. If it pays to re-stock our lakes with fish-eating fish, surely it would pay to re-stock our forests with foxes worth five hundred dollars each, that do not consume as food, more partridges than a ten dollar Red one will. One of the finest black fox pelts I ever saw came from Northern Ontario.

PLANTING TREES IN N. Y.

Syracuse, N.Y.—The spring of 1920 is the biggest year yet recorded for forestry in New York State.

This was shown by the addresses at the First Annual Forest Week of the New York State College of Forestry at Syracuse, when five busy days were spent in discussions of various forestry programs.

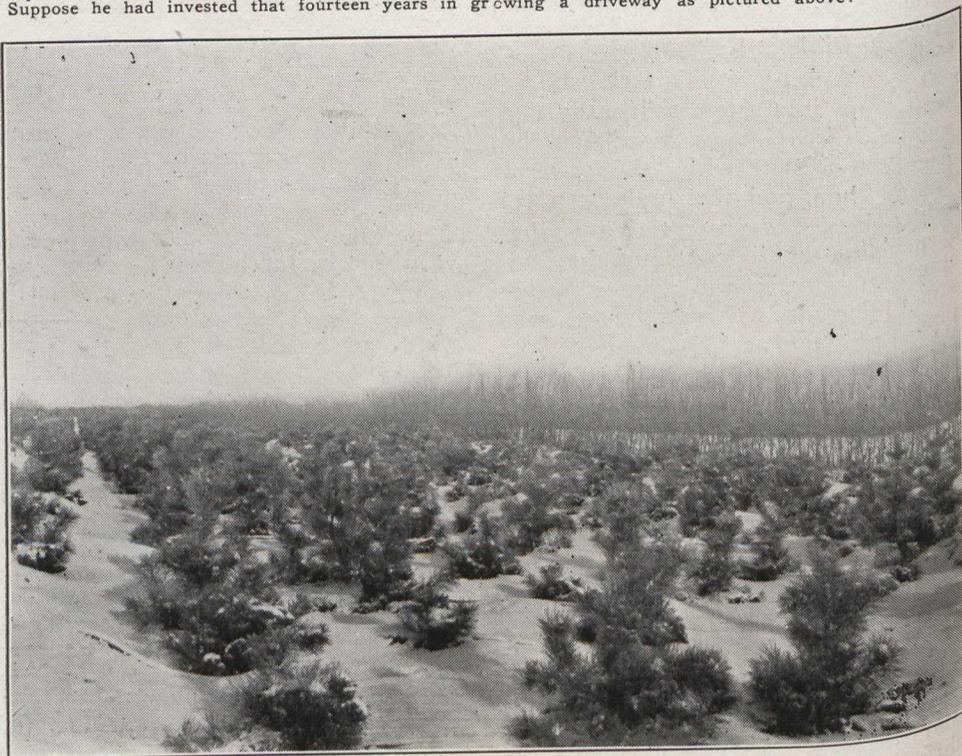
Here were some of the big items of news of the week:

Monday, Public Forest Day.—The College of Forestry will alone plant big areas as follows, during April and May of this year: Otsego County, township forests, 50,000 trees; watershed planting, 50,000 trees; Malone city forest, 40,000 trees, chiefly pine; Chenango County, township forests, probably 30,000 trees; Herkimer county, many small plantings, depending on the number of trees that can be secured from the State, probably 50,000 in all; 30,000 trees in Lacona, N.Y.; 20,000 trees on the College of Forestry arboretum at Syracuse; 65,000 trees at Streeter Lake, under supervision of the State Ranger School.

Tuesday, County Agent Day.—Forestry College speakers declared that the State can provide from its woodlots, one-third of its lumber bill of \$125,000,000 a year, land not now touched; the State College of Forestry at Syracuse will begin research development of 90 acres of woodlot near Syracuse.



TREES WILL PROVE THE GREAT STABILIZER OF PRAIRIE POPULATION.
 A Canadian prairie farmer, after 14 years of successful toil, decided to sell out and move to Ontario. He gave this bluff explanation of his action: "I'm hankering for the sight of trees. For fourteen years I have looked from my window on a world of what? Barbed wire! Barbed wire! My children are growing up to a landscape of what? Barbed wire! Barbed wire!" Suppose he had invested that fourteen years in growing a driveway as pictured above!



Getting a crop of young pine trees under way at Indian Head, Saskatchewan.

What to Plant for Prairie Tree-Shelters

By Norman M. Ross

Chief of Tree Planting Division, Indian Head, Sask.

With Tables Showing How Fast Various Trees Attain Good Height



In Manitoba, where the elevation is lower, tree growing is a much simpler matter than in Southern Alberta. In fact if one leaves out of account the probable injury from insects, the establishment of a shelter belt in Manitoba and Southern Saskatchewan is, provided the proper varieties are used and soil properly prepared, a comparatively easy matter.

As to varieties, the ones generally used are Manitoba maple, green ash, American elm, Russian poplar, cottonwood and Russian willows. We have other varieties which are very useful for ornamental purposes, such as birch and mountain ash, and which would also do well in shelter belts if young plants could be secured in sufficient quantities at a reasonable cost. Among the conifers, the Scotch, lodgepole and jack pines, the white spruce and Colorado spruce and tamarac are hardy everywhere. The balsam fir, black spruce, mountain dwarf pine, Cembra or Swiss stone pine, European larch and Siberian larch are quite hardy, but more useful for ornamental work, either owing to their habit of growth or to the difficulty of securing young stock.

In 1901 the Dominion government commenced a system of co-operative tree planting which has worked out very well and has become very popular among the farmers on the prairies. At that time, however, the Forestry Branch had many things to contend with: the general impression was that trees could not be grown, and for several reasons considerable difficulty was experienced in getting

any farmers to start in on shelter belt work. There was a little opposition on the part of the nurserymen, which subsequent results prove to have been very short sighted on their part, as there is no doubt that the work of the Forestry Branch has enormously increased the general interest in tree planting and horticulture generally, and consequently greatly widened the demand for all kinds of nursery stock, more especially in fruits, ornamental shrubs and perennials.

From the plantations established on the Experimental Farms and the few private plantations that had survived, it was seen that certain methods gave good results, while if these methods were not followed failure was practically certain.

The Forestry Branch decided to supply trees to any farmer free of charge and express paid, provided that certain conditions were complied with. The conditions were:

1. That the ground be properly prepared before planting.
2. That the trees be planted according to the plan supplied by the department.
3. That the ground set out in trees be maintained as a permanent shelter belt and be properly fenced and cultivated.

There is no question that the most important feature with us is the preparation of the ground. Of course, the selection of the varieties is generally important, but as the department supplies the stock that feature is entirely controlled.



At five years of age Scotch Pine under prairie conditions will average 2 ft. high; at 13 years, 11 ft. high.

After carrying on this distribution for some seasons it was found advisable to insist that all ground for planting must be summer fallowed, so that now no trees are sent out for planting on garden land, back setting or stubble plowing.

In setting out the belts we arranged always that the trees be spaced approximately four by four feet. This feature aroused great opposition in certain quarters, and even yet it is largely a matter of opinion as to whether in all cases such close spacing is always best. However, considering the average conditions and the fact that the average farmer is very much averse to hoeing, and what may be called pottering jobs, it was thought that on the whole the plantations should be set out in such a way that they would most quickly take care of themselves if for any reason they happened to be neglected soon after becoming established. There is no question at all but that if trees are spaced eight by eight or ten by ten and given good cultivation, they will eventually grow into better individuals, and more rapidly

than if set four by four feet. But the labor is increased enormously, and it requires several years more before the widely spaced trees are effective as a shelter. The greatest danger of wide spacing, however, lies in the probability that the farmer will fall down sooner or later in his cultivation, and that of course means the ruin of the belt.

The fact remains, however, that the four by four spacing has given excellent results. Where there have been failures, it cannot be placed to anything but lack of care in keeping grass and weeds from among the trees.

Since the commencement of the war conditions as regards labor have been such that there has been a natural falling off in the distribution of trees, but that is only a temporary condition, and each season farmers realize more and more the necessity for tree planting.

Since 1901 over forty million plants and cuttings have been distributed. We raise the stock on two nurseries, one at Indian Head and the other adjoining Saskatoon, both in Saskatche-



Wouldn't you pay a fat premium to get a prairie farm with such a grove of evergreens as this?

wan. Both of these nurseries have a capacity of from four to five millions annually.

The principal feature of our distribution is the inspection system, and the success of the scheme is due very largely to this inspection. As far as possible, every applicant for trees is visited, and no trees are granted unless the conditions comply with our regulations. Approximately 45 per cent. of applications are turned down each season, principally on account of lack of preparation. Eight inspectors are employed on this work. In the summer they are on the road from June to October, and during winter they work in the office preparing the distribution lists, planting plans, etc.

In regard to stock, we use only one year Manitoba maple, two year ash, one year caragana and uprooted cuttings of poplars and willows. We do

not advise cutting back to the tops of the seedlings except the caragana, which when used for hedge must be cut back to the ground at time of planting. We strongly advise against any general pruning in a shelter belt, as it only means extra work and makes conditions for the growth of trees less favorable. The belt should be grown as thick as possible from the ground up. If pruning is done, it should be confined to the inside rows.

Evergreens are sent out at a nominal charge of one cent each, of \$1.00 per 100. We use four year transplants of Scotch and jack pine, and five year transplants of white spruce. The demand is greater than we can supply.

At Indian Head we find that the growth of the more common trees, ascertained from hundreds of measurements made each year on the nursery, is as follows:

	At 5 years of age feet	At 13 years of age feet	At 16 years of age feet
Man. Maple	8	19½	
Green Ash	4½	14	
American Elm	4½	12¾	
White Birch	8½	20	
Russian Poplar	12	30	
White Spruce	2	7¼	13½
Scotch Pine	2	11	18¾
Jack Pine		10½	
Lodgepole Pine		8	
Tamarac	5½	17½	22¼
Siberian Larch	5½	20	

These ages are from seed or cuttings as the case may be, and all measurements are made in plantations spaced about four by four feet. No pruning or thinning has yet been found necessary in any of the plantations.

For general prairie planting the evergreens will, in my opinion, undoubtedly give the best ultimate results. Even in a dry season the growth is good, and once established they will withstand neglect that would be fatal to the broad leaf varieties.

PAPER INDUSTRY IN PROGRESSIVE STAND.

Legislation for a national forest policy in order to promote reforestation, which is regarded as essential for the paper industry, was recommended to the annual convention of the American Paper and Pulp Association by its committee on forest conservations.

General recommendations for a national forest policy, to be co-ordinated with state legislation, include:

Permanent annual appropriation of \$1,000,000 to be applied only where the States co-operate, annual appropriation of \$500,000 for forest surveys and land classification, permanent annual appropriation of \$1,000,000 to acquire land suitable for timber growing, and permanent annual appropriation of \$1,000,000 for forest planting operations in National Forests.



A Break in the Woods—one of the lovely natural pictures encountered in many parts of Nova Scotia.

How To Improve A Small Woods

by B. R. Morton, B.Sc. F., Ottawa

An Answer to a Score of Questions Through Forestry Journal Pages



What is the condition of your woodlot today? Examine it carefully. Does it contain the best kind of trees? Has the past cutting pretty well removed most of the better species, and made space for the less desirable? Are willows, hawthorns, ironwoods, soft maples, and aspen, occupying ground that might better be growing sugar maple, beech, ash, hickory, oak or white pine? Are many of the old trees dying, decayed, crooked, forked or so widely branched that they are holding in check the young trees beneath them? Are there open grassy spaces without any trees or are the younger trees in the open places so far separated that they are branched almost to the ground? Are the trees crowded so tightly that none of them can make proper growth? If any of these conditions prevail, your woodlot is in need of attention.

The conditions in woodlots are so variable that without making a careful examination it is impossible to give anything but general advice regarding their care. It is possible only to point out some of the things that should be borne in mind when undertaking this work. Much depends upon the judgment of the person in charge.

Protection Against Animals.

The first step to be taken in the care of the woodlot is its protection against injury by animals and fire. The grazing of stock in the woodlot is one of the greatest causes of its deterioration. The same piece of ground will not serve as a pasture, and remain a profitable woodlot for any considerable length of time. If it is

necessary that your livestock should have access to shade, fence off a small portion of your bush and confine them to this. Goats, sheep, cows and horses destroy hardwood seedlings by browsing on them. Goats and sheep are the worst offenders in this respect. They will eat many woody plants not touched by others, and during the hot part of the day they stay in the shady part of the woods, nibbling at the small trees in preference to grazing on the grass growing in the sunny openings.

The injury done by livestock is, however, not confined to the young trees. As a result of the destruction of the underbrush the soil is exposed to the sun and wind. These, together with the tramping about of the stock cause the earth to become packed, dry and hard, and the rain, instead of being absorbed and retained for the use of the trees, runs off the surface, carrying with it much valuable humus which acts as a fertilizer. Shallow-rooted trees are seriously injured by having their roots exposed and barked. Much of the stagheadness, i.e., dead tops, is caused by this form of injury.

Keep Fire Out.

Fire should never be allowed to run through the woodlot. Many woodlots show traces of fire damage. These fires in most cases have been the result of carelessness on the part of the owner or his neighbor. Proper precaution was not taken when burning stumps or brush and the fire was allowed to spread through the leaves and underbrush. Some owners are short sighted enough to believe that

no harm is done if trees of marketable size have not been destroyed. They place no value on the seedlings and young growth which will be the trees of the future.

It is, however, not merely by the destruction of young trees that the fire does damage. Larger trees are also injured. Fires which at first sight do not seem to have done much damage, will frequently scorch the bark at the base sufficiently to kill the living tissue beneath it. The bark on these scorched patches, sooner or later drops off, and the wood becomes exposed to the organisms of decay. The destruction of the leaves and litter on the floor of the woodlot is also a serious loss. These serve as a fertilizer and act as a sponge in absorbing moisture.

Winds also cause considerable damage to woodlots by drying out the soil and over-turning trees. The borders of the woodlot should be completely banked up with branches and foliage to protect the interior. Trees growing along the edge should be allowed to retain their branches right to the ground and open borders and gaps should be closed by planting, if this is necessary.

Tree diseases are usually caused by parasitic fungi. The most common of these are those which cause decay. Hollow trunks, discolored wood, or those shelf or hoof-shaped projections frequently found attached to the side of trees and logs are indications of the presence of decay-producing fungi. These projections or 'punks' as they are sometimes called, are the fruits of the organism growing within the wood and causing its destruction. These bodies produce minute seeds or spores as they are termed, which are carried to other trees and infect them. For this reason decaying trees are a source of danger to others. The removal of the punks will reduce the immediate danger of the spores spreading, but will not stop the decay in the affected trees. Many of these decay-producing fun-

gi are not capable of attacking a tree except through a wound, or where the bark has been broken, and, therefore, the needless blazing or cutting into the trunks of living trees should be avoided.

Stimulating the Stand.

In many woodlots which have been protected from cattle and fire, a dense even-aged growth of young trees has sprung up in the more open places. This is a desirable condition. In their youth the trees should be close enough together to force a rapid height growth and produce clear trunks. When about five years old they should number from 2,000 to 3,000 per acre. This number will gradually diminish, until at from ten to fifteen years of age they will number from 1,000 to 1,500 trees, and at maturity not more than 150 of the original trees will remain. Left to itself this thinning would come about in a natural way. The more vigorous trees will get ahead of their weaker neighbors, and sooner or later overtop them, causing them to die. Trees, even of the same species, differ in their rate of growth.

Nature, however, is slow and a little assistance by way of artificial thinning will stimulate the growth and concentrate it into a smaller number of the most desirable trees. Proper artificial thinning will shorten the time required for the trees to reach marketable size by ten to fifteen years.

In a woodlot containing many species the relative value of each species must be considered. The owner must decide for himself what species he is going to favor after he has given careful consideration to the adaptability of each species to local conditions. Generally speaking sugar maple, elm, white ash, hickory, white oak, beech, chestnut, red oak and yellow birch are the preferred hardwoods; while white pine, red pine, white spruce, red spruce, tamarack and cedar are the most desirable conifers.



A Ranger's cabin and lookout tower, north of the Canadian National Railways in the Cochrane, Ont., forest protection district. Photograph by courtesy of Ernest G. Poole.

The purpose of thinning is to stimulate the growth by giving each tree sufficient light and space to develop and yet keep a complete cover over the entire area of the woodlot so that the sun and wind will not deteriorate the soil. A large proportion of any tree has been derived through the leaves from the air and sunlight and foliage are very necessary agents in its growth. Shading or crowding which interferes with the development of the leaves must necessarily check the growth. To keep trees too long in a crowded condition is not advisable. Since other things being equal, the tree receiving the most light will produce the most wood. We must at the same time be careful and not go to the other extreme and grow our trees in stands which are too

open, for our object is not merely to secure wood in quantity; we also desire quality. We require the wood in a form in which we can best use it. Ordinarily the form we most desire it in, is long straight trunks, clean of stubs and branches. We must, therefore, remember that trees grown too much in the open do not have desirable trunks, since it is characteristic for a young and vigorous tree to spread out and take all the space it requires, and to develop a low bushy head in a comparatively short trunk. To secure tall, clear trunks we must keep the young trees sufficiently crowded to prevent the crown or head becoming too spreading. We must cause the lower branches to be killed off by shading when they are comparatively small, so that they will leave no large stubs to form knots in the sawn material. By crowding the trees from the time they are quite small, and from time to time thinning them as they require it, we can retain a sufficient amount of shade to cause the pruning to take place but at the same time permit the tree to have enough light to keep up a good rate of growth.

Which Trees Need Most Light?

A woodlot composed of only a few species is much easier to thin properly than one composed of very many kinds of trees, and especially if they are of different ages. In the following list the trees have been grouped according to their light requirements. This order is not absolutely fixed, but will be found to vary somewhat in different localities. Young trees as a rule will tolerate more shading than those nearer maturity. Trees growing on a site not suited to them will require more light than if they had proper soil and moisture conditions.

Shade Bearers: Sugar Maple; Beech; Hemlock; Balsam fir; Spruce; White cedar; Silver Maple; Red; Elm; Basswood.

Intermediate: Chestnut; Birch; White Pine; Black Walnut; Sycamore; Black Cherry; Oaks.

Light Demanders: Black Ash; White Ash; Jack Pine; Red Pine; Cottonwood; Tamarack; Hickories; Locust.

In the case of young stands of mixed species it is desirable to have some knowledge of each species requirements in regard to light and shade. Take for example a stand of young white pine and hemlock coming up together. The white pine being the more valuable it is the tree we desire to encourage the most. It is well, therefore, to know that the hemlock will produce more shade than the white pine, and we must favor the white pine when thinning, to encourage it to keep ahead of the hemlock. Should the hemlock become the dominant, or leading tree, the white pine will suffer by being too severely shaded.

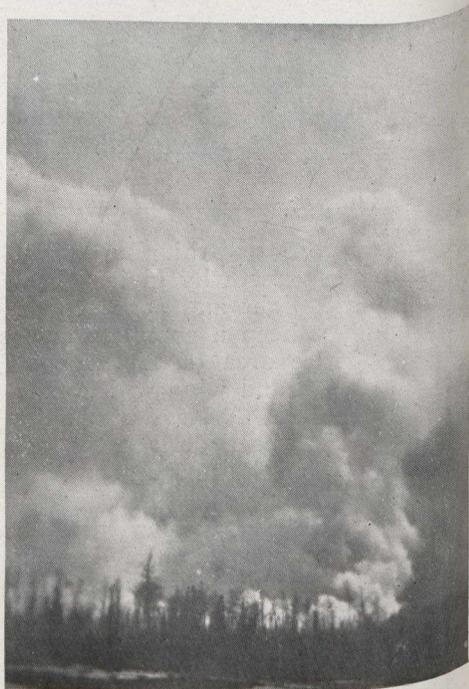
In thinning, select the trees you desire to retain and then decide what trees should be cut to help the ones that are to remain. It is well to thin on the safe side and take out too little, rather than too much. One can always come back later and remove a few trees if necessary. It is a much more difficult matter to overcome the evil of too heavy a thinning.

It is a good general rule not to cut a tree if its removal will leave an opening which cannot be closed by the branches of surrounding trees in from three to four years. Begin to thin when the trees are still young, as soon as the lower set of branches have been killed, and repeat this thinning every five or six years. Light thinning every five or six years is better than severe thinnings made at longer periods. The average woodlot owner, however, will probably find it more convenient to begin thinning when the material is of sufficient size to make firewood or be used for some other purpose.—B. R. MORTON.

"CANADA FIFTY YEARS BEHIND."

Mr. Henrick Carbonnier, honorary attache to the Swedish Consulate in Montreal, has just visited the Lau-

rentide Company's nurseries at Proulx, and some of the old cutting operations in the Peche district. He has also visited Price Brothers and the Belgo-Canadian operations. Mr. Carbonnier is making a tour of the continent, studying forest conditions for the Swedish Government, and will visit British Columbia, Washington, Oregon, California, the United States National Forests, and the Southern Pine Forests. While at the Laurentide Company's nurseries he expressed surprise that woods operations in Canada were not managed by technically trained men, and said that in Sweden all such work was under the direction of foresters. Mr. Carbonnier declared that in Canada we are passing through the same stage of handling our forests that Sweden did fifty years ago, and said that unless a change were made here in the methods of cutting, which he regarded as destructive, we would be in a difficult position in the next generation.



TIMBER SCARCITY? SURELY NOT.
Canada has burned down, through public indifference, 437 times as much timber as was cut in the whole of Canada in 1919.
And how much was cut last year?
Enough to make new wooden houses for one million Canadians.



Commission of Conservation.

PILING AND BURNING ON A LOGGING AREA.

Dominion Forestry Branch crew at work. Nisbet forest reserve, Saskatchewan.



Commission of Conservation.

HEAVY LUMBERING SLASH BEFORE PILING AND BURNING.

Fire danger extreme. At left is an area on which the debris has been piled and burned, thus greatly reducing the fire hazard. Nisbet forest reserve, Saskatchewan.

GOOD LUCK, ROYAL SCOTTISH!

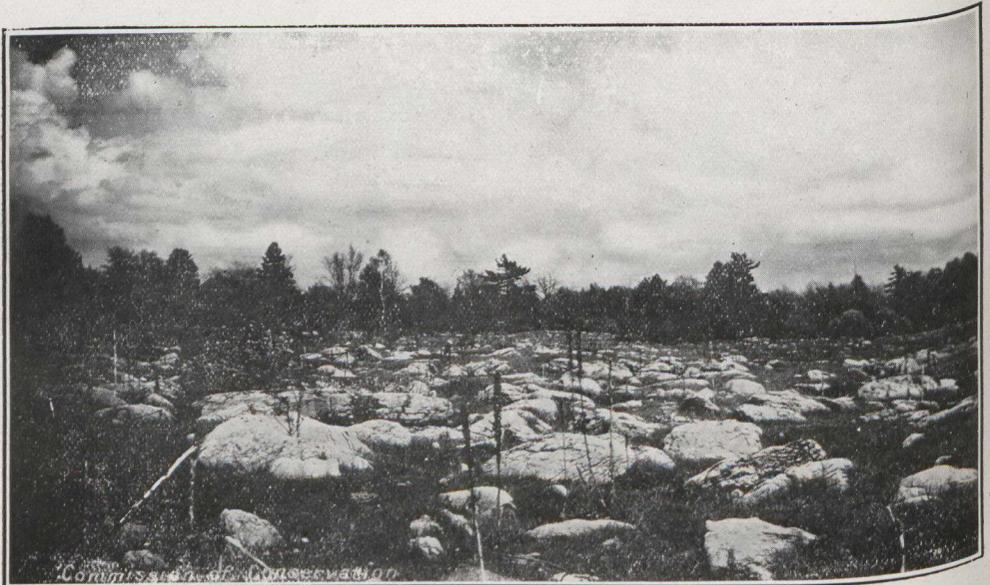
Of the several well-organized and effective forestry societies within the British Empire, one of the most admirable is the Royal Scottish Arboricultural Society, with headquarters at Edinburgh, Scotland. Working along lines not essentially different from those of the Canadian Forestry Association, and aiming to interest land owners and the general public in all phases of forestry and arboriculture, the Royal Scottish Society has grown in influence. With such public measures as the organization of a Forestry Department under the British Government, in order to encourage reforestation and the constructive management of woodlands, the influence of the Society in shaping the legislation, and in safeguarding the particular interests of Scotland, has been substantial. Depending entirely upon voluntary contributions for its upkeep, the various educational activities nevertheless have developed potency year after year. The membership strength has steadily grown,

ORGANIZERS WANTED!

The Canadian Forestry Association will employ, at good remuneration, Organizers in the following cities: Vancouver, Victoria, Calgary, Edmonton, Saskatoon, Regina, Winnipeg, Toronto, Ottawa, Fredericton, St. John and Halifax. A sterling opportunity for profitable and dignified employment. Applicants must have had successful records in some form of salesmanship.

206 Booth Building, Ottawa.

new applications coming from all parts of the country. The Duke of Buccleuch is President of the Society and the executive direction is in the hands of Mr. Robert Galloway, S.S.C.



Ontario's real gold mines, had they been handled constructively. Photograph taken on the Trent Valley watershed where there are 389,000 acres in farming, they once constituted the most valuable of Ontario's pineries. A few seed trees remain but not enough to re-establish a timber crop.

Can Canada Achieve Europe's Profits?

GERMANY.



CANADA.



Relative area of the forests of Germany and Canada. The German forests have been built up from inferior waste lands and today produce a larger timber cut than comes from the whole of Canada.

Canada has more than 14 times as much forest area as Germany.

Canada's forests as a rule grow on better soils.

Canada cuts from 500 million acres three and a quarter billion board feet of lumber a year.

Germany, in normal times, cuts about five billion board feet from just 35 million acres.

In other words, Germany cuts more timber each year than Canada, and does so from one-fourteenth of our forest area.

Such facts are not in themselves very remarkable, considering that Germany has nearly eight times the population of the Dominion.

The kernel of the matter lies, not in what is taken out of the forests, either of Canada or Germany. The recuperative condition of the remaining forest is the only factor that need engage our attention.

Investigative work on Canada's cut-over lands has not been very extensive, so that conclusions at best are of a general nature. Enough is known, however, to justify the assertion that Canadian forest tracts (particularly east of the Rockies), once cut-over, do not re-establish themselves satisfactorily. Second and third crops follow either not at all, or at too long intervals. The tendency is towards deterioration of the more valuable stands, a lowering of the yield per square mile, a process which, of course, cannot be contemplated with comfort by any forest-owning government, or any wood using industry.

Their Re-investment Policy.

The purpose of this article is not to build up a case for the indiscriminate application of German forestry methods to Canadian forests, but to provide a simple illustration of the fact that both France and Germany have so operated their forest lands as to extract enormous annual harvests of logs while ensuring an increasing richness of the **capital stock**.

Germany's forests, like those of France, are the product of intensive scientific management, with control of cutting, and attention to the reproduction of the most valuable species.

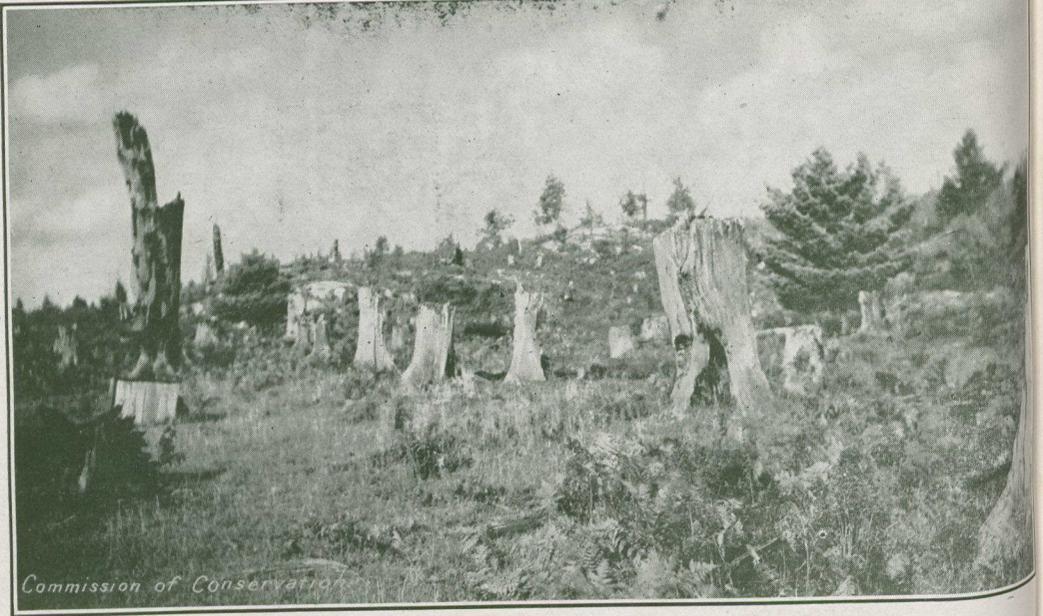
While Canada has been cashing-in on a ready-made legacy of virgin timber, re-investing almost nothing in replacement account, France and Germany have put the chief stress upon re-investment, upon future profits.

As a consequence, Germany has doubled her forest capital in the last generation. Canada's forest capital cannot be said to be nearly equal to what existed a generation back.

Of Germany's 35 million acres of forest, 46 per cent. belongs to private individuals, 32 per cent. to the state, 16 per cent. to communities, half the remainder to the Crown and the rest to corporations.

Of Canada's more than 500 million acres of forest (about half that being of merchantable type), not more than ten per cent. belongs to private owners. The Crown enjoys regulatory powers over the remainder.

In Germany, the first general forestry movement began about 1750, as



Commission of Conservation

Forest fires have robbed Canada of at least seven times as much timber as has been cut. Dr. Howe estimates this useless sacrifice of national wealth at 1,091 billion feet (board measure) of useful timber.

a consequence of a temporary fuel famine.

In Canada, while certain protective measures against forest fires had an early origin, the idea of technical forest management to secure continuous forest crops was not seriously mooted until after 1900. Germany, therefore, has had far more than 100 years start in the application of scientific method in timber production.

The state forests of Prussia are 7,518,189 acres in extent. In 1913, the timber cut on this area was no less than 2,709 million board feet. In the whole of Canada the average annual lumber cut is about 3,250 million board feet.

Bavaria, in 1911, made a net profit of \$4.12 per acre from her state-owned forests.

If Canada could cultivate such a revenue from even one-tenth of her Crown forests, public debt would be a thing to laugh at. There would be \$100,000,000 alone from the relatively small forest reserves of the three prairie provinces, in place of a net deficit of several hundred thousand dollars.

Spending So As To Earn.

Of the 2,150,000 acres of forests in Bavaria, 77 per cent are coniferous, and the average value in 1912 was \$50 an acre, or \$32,000 a square mile.

Bavaria spent on forest management, \$4,965,000 a year, more than double what is spent by all the Governments of Canada on forestry departments, fire protection, etc.

Bavaria's total net revenue from her forests in the same year amounted to \$1,187,000.

Each German state has three classes of forests. First, those owned by the state themselves; second, those owned by the cities or small communities; third, those owned by private individuals. Most of the communal and private forests are regulated by the state, to some degree at least. One of the most important restrictions is that no private owner or community can cut more than is produced, and that all deforested land must be reforested.

The German forest policy aims to reforest all waste lands and to gradually increase the forest area under

direct state control. It aims to improve the education and training of foresters and rangers at the expense of the state and is seeking to extend fire and other forms of protection over all forest lands.

"The financial success of German forestry," remarks Prof. W. R. Lazenby, "depends mainly on two factors: First, good means of transportation; and second, that the owners, whether they be state, city or private, refuse to sell more than a small annual percentage of the stand. By doing this, the market is never overstocked, for the demand is always greater than the supply, and the price received is much greater than the cost of production, including the interest on the money invested at compound rates."

What Lesson for Canada?

No reader of this Journal will, of course, fall into the error of picturing Canada, at her present economic milestone, as able to multiply Germany's revenue, per acre, by Canada's potential timber-growing area. Germany's revenues, like those of France and Switzerland, are the product very

largely of a keen local demand for wood materials in all forms, a restricted supply, and zealous management of the forest itself as the reproductive source of raw materials.

Canada, however, may read in the experience of European countries a prophecy of immense industrial development of vast public revenues, of increased population and an overflowing export trade, reared upon the pillars of an undiminishing forest.

When Canada has 50 millions of population, every square mile of forest will assume an economic importance now undreamed of. The older the world grows, the greater is its insistence upon lavish supplies of timber and pulp. Time, of course, will never alter the fact that 80 per cent. of habitable Canada is non-agricultural, and fit only for tree production.

Forests cannot be grown between spring and fall.

If Europe enjoys today the rich prizes of a century of constructive forest management, the time to plan for the Greater Canada of 1950 or 1990, in respect to its forest properties, is **Now**.



The Tree-bordered Shores of Lake of Bays, Ontario

Canada Has Lumbered 100,000 Square Miles

by Dr. C. D. Howe

According to Dr. Howe, Canada has lost through forest fires, 1,091 billion feet (board measure) of useful timber. This amount, he estimates as 437 times as much as is yearly cut in Canada. The potential loss to the public treasury has been at the lowest estimate \$1,042,500,000.

Canadian lumbermen have cut about 100,000 square miles of green timber.

"The total area cut over by lumbermen in the past, outside of the area cleared for settlement, can only be approximated. If it is granted that the lumbermen have cut over 100,000 square miles of land, exclusive of lands occupied for agriculture or settlement, it would mean a total cut in the past 300 years of 192,000,000,000 board feet, at the low yield of 3,000 board feet per acre. This, in addition to the large quantity which has been cut from the 92,000 square miles of cleared farming lands, is certainly as much lumber as has been produced in Canada. Therefore, it may be assumed that lumbermen in Canada have not actually cut more than 100,000 square miles of green timber, if, indeed they have cut as much, when allowance is made for the area covered by fires which have caused their operations to be scattered.

"The original timbered area, omitting semi-treeless land, was approximately 1,900,000 square miles. Of this we have shown 98,000 square miles to have been cleared for settlement, and 100,000 square miles to have been cut over by lumbermen, leaving a timbered area yet untouched of 1,702,000 square miles. Assuming the average of 3,000 square feet per acre, there should yet remain 3,279 billion board feet of timber in Canada, at a very conservative estimate. On the contrary the highest estimate which has been made, that given by the Chairman of the Conservation Commission, the Honorable Clifford Sifton, places the amount of saw timber and pulpwood in Canada at 494,600 million feet, and 1,100 million cords respectively.

"By converting the pulpwood into board feet, allowing 500 feet board measure for each cord, it is found that there are standing in Canada only 1,094 billion feet of lumber, including the very low grades. The difference between this and the quantity which should yet remain is 2,185 billion feet." This quantity has been destroyed by forest fires.

"It is a quantity so large as to be beyond comprehension; it is 437 times as much as is yearly cut in Canada; it is 49 times as much as the combined yearly cut of the North American continent, north of Mexico. It means that for every foot of timber that has ever been cut in Canada by lumbermen, at least seven feet have been destroyed by fire. If the stumpage value is placed at the low sum of fifty cents per thousand feet (the smallest royalty collected by any Canadian Government), the loss to the public treasury has been \$1,042,500,000. The actual money loss to the country has been many times greater, as several dollars are expended in logging, manufacturing and shipping every thousand feet of lumber."

THE "STICK OF GIANT."

The part that modern high explosives play in the lumbering industry in British Columbia is no small one. Their employment in road building, and in the removal of stumps and boulders; in the splitting up of huge logs, and the removal of log jams are but a few of the ways in which explosives are reducing labor costs and hastening production in the forests of that province.



"I Believe that 'God has lent us the earth for our life. It is a great entail. It belongs as much to those who are to come after us as to us, and we have no right by anything we do or neglect, to involve them in any unnecessary penalties, or to deprive them of the benefit which was in our power to bequeath.'"

(Ruskin.)

THE ASSOCIATION ENLARGES ITS PLANT

The Canadian Forestry Association has moved to its new and larger offices in the Jackson Building, recently constructed on Bank Street, Ottawa.

This is a year of expansion along all lines for the Association. All forms of educational work have been substantially developed. New classes of population are being reached, new

enterprises have been set under way. It ought to mean a year of vital national service, provided that every member joins hands with the Association's permanent staff at Ottawa. The surest way of fulfilling your personal part in forest conservation is to make sure your 1920 fee of two dollars is paid.

Controlled Fires to Clear up Farm Land



A Successful Experiment on a Wholesale Scale in Northern Alberta



An experiment in wholesale clearing of farm lands by controlled fires was carried out by the Soldier Settlement Board last year in Northern Alberta, under the direction of Mr. Fred V. Seibert, D.L.S. The last issue of the Forestry Journal contained two photographic reproductions showing the nature of the work. Herewith is given Mr. Seibert's description of the operation. His conclusions are quite definite: That firing is a safe and economical method of clearing land for settlement where the country is covered with scrub poplar, willows, brule and windfall; that Spring fires can be controlled; that such controlled firing can be made of great practical advantage in protection of timber growing areas of brule and windfall.

We started work on April 15th and ceased operations on May 21st.

Our first work was to fireguard the area, and this operation was also conducted as an experiment. We tried every method that looked at all reasonable. We found that the choosing of the location of the fireguard was a large factor in its economical construction; that it was not advisable to follow section lines, but to follow open meadows, grassy knolls and creek banks even to the extent of going a few miles further. By starting fire-guarding early, as soon as the snow is off, one man with a torch and three or four men with good fire beaters, consisting of a wet blanket tied to an axe handle, can first go around the area and burn off the ridges which dry out first, then they can make a second trip and burn off the hay sloughs and widen out the ridges if necessary, and finally, where necessary, on a third trip, they can

connect these areas already burned and so complete the fire guard.

Building Guards.

While our guard was in no place less than twenty feet, in some cases it was from ten to twenty chains, and I have seen places outside the area experimented on, where it should be even more. The main thing in constructing a fire guard is not alone to comply with the regulations, but to have a guard of sufficient width to be absolutely sure that no fire will jump it. The width must be left to the discretion and good judgment of the men in charge, who, to be competent to judge, must have had considerable experience with forest fires. He must take note of all the conditions bordering on the fire guard that will assist in carrying live sparks over it. Dry standing stubs with dry light bark is an example of what he must look for. One such tree near the fire guard might be sufficient to carry the fire across. The fire climbing the stub will cause sparks to be blown off by the wind which, before they reach the ground may be blown many chains. Too great care cannot be taken with the fire guard, and it is always better to have it wider than necessary than a few feet too narrow.

When the guard was completed we started burning small areas, noting the results, for only in this way could we be sure of the best time at which to set the final fire in order to obtain the maximum results.

At the same time an area of standing brule and windfall, with a good mat of grass was chosen, and a line picketed through the centre in such a way as to equally divide the work of



Clearing Land on a Wholesale Plan by Controlled fires. A view before burning.



The Same View as Above After Burning.
(Samples of soil taken here showed no damage from fire.)

clearing. One side was cleared before it was burned, and the other after, and a strict account of the time and men employed was kept. This showed that the clearing before the fire took at the rate of one man forty-four (44) hours to clear an acre, and after the fire, one man eight hours for the same area. This means that it took five and a half times as much work to clear an acre before firing as it did afterwards, or, in other words, the cost of clearing was reduced by firing, over eighty (80) per cent., or \$1.00 is doing what \$5.50 did before.

On May 18th, when we considered that the time had arrived for the best results, we fired the whole area, or, to be more exact, that portion of it not burned over in the experiment prior to that date.

Soil Not Injured.

Six soil samples were taken before the fire, and from the same places six were taken after the fire. Here too, an effort was made to get as nearly representative conditions as possible. One sample, however, was given a very severe test, a much more severe test than would occur in actual burning operations. This sample was taken in the area previously mentioned, which was cleared before the fire. A pile of logs five feet high and ten feet wide was made over the spot, and when burned the flames went fifty feet into the air, and it was impossible to remain closer than one hundred feet. All tests showed practically no damage to soil, and in the case of the extremely severe test mentioned above there was an increase of organic matter. (Soil analysis made by C. J. Lynde, Professor of Physics, Macdonald College.)

To one not conversant with conditions in Northern Alberta these results are hard to understand. The ground at this season of the year is saturated with water from the winter snow, and the frost is out only near the surface. The hottest fire takes place where there is the thickest mat of grass and material, and it is here that the most moisture and frost is retained in the ground on account of the protection thus afforded

from the warm rays of the sun. In the extremely severe test quoted above, the ground was still saturated with water, and the frost was only to a depth of six or eight inches. Where the ground has dried out it is because of the lack of covering and protection from the sun, and where the condition prevails there cannot be sufficient fire to burn the soil because of this lack of combustible material.

Now let us deal with the results of the main fire, set at a time when we had concluded from our daily experiments, that the maximum results would be obtained. Wherever there was a good mat of old grass excellent results were obtained. Most of the dry material, windfall and rule not lying flat on the ground was consumed. That lying flat on the ground was in some cases consumed, but more often only reduced in size and burned through in several places, thus making it easier to handle. All green trees and dwillows are fire killed, and in some cases burned completely through. The results obtained were in direct proportion to the amount of old grass, which must be the chief carrying agent for the fire and source of kindling for the larger material. Of the twelve quarters experimented on, eleven are now taken up by returned men, and the only quarter remaining, I have reason to believe, is left because it is isolated from any other quarter open for entry. Most men prefer to take the full half section allotted to them. This land was taken because of its improved condition after burning.

OUR SPEAKERS' BUREAU.

If you have an opportunity to address audiences, juvenile or adult, in your community, we will be glad to identify you with our Speakers' Bureau and supply you with interesting lectures.

This is an opportunity for a vital public service in the cause of Forest Conservation.

Canadian Forestry Association,
Jackson Building,
Ottawa, Canada.

Ontario's Tree Incubating Plant

Probably in no other district in Ontario has reforestation taken such a grip as in Prince Edward and in Norfolk counties, for both of these have areas of soil which lends itself to no other branch of field husbandry.

It was with at least a degree of foresight that the Government opened the reforestation station in South Walsingham Township, Norfolk County, three miles north of St. Williams, in the year 1908.

At that time the seedlings propagated on experimental plots at Guelph were transplanted to a more congenial soil, for at least the conifers, and six years later these had risen to a height of from eight to 15 feet. Today they are 20 to 25 feet high and four to eight inches in diameter at the base.

The Forestville Station.

The Forestville station, as it is called, is serving a double purpose. The plantation is about 800 acres in extent and while reforestation is carried on as an experiment, on a large scale, hundreds of thousands of trees are grown from seed and distributed free of cost throughout Ontario for reforestation purposes.

Already it has been demonstrated that light blow sand, upon which nothing else will thrive, a splendid covering of pines may easily be grown. Waste land becomes more attractive, productive and valuable. added windbreak is provided, and moisture is held in the atmosphere and the soil. But what is most important, new forests spring up to add to the ever-diminishing supply of timber.

But white pine is not the only species propagated at the Forestville station. Scotch, red, jack and bull pine, white cedar, hard and soft maple, white ash, black walnut, black locust, red oak, Carolina poplar and black cherry are some of the species grown. In fact, almost every species indigenous to Ontario is represented here.

During the past ten years those in charge at the station have done much

experimental work along the line of seed selection, and have learned that local grown seed is most satisfactory. As in other branches of husbandry, it has been found that poor seed does not pay.

A Natural Arboretum.

Few counties in Ontario can boast of such a varied soil as Norfolk — everything from barren blow sand to heavy clay, and as naturally follows, few can boast of such a variety of timber—Rock elm, soft elm, hard and soft maple, varieties of beech, birch, walnut, butternut, chestnut, black, red and white oak, the poplar and willow tribe, locust, buttonwood and cherry are among the deciduous; the pines, balsams, cedars, spruces, larch and junipers among the conifers. How fitting, therefore, that the station should be located as to encourage propagation of forest on waste land or inaccessible areas desirable of reclamation, with such a variety of local grown seed available. The seed question at present is quite a problem.

Sowing the Seeds.

Seeds domestic and imported are first planted in beds with a protective covering of lath screen to prevent excessive heat and provide somewhat of an approximation to natural conditions. Broadcast or in rows, with a covering of a quarter of an inch or less, the evergreen seeds germinated slowly, as a rule, when sown either in autumn or spring.

The plants are left undisturbed for two years, the screens removed at the end of the first year and they are then set out in nursery lines. White pines are, at this time, about four inches high. The transplanting develops the root system. A year or two later these seedlings are ready for planting in the open. Perhaps the planting out, which will be of most interest to those who have pursued this article thus far, is sufficiently described in the words of a prom-



"Parlor-car Forestry," as it is in real life. Gifford Pinchot once said that in New York State Foresters were to be found everywhere but in the forest. The true professional, however, usually wins his way only through actual woods experience. The photograph points out clearly the joy of life in a Canadian muskeg, 300 miles from a real town.

inent farmer of Norfolk County, who is also well versed in lumbering. W. A. Bower, of Simcoe, who has considerable holdings in the county, is one of those who has taken advantage of the Government's encouraging assistance towards reforestation. Interviewed by The Free Press a few days ago, Mr. Bower said: "I have planted white pine to reclaim light ridges; on more than one occasion. We got 23,000 pines about three years old, and from 12 to 18 inches high. There were seven of us with a team and plow. We plowed furrows five feet apart, following the plow with a spade and opening a slit in the bottom of the furrow, while another helper slipped a plant to the proper depth into the slit thus made and pressed the soil about it with his fork. The plants were set four feet apart in the furrow and the furrow was left to fill in gradually; 11,400 plants were set in one day and the four-acre lot completed in two days. No fertilizer was used and no cultivation whatever followed planting. In five years these trees were as high as a man and some of them three inches

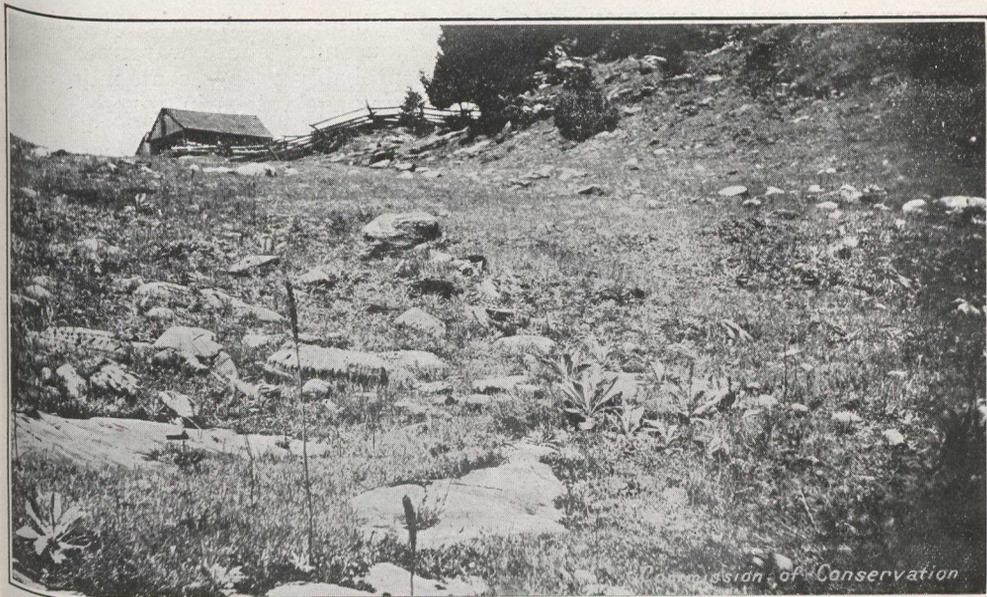
in diameter. A very small percentage failed to grow, but after some years there is a natural dying out through overcrowding, which earlier has served the purpose of preventing side brouchings."

Makes Good Investment.

Another Simconian, who brought 5,000 plants home in his Ford car protests that growing pine on land now waste, that should never have been laid bare is a better investment than life insurance.

But all varieties of trees cannot be grown on soil suited to their nature with the absolute neglect after planting that may obtain in the case of remantling blow sand with pine. And whatever be the variety, the transfer should be made as rapidly as possible, and the root fibres should never be allowed to dry off or be exposed to wind or sunlight longer than is absolutely necessary.

The black locust produces a splendid fence post which lasts longer than oak, cedar, ash or chestnut, and is now being grown at Forestville for this purpose in seven years. Hardwood varieties at the station, planted



Poor stuff for a farmer to give his time to: A piece of cleared land in Central Ontario which can never pay a profit until it is put back under timber. The maximum depth of soil is less than 12 inches.

in 1915, reach a height of 20 feet. Pine and locust predominate in reforestation area, and vacancies are the 1,620 acres now under attention, are being rapidly filled up.

There are at work on the plantation by winter, about ten men, and by summer, about 25. During winter they are engaged in removing from the old wood plots trees that show decay. This work is done carefully so as to inflict the least possible injury upon the under forest which is being nursed along to replace the old pioneers when they go down.

Then there are shipping boxes to be made for the spring, thinning here, the controlling of snowdrifts there—for injury to young trees through snowdrifts is kept well in check. There is gravel to be hauled, occasional buildings to be erected and general farm work to be attended.

With the spring shipping comes seeding and transplanting, or rather transplanting and seeding. Then vacancies in the woodland have to be filled in, and the summer brings the work of removing dead trees, and the pursuit of many lines of work—farm work, of course, but of a kind peculiar to the farm.

Up to the present only about 600-

000 plants have been grown yearly, but in a couple of years it is expected that two millions a year will be available, and the increase will go on.

About five per cent. of the shipments of plants goes to destinations in Norfolk County. The remainder is distributed all over Ontario.

Rules for the Prairie Planter.

There are three main points which must be observed if success is to be hoped for. It is safe to say that at least ninety per cent. of the failures in tree-planting are due to the fact that the importance of one or of all of these features has been overlooked. The three points are these:

1. The soil must be most thoroughly prepared before planting.

2. Only such species of trees should be used as are known to be hardy in the district and suited to grow in the particular kind of soil and in the situation where it is desired to plant them.

3. A certain amount of cultivation of the soil after planting is absolutely necessary. This cultivation must be carried on until the trees are well established and able to grow without further care.

HIGH TIMBER PRICES IN FRANCE.

Stumpage value of the principal timber trees of France averaged five times those prevailing in the United States. Col. W. B. Greeley says that the U. S. army paid for maritime pine stumpage in the Landes, around \$26 per thousand board feet. Oak timber of all grades in the Loire River Valley and in the upper watershed of the Marne, averaged \$36 per thousand on the stump. The silver fir and the spruce in the Vosges and Jura Mountains, timber averaging six or eight logs to the thousand feet, cost about \$50 per thousand standing, while se-

lected piling sometimes exceeded \$90 per thousand. These war time prices were probably 75 per cent. more than the stumpage values in 1914.

"The price of forest products is high—in paper money. Spruce logs sell in the woods, 15 miles from the nearest railroad, at 2,000 marks per 1,000 board feet. Timber fit for furniture is beyond the reach of anyone. Nevertheless, the forest authorities do not cut more than the 'sustainable yield'—or as much as is replaced by our annual growth."

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PRESENT CONDITIONS IN GERMANY.

In a letter to an American friend, Dr. Schenck, former head of the Biltmore Forest School, North Carolina, gives an interesting sketch of economic conditions in Germany at present:

Doctor Schenck declares that "German forests continue an A-1 asset. Our forest policy has been a conservative one, as you know. It reaps today what it has planted. Were it not for our forests the coal situation would be critical in the extreme. There is no coal whatsoever to be had for my house at Darmstadt; here in Lindenfels I have wood and some coke, enough for the time being.

"We require better economic conditions, safer than those now prevailing with reference to food and living. If our crops fail in 1920 there will be a disaster, a catastrophe by which the Black Plague of London is a million times repeated. Unfortunately, chances for reasonably good crops are few, and slight. There is no sugar to be had today; not an egg for the sick; no meat, of course—except for the rich and the very rich. Wages are high, but you cannot buy that thing for a stiff price which is not in any market.

"Our present forest policy continues to be conservative—much too conservative for me. If there were ever a time to empty a saving's box, that day has now arrived. Where the forests stand on farm soil they might well be converted into farms, although the authorities do not seem to approve of the change. Many of our forests might be thinned out twice as heavily as is customary, but the forester does not care to abandon the old practices.

DYNAMITE REJUVENATES A TREE.

Mr. P. L. Neel, of Philadelphia, purchased a place in Merion, Pa., which was vacant for about five years, heavily overgrown with grass and in bad shape. The grass was cut and all the dead wood removed from the beautiful shade trees. All

the rotten cavities were cleaned out, waterproofed and then filled with waterproof cement, guy wires and bolts being used when necessary.

The question was how to most readily feed the roots of these trees so that the greatest results could be obtained in the shortest possible time. Realizing that if they were simply manured on the top of the ground and the rain allowed to act thereon, a great part of the nutrient qualities of the fertilizer would run off on the surface and simply be absorbed by the grass and upper strata of earth, the following method was suggested:

Dig a ditch at the tips of the branches about two feet wide and three feet deep, filling the ditch with alternate layers of composted manure, that is, a layer of manure on a layer of dirt and so on. However, it was further suggested that if the ground could be loosened up and manure placed on the top of the ground, this costly work could be avoided.

The most inexpensive, efficient and practical way of doing this was by putting charges of one half stick of

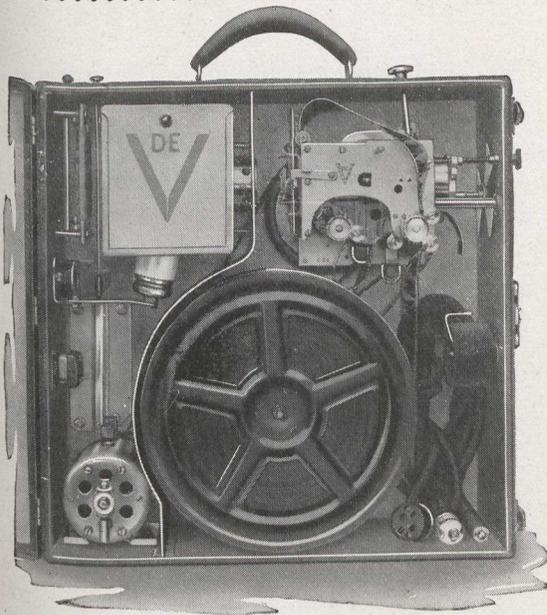
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dynamite in a circle around the tree about ten feet apart, the circle following the line of the tips of the branches. This was done and the results were very gratifying.

This tree was found to be but a shell, the entire centre rotted out and twenty feet up into the branches. So badly was it gone that a professional landscape man gave it up as worthless, but Mr. Neel said he would take a chance. The undertaking was a complete success, with renewed life and beauty to the tree.

TIMBER RESOURCES OF POLAND.

According to the Polish Consulate General in London, the new Polish Government is starting in on a campaign of interesting other European nations, especially Great Britain, in its forest resources. Poland's financial condition is deemed so critical that

she has decided to put her forest resources, which are said to be enormous, on the market. The first installment of the timberlands which Poland proposes to offer for exploitation is said to contain more than 15,000,000 cubic meters. The plan seems to have been adopted of exploitation by the Polish government itself, which move is expected to lead large private timber owners to follow suit. It is thought that this decision may mean an opportunity for manufacturers of logging and sawmill machinery. Sweden, being a closer neighbor of Poland, will probably not overlook this opportunity. Most of the sawmill machinery in the Archangel region of North Russia is of Swedish make, even in mills owned by British capital.

TWO-THIRDS OF EACH TREE WASTED.

"At present two-thirds of the average tree is wasted before the wood is put to use," said C. P. Winslow, Director of the United States Forest Products Laboratory, in an address at a recent meeting of the Madison Section of the Society of American Foresters. "Without doubt, a considerable part of this waste can be used," he added, "and it is the function of forest products research to develop every possible new use, within the limits of the financial resources available for such work. Such better utilization also has a vital relation to the practice of forestry on private lands, by making possible a greater net return per acre, thus making continuous production of private forests more financially attractive than at

present." Among the new uses of wood now being developed which may have profound effect upon future forest production, Mr. Winslow mentioned the use of "built-up" wood, in which small pieces of wood are glued together into laminated parts of various shapes and sizes, which can be made just as strong and useful as an equal amount of solid wood. The increasing uses of laminated wood make it reasonable to assume that many of the forests of the future can be profitably cut at an earlier age than at present with much closer utilization of the trees grown, thus naturally increasing the financial return per acre. The greater utilization of wood waste and wood in the smaller sizes for chemical products and paper pulp was also given as a fertile field for research.

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What Excess Growth in B.C. Really Means

In a recent issue of the Pacific Coast Lumberman, the report of the Commission of Conservation on "The Forest Resources of British Columbia," was interpreted as saying that the growth of new timber is five times the annual cut. Others than the Lumberman have jumped to the same general conclusion. Mr. Roland D. Craig, who played a chief part in preparing the report, has written an explanatory letter to the Lumberman and Forestry Journal readers will be equally interested in its contents:

"I notice in the leading editorial of your March issue that you refer to me as claiming that the growth of new timber is five times the annual cut. I should like to correct the impression that has evidently been taken from my statement in this connection in the report on the "Forests of British Columbia." I was careful

to point out that there was sufficient forest land on which young forests are more or less completely established to grow about five times the amount annually cut, but that the realization of this increment is contingent upon the protection of the young growth from fire.*

"We all know, however, that every year thousands of acres of valuable young growth are burned over, not only destroying the existing growth, but seriously retarding or, in some cases, precluding subsequent natural reproduction. The public, and even many of those entrusted with the protection of the forests have not in the past appreciated the value of young growth. Not many years ago, while travelling up the coast with a fire ranger, I called his attention to a fire which was getting under way in a splendid young stand of fir about

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15 to 20 feet high. He said it was not worth bothering about as there was only small stuff and no "timber" there, and so the fire was allowed to run up the mountain side unchecked. This attitude is quite prevalent, even yet, among those working in the woods, and every effort should be made to bring about a more general recognition of the fact that this young timber will before long be in demand, and that it has a present value.

"There are several ways of valuing the young growth. If one figures on the cost of replacement by planting, young stands less than a foot high are worth at least \$10 per acre. The Dominion Forestry Branch assigns the following arbitrary values for certain kinds of reproduction when fully stocked:

Age	Pine, Spruce, etc.	Poplar
Up to 25 years ..	\$ 5.00	\$3.00
25-50 years	10.00	6.00

If one applies only a proportion of the present stumpage value, based on

the present age a socompared with the mature age, 10-year-old reproduction in the Douglas fir-cedar type should be worth between \$3.00 and \$5.00 per acre.† The Forest Branch reports of the areas of valuable young growth burned in recent years are interesting though the valuation placed on the young growth is very low, and it is reasonable to presume that it is impossible to secure complete reports as to the area of all the fires in this class of timber.

Year	Area acres	Value	Average value per acre
1914 . .	58,402	\$18,355	\$ 31
1915 . .	13,317	20,504	1 54
1916 . .	11,278	219	02
1917 . .	16,226	17,743	1 09
1918 . .	11,989	35,675	2 91
	113,112	\$92,923	\$????

To this must be added the areas destroyed on Dominion lands.

"As to the basis of our estimate of the possible forest increment, I may

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say that our investigations showed that out of approximately 149,000 square miles, which could be classified as forest land, only 52,000 square miles carried timber of possible commercial size of a quality. This leaves 97,000 square miles suitable for the growth of forests and on which there is not a merchantable stand, but there is a very considerable amount of young forest already established. At the low annual rate of growth of 100 board feet per acre, at which it would take 100 years to produce 10,000 board feet per acre, this area could produce 6,200 million feet. No increment is to be expected on fully stocked mature stands, but there are, in addition to the above, 7,500 square miles on the coast, and 23,800 square miles in the interior on which there are comparatively light stands of mature timber, and on which there is also considerable young growing timber.

"It must be remembered that a large proportion of the reproduction

in the province is comparatively young and will not be merchantable for 50 or 100 years, and that, even then, it will not attain the size which is demanded by the trade at the present time. However, when it becomes more difficult to get the fine old timber we have been accustomed to, the standards will doubtless change as they have elsewhere.

"As pointed out in our report,† we have very little definite information as to the extent of the natural reproduction or the rate of growth of the forests under the different conditions which prevail throughout the province. Until careful research is conducted along these lines, we can only make broad estimates of the possibilities and cannot say with definiteness what is taking place.

"The Commission of Conservation is now conducting extensive investigations of the reproduction in the pulpwood areas in Ontario, Quebec and New Brunswick. This work is being carried on in co-operation with

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several private corporations including the Laurentide Company, Riordon Pulp & Paper Co., Abitibi Power & Paper Co., and the Bathurst Lumber Co. In addition to a survey to determine the extent and nature of the natural reproduction, permanent sample areas are established on which the conditions affecting the growth are studied and experiments in different methods of cutting are being conducted to determine the best and most economical means of securing a satisfactory reproduction. The importance of maintaining the timber supply is recognised to such an extent in eastern Canada that extensive planting operations are being undertaken.*

*See pages 9 and 241, "Forests of B.C."

†See page 136, "Forests of B.C."

‡See page 160, "Forests of B.C."

college work, men who are now available for professional work. In addition there are 24 juniors, who, according to the custom of the college are required to take five months of practical work from May to October to be permitted to take their senior class work in the fall.

To care for these 52 men, the college has received calls from governmental and private concerns for over 300 men. There are so many calls for trained men that the graduates and juniors are not forced to decide quickly, but are able to make a selection of the best offers which are made. This 300 men demand is in addition to calls for untrained men for general woods work.

GREAT DEMAND FOR FORESTERS.

Syracuse, N.Y.—America's realization of the urgent need for more forested land and a better utilization of the products of the forest has been demonstrated this year as never before by the call for trained foresters made upon the New York State College of Forestry at Syracuse.

This year's senior class numbers 26 men, some of whom returned from the army for the completion of their

PINE MEN SUPPORT RESEARCH

The U.S. National Research Council has received a gift from the Southern Pine Association of \$10,000 to pay for the incidental expenses of a co-ordinated scientific study by a number of investigators of the re-growth of trees on cut-over forest lands with the aim of determining the best forestry methods for obtaining the highest productivity. Although some of these cut-over lands can perhaps be most advantageously used for agricultural purposes there is a large acreage of them which will yield better returns if devoted to re-forestation.

"Canoes that have made Maps and History."

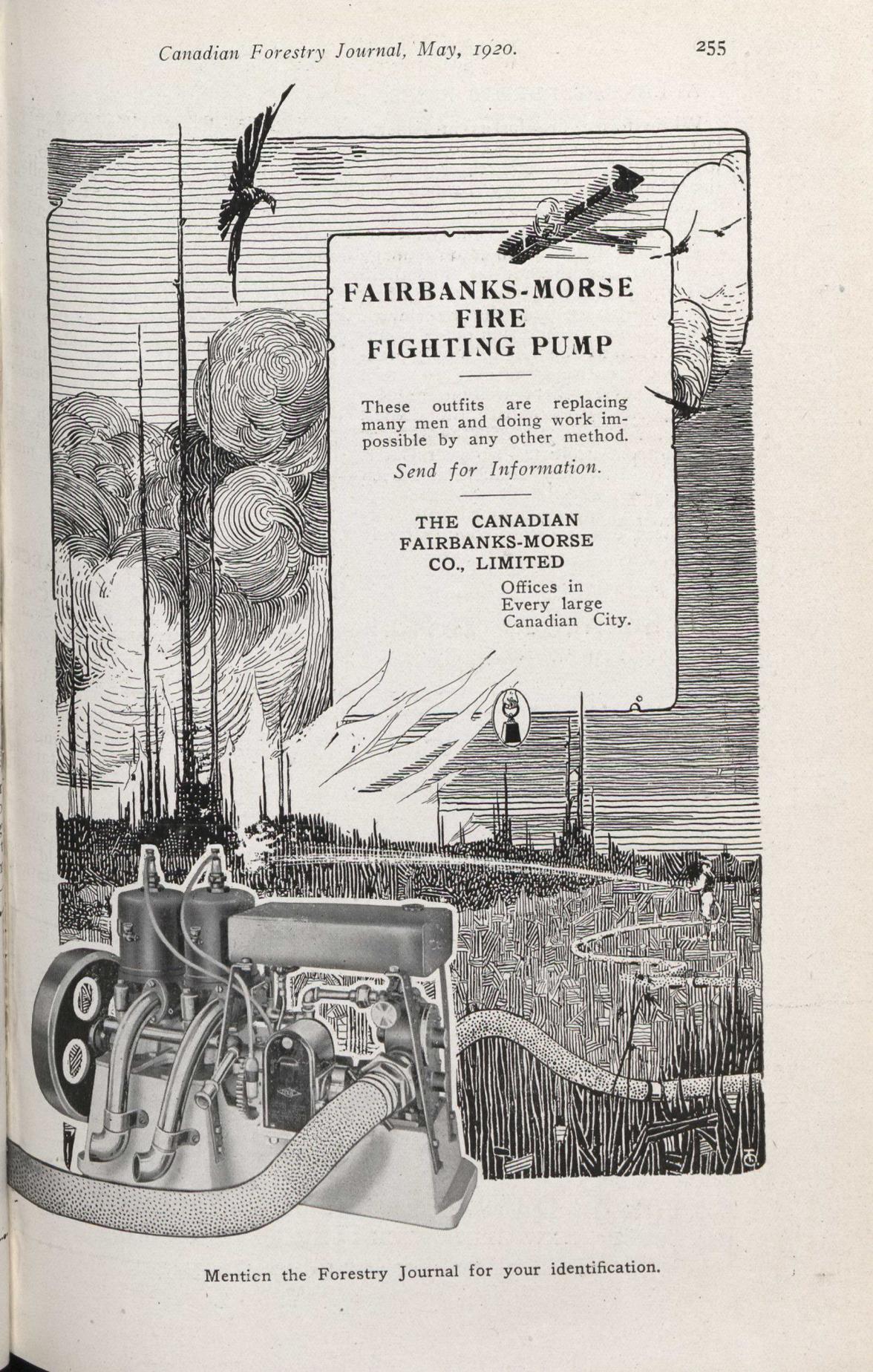
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A detailed woodcut-style illustration of a forest fire. In the foreground, a Fairbanks-Morse fire fighting pump is shown in profile, with its engine, flywheel, and hoses. A fire hose extends from the pump across a field towards a burning forest in the background. The forest is filled with tall, thin trees, some of which are engulfed in flames. A large, billowing plume of smoke rises from the fire. In the upper left, a bird is shown in flight. In the upper right, a person is depicted climbing a tall, thin structure, possibly a fire tower or a ladder. The entire scene is framed by a simple border.

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ALBERTA'S FOREST FIRES.

While forest fire losses in Alberta last year aggregate \$2,250,000 they would have been far greater but for the Dominion Forestry Branch and its officials and employes.

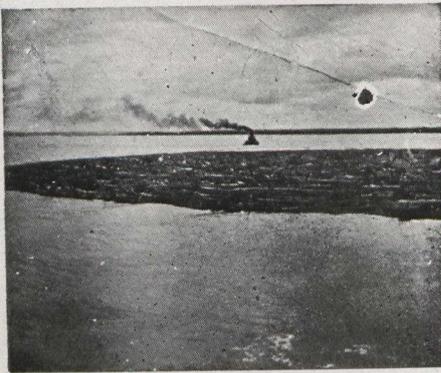
The last big fire previously occurred in 1910, when much more damage was done, for the reason that there was no preventive nor fire fighting service. In that year the fires swept from below the international boundary, far into the north, along practically the entire slope of the eastern Rockies. As there was no regular organization to combat the flames, the sporadic efforts of the settlers were almost useless. Two years later, when the Forestry Branch had been established, a different system prevailed, and since then until 1919, forest fires damage was comparatively

light. In 1918, for instance, it was only \$1,000 in the Alberta reserves.

Last year conditions were altogether against the fire fighting and preventive forces. The long drought left the woods dry as tinder, and high winds, which persisted for weeks at a stretch, fanned the flames beyond control. It was the experience in every instance that the Forestry Department officials and employes were on the ground of a fire within a few hours, usually less than four, of the time it was reported, and often they would not get away for days, so bitter was the struggle.

Five hundred and forty-eight thousand acres were swept over and the loss in merchantable timber has been estimated officially as being \$500,000. Young timber was damaged to the extent of \$1,370,000, and other growths \$400,000.

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"THE AGE OF WOOD."

It is a common experience to hear the present day referred to as "The Age of Steel." Modern industrialism, modern warfare and modern scrapers have given to steel a particular prominence. It is less generally understood that today is equally "The Age of Wood."

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comfort about wood that gives it a definite place in our affections that steel could never win from us. The varying grains of wood give them a character, almost a personality, of their own, around which we can weave stories of fact and fancy as we will.

Many regard trees as actual friends and feel their loss keenly if circumstances remove them from the presence of their beauty, strength and shelter.

The steel radiator, with its song of steam, will never compete with the yellow dragons and red demons to be seen dancing in a wood fire, or compare with the devil-may-care song of the flames—and the greatest stories in the world have had their birth and been told and re-told around the blazing log.

All the indoor drama of the romance of love and friendship has been enacted on a stage and against a background of wood, for the most part.

Even from the commercial point of view — newspapers, books, clothes, furniture, amongst other necessities and luxuries, are made increasingly from wood and its by-products.

The numberless objects of use and

beauty in modern life that have their birth in wood are literally the offspring of the axe, and, from this point of view, the logger may be regarded as the fairy godfather of our modern civilization.

Yes, this is "The Age of Wood."—H. B. C. in Pacific Coast Lumberman.

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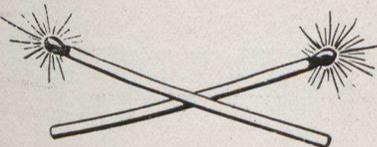
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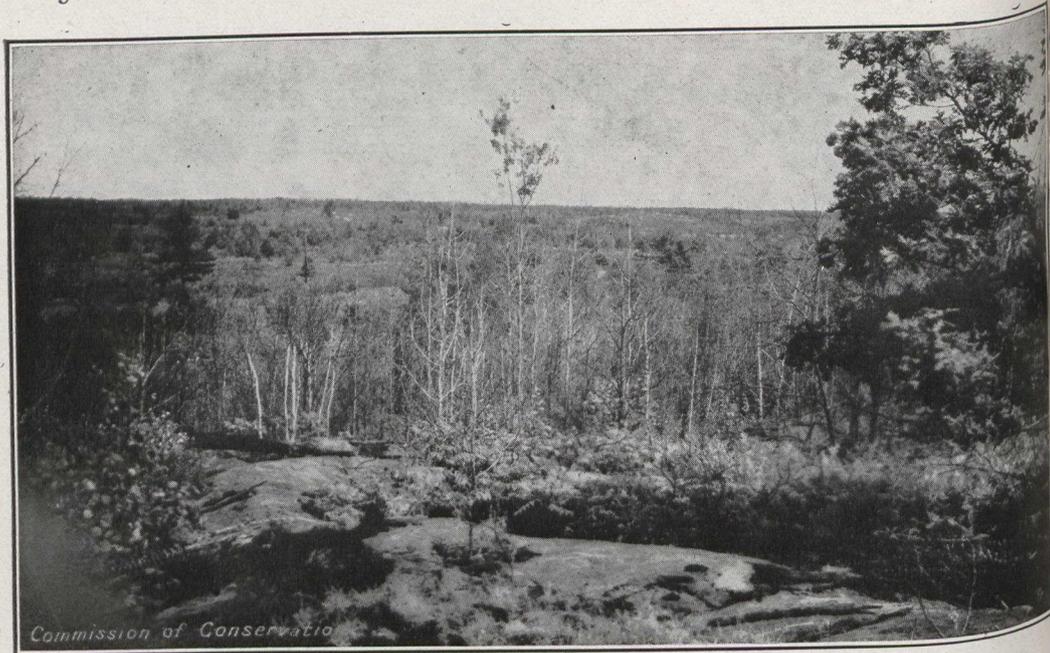
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Under the charge of Mr. Archibald Mitchell, an expert tree-planter and lecturer, who has studied prairie conditions for many years, the Canadian Forestry Association's Tree Planting Car will be ready, it is expected, by June 1st, for a tour of probably four months in the prairie provinces.

The enterprise is purely educational, and is being paid for wholly by the Canadian Forestry Association through its members and friends. It is not a Government or commercial undertaking in any sense.

Fuller details will be given in a direct letter shortly to be issued to all members of the Canadian Forestry Association.

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The REPORT Forward Movement in Forestry*

by Clyde Leavitt

Chief Forester, Commission of Conservation

(Continued from the March Issue)

A Careful Review of Measures Adopted Throughout the Dominion for Perpetuating the Forest Resources



The necessity for forest research as a basis for silvicultural practice is recognized by the British Columbia Forest Branch, which has provided definitely for this class of work in the administrative reorganization recently made effective.

Some of the pulp and paper companies are making a beginning at forest research work, independently as well as in co-operation with governmental agencies. For example, the Belgo-Canadian Pulp and Paper Company, through its forestry department, has made some experimental thinnings, with the particular object of increasing the rate of growth of spruce and balsam. Experiments along similar lines have been made by the River Ouelle Pulp and Lumber Company, in co-operation with the Quebec Forest Service, including also some experimental cuttings under the strip system.

It is greatly to be hoped that a large extension of forest research by the various administrative organizations, Dominion and Provincial, may be made possible by the appropriation of adequate funds. The field is so large that there need be no fear of wasteful duplication for at least many years to come.

DISPOSAL OF LOGGING SLASH.

For many years, it has been recognized that slash resulting from logging operations constitutes a most serious fire hazard. The great majority of destructive forest fires gain headway because of this accumulation of inflammable debris on cut over lands. It has been fully recognized that if this accumulation could be disposed of safely, at a reasonable cost, the problem of forest fires would be well on its way to solution, to say nothing of greatly lessening the damage to standing timber by forest insects and parasitic fungi.

The Dominion Forestry Branch is the pioneer in systematic slash disposal in Canada. On all timber sales in the Dominion forest reserves, this is required as

*Constituting the second instalment of the report of the Committee on Forests, Commission of Conservation.

one of the terms of the contract. While others have been discussing the matter the Forestry Branch has gone ahead and secured results. Slash disposal is now generally in effect in timber sales on unlicensed lands in the Dominion forest reserves. Operators find that, once their men become familiar with the work and recognize that it must be done, the cost is by no means prohibitive and competition with timber cut under other conditions is quite possible. Of course, the stumpage revenues to the Government are somewhat smaller by virtue of this requirement, but forest officers regard this as a good investment. On Dominion Crown lands under license, however, this requirement is not effective, these lands not being under the jurisdiction of the Forestry Branch. In consequence, the fire hazard to forest reserve lands is greatly increased.

In British Columbia very considerable progress has been made toward slash disposal in the Coast region, and a beginning has been made in the Interior. This is largely the result of co-operation between the B. C. Forest Branch and the operators, though there is now legislation under which slash disposal may be made compulsory, the cost for the most part to be divided between the operator and the forest protection fund. On the Coast, broadcast burning is the rule, this involving comparatively little additional expense.

In the eastern provinces, however, broadcast burning is not feasible to any great extent, partly because of damage to the remaining undersized timber, and partly because in many cases the soil itself is highly inflammable. As a rule, under such conditions, slash must be piled for burning, and this necessarily involves material expense, in addition to the cost of burning, which has to be done under careful supervision.

During the past autumn and early winter, several experiments in slash disposal have been under way in Ontario, Quebec and New Brunswick.

In Ontario, slash disposal has been required in connection with two sales of timber, one to the Shevlin-Clark Lumber Company, in white and red pine, and the other to the Graves-Bigwood Lumber Company, on a tie operation in jack pine. While no specific figures of costs are yet obtainable, the indications are that, so far as these particular cases are concerned, the work is being handled at an additional cost which will be quite within the bounds of reason. Mr. L. E. Bliss, formerly Field Superintendent of Fire Protection with the Ontario Forestry Branch, is in charge of the tie operation for the Graves-Bigwood Company, and is fully confident that the experiment in slash disposal in question will be a complete success, at an additional cost not at all prohibitive.

In Quebec and New Brunswick, a number of comparatively small experiments have been made, among the companies concerned, being the Laurentide Company, Riordon Pulp and Paper Company, John Fenderson Company, River-Quelle Pulp and Lumber Company and Bathurst Lumber Company. In the first of these the Commission of Conservation has co-operated with the company, and in the last it has co-operated jointly with the Bathurst Company, and the New Brunswick Forest Service, in both cases on experimental cuttings, to which further reference is made in the section on forest research.

While space prohibits a full discussion of costs in this report, it may be said that, for the most part, the results thus far are rather discouraging, as showing costs which are too high to be feasible for general adoption throughout logging operations, so long as present high costs of woods labor prevail. However, with wages reasonably normal, the cost would apparently not necessarily be prohibitive, if the work were handled to the best advantage. The most favorable figures thus far reported are those for the Laurentide experiment, where costs averaged around \$1 per cord for pulpwood or roughly \$2 per thousand for saw timber. Other costs are higher, in some cases, greatly so.

It must, however, be recognized that this work is still, in the east, in a purely experimental stage, that knowledge is still generally lacking as to the best methods of conducting such work, that woods labor is at present very expensive and sometimes far from efficient, and that, in some cases, such experiments have to contend with the natural conservatism of men accustomed through a lifetime to doing things in a particular way. In the conduct of such experiments, care has to be taken that such natural conservatism does not take the form of open or concealed hostility to the project, with consequent

danger that costs will be made prohibitive. In any event, if success is to be expected, a good class of labor must be assigned, and there must be close sympathetic co-ordination between the work of the felling crews, and the assigned to slash piling and burning. The such a spirit should sometimes be lacking is perhaps not unnatural. Until slash disposal comes to be accepted as a matter of course — something which has to be done—the best results cannot be anticipated.

In the meantime, it is highly desirable that further experiments be conducted, on a commercial scale, in connection with regular operations, in order that the best possible information may be obtained. At least until some basis can be devised under which logging slash can be disposed of, it is quite evident that provincial experiments must proceed slowly and cautiously in relaxing diameter limit restrictions and permitting clean cutting on Crown lands, since otherwise the hazard will be tremendously increased through the much heavier accumulation of inflammable debris on cut over lands to say nothing of damage to present and prospective young growth.

At any rate there seems little doubt that it would be greatly in the interest of all concerned were there to be a requirement for the disposal of logging slash along railway rights-of-way, stream roads, main tote roads, driving roads around camps and around the edges of cutting areas. The cost of this, if distributed over an entire operation, should not be prohibitive, and such action would greatly increase the chances of controlling fires in cut over lands and in preventing the destruction of green timber.

The disposal of inflammable debris outside railway rights-of-way is particularly desirable, since so many fires start along railway lines, due to outside agencies, well as to the railways themselves. Justice to the railways, as well as for the protection of outside property, the desirability of such action is quite obvious. Legislation contemplating such action at least a limited extent is in effect in several of the provinces, but has not been made generally effective, though some ginnings have been made for the part on a more or less voluntary basis through co-operation.

It is significant, in this connection, that the St. Maurice Forest Protective Association has appropriated \$20,000 to be expended in the disposal of inflammable debris outside the right-of-way of the Transcontinental Railway, through the holdings of its members in the province of Quebec.

The value of such work was fully demonstrated several years ago in Ontario

when a strip outside the Grand Trunk right-of-way through Algonquin Park was thoroughly cleared of inflammable debris, is through co-operation between the provincial government and the railway company. The notable reduction in railway fire damage in that territory is sufficient witness of the efficacy of the work.

DOMINION LANDS.

Throughout the period of the war, the technical work of the Dominion Forestry Branch was greatly handicapped through enlistments for overseas service. During the past year, however, this situation has gone much improved, though the Branch still finds it impossible to secure a sufficient number of trained foresters to meet its requirements. Only a comparatively small number of men will be graduating this year from Canadian forestry schools, so it will be at least another year, or perhaps more, before new men trained in forestry will be available in anything like adequate numbers to meet the pressing demands of the situation.

Since the beginning of the war, no additional forest reserves have been made to the Dominion land reserves. Additional large areas have been found, upon careful examination, to be unsuitable for agriculture and chiefly valuable for permanent timber production. The early inclusion of these areas within permanent forest reserves, by Act of Parliament, is highly desirable, in the public interest.

Settlers' clearing fires have always constituted a source of serious fire danger to the Dominion forest reserves. In Manitoba, Saskatchewan and British Columbia there is provincial legislation providing for the regulation of such fires under the permit system, which is also giving admirable results in all the eastern forest provinces. In Manitoba, and in the Rail Belt of British Columbia, this legislation is effective as to Dominion lands.

Because of co-operation between the provincial authorities and the officials of the Dominion Forestry Branch, under which the latter have authority as officers of the province to enforce the legislation. In Saskatchewan, while the fundamental legislation is in existence, co-operation between the two organizations is lacking, as a result of which Dominion lands have unnecessarily suffered from fire, in territories where no adequate provincial forest protective agency is locally available. In Alberta, on the other hand, there is no such legislation, and Dominion forest fires continue to suffer from unregulated clearing fires.

The Dominion forest products laboratory at Montreal, maintained by the Dominion Government, through the Forestry Branch, in co-operation with McGill University, have in the past rendered most

valuable services of a public character. During the period of the war, much work of a most valuable character was performed in connection with the production of explosives. The peace time activities of these laboratories are calculated to prove of the greatest value to the lumbering and pulp and paper industries. As a result however, of war conditions, coupled with an inadequate salary scale, the work of these laboratories has been greatly disorganized through the loss of personnel. It is greatly to be hoped that the reclassification of the Dominion Civil Service now under way, may render it possible for these laboratories to be re-organized on an adequate basis, and thus to resume and increase their great usefulness to the people of Canada. The branch laboratory at Vancouver, maintained in co-operation with the University of British Columbia has also done valuable work, and should be continued.

BRITISH COLUMBIA.

The outstanding development of the year in British Columbia has been the re-organization of the Forest Branch. The re-arrangement of the personnel, and the revision of procedure, both in the head office and in the field, will result in greatly increased efficiency and will make it possible for the branch to fulfill its function of serving the public in a more adequate way than ever before.

The return from overseas service of quite a number of foresters who were formerly on the field and office staff, coupled with new accessions from other sources have made the reorganization possible. An important incident has been an upward revision of the entire salary scale, which will go far toward making it possible to attract and retain the best men. The salary scale now established sets the pace for all other governmental forestry organizations throughout Canada.

Legislation has been enacted which provides for the compulsory disposal of logging slash in accordance with the directions of the local forest officer. In case of lands contributing to the forest protection fund, the cost of such work is shared equally between this fund and the timber owner. Partly as a result of this legislation, approximately 120,000 acres of slash has been burned during the past year. The great bulk of this was in the Coast district, where broadcast burning is the rule and where the additional cost involved in slash burning is comparatively low, in many cases being practically negligible. In the Interior, there were three slash-burning operations, totalling 1,875 acres which were burned at an additional cost of 84 cents per acre.

The past year has been a bad one for forest fires, the total number reported be-

ing over 1,100. Known causes in descending order are campers, logging operations, brush burning, lightning, railway construction and incendiarism.

Following the precedent so satisfactorily established nearly two years ago, the forest ranger course for returned soldiers has been continued at the University of British Columbia, under the auspices of the Vocational Board, in co-operation with the Dominion Forestry Branch and the British Columbia Forest Branch. This course has rendered a valuable service not only to the returned soldiers, but also to the forestry organizations which have employed the men.

There is the most urgent need for the establishment of a full-fledged forestry department at the University of British Columbia. Such action is under consideration by the provincial and university authorities, and it is greatly to be hoped that the necessary funds can be made available. When it is considered that the forest revenue to the provincial treasury is now well over \$2,700,000, it seems perfectly logical that the necessary small fraction of this amount should be diverted to forestry education, in the interest of the future.

ONTARIO FOREST RESOURCES.

The survey of the forest resources of Ontario was commenced last spring under the supervision of R. D. Craig. On the return of Major G. H. Edgecombe and Mr. A. V. Gilbert from overseas, their services were secured to assist in this work. This project is receiving the active co-operation of the Provincial Government and all the records and cruises in the Department of Lands and Forests have been placed at our disposal. The Crown timber agents and other officials of the department have been instructed to furnish the Commission with the information which they have gained through long experience in the different regions. The timber owners are being asked to supply estimates of the amount of timber on their holdings and those so far approached have shown a most commendable willingness to assist in this work, which is recognized as being of vital importance to the lumber and pulp industries. The general recognition of an impending shortage of timber has caused a demand for more definite knowledge of existing and prospective supplies.

It is proposed in making the report on the forest resources of Ontario to divide the province into six main regions, the southern portion, which is chiefly agri-

cultural, the Ottawa river drainage area, the Georgian Bay and Lake Huron drainage area, the Lake Superior drainage area, the Lake of the Woods region and the Hudson Bay drainage area. Most of the work done this year has been in the Ottawa river and Lake Huron regions.

In addition to collecting detailed reports from the lumbermen, provincial officials and others, the foresters engaged on this work spend considerable time travelling through the various areas, in order to become familiar with local conditions so that the data collected may be intelligently compiled. This, of course, would be impossible if purely mechanical methods were used. The problems of forest regeneration and utilization are being studied with the object of determining if possible the best means of maintaining the productiveness of the forests.

This project has been endorsed by the Canadian Lumbermen's Association and by the Woodlands Section of the Canadian Pulp and Paper Association, through formal resolutions adopted at the recent annual meetings of these representative organizations.

FOREST RESEARCH.

The forest research work of the Commission, under the immediate direction of Dr. C. D. Howe, has been continued and extended. It has received the endorsement of both the Canadian Lumbermen's Association and the Woodlands Section of the Canadian Pulp and Paper Association.

Field parties have made investigations upon the limits of the Laurentide Klondon Companies, in Quebec, in continuation of co-operation previously established with these companies. These projects involve primarily the establishment and continued study of permanent sample plots and growth study plots, in addition to regeneration surveys.

In co-operation with the Abitibi Company, a party spent the field season on their limits in Ontario, in regeneration and growth study work, the party remaining five weeks longer, during autumn and early winter to assist the Company's forestry department in the collection of further data, showing the rate of growth of spruce and balsam in a portion of the Abitibi district. The regeneration studies are being conducted in order to determine the extent to which the various species are being reproduced naturally and the conditions which are favorable to the reproduction of the valuable species, particularly spruce.

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