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ILLUSTRATED CANADIAN FORESTRY MAGAZINE

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Vol. XVIII OTTAWA, CANADA APRIL, 1922 No. 4.

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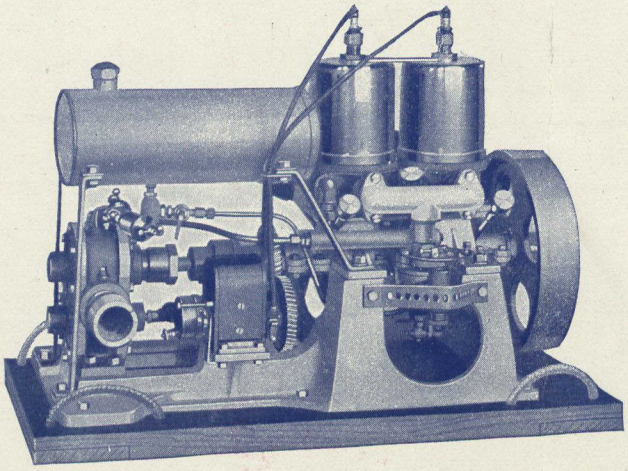

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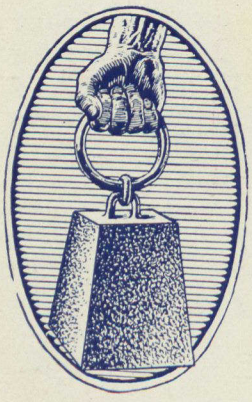

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THE ILLUSTRATED CANADIAN FORESTRY MAGAZINE

A Monthly Publication, National in Scope and Circulation, Devoted to Tree Planting and to the Conservation and Development of Canada's National Heritage—Her Forest Resources.

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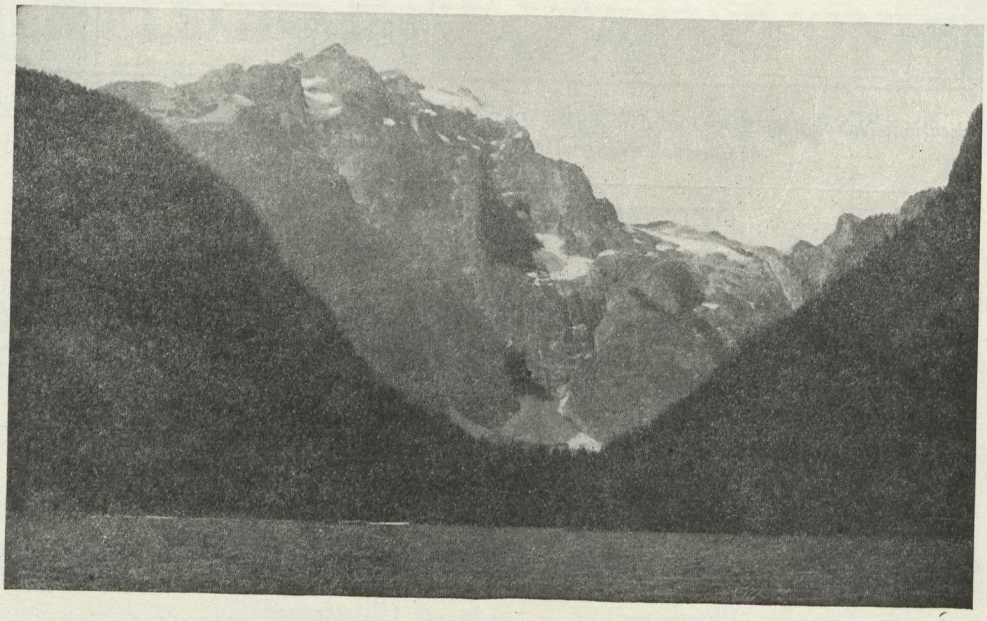
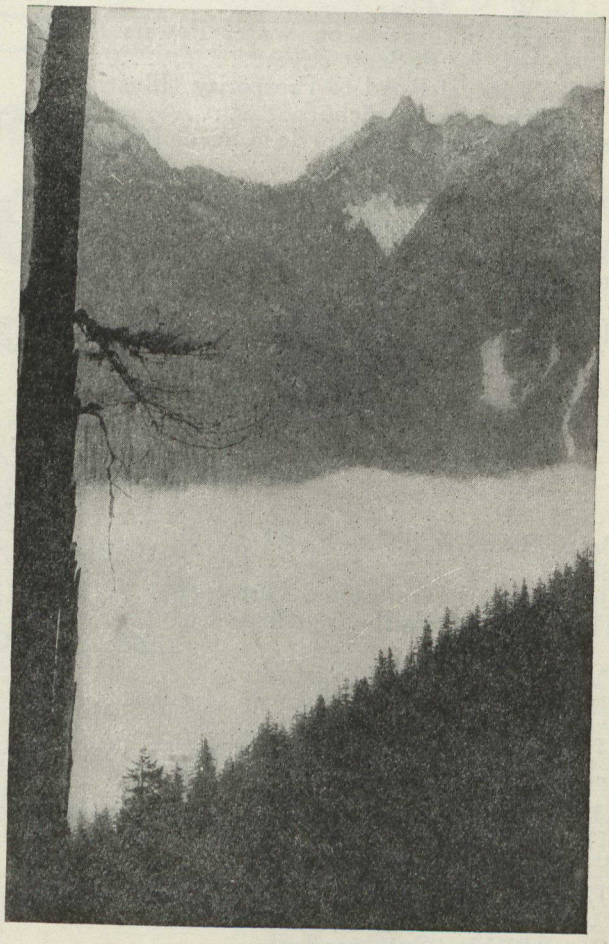


STAVE LAKE—Nine miles long and more than a mile wide. The granite peaks on its east and west shores rise high above the timber line and are covered with snow and small glaciers.

Watershed of Britannia Creek.



Eugenia Falls, Beaver River

Photos reproduced by courtesy of Dominion Water Power Branch.

Protection Methods in Canada's Forests

A Careful Description of Modern Methods of Combatting Fire in Forest Areas—How Staffs Are Organized

by W. N. MILLAR

EDITOR'S NOTE—*In fairness to the author of this very excellent article on Forest Protection Methods and with a view to the progress which has been made in the development of aeronautical auxiliaries to fire-fighting forces, it may be well to point out that the omission of any reference to aircraft by Prof. Millar, is probably due to the fact that the information herein contained was assembled during the period that aerial accomplishments were much more in the experimental stage than they are at present. A very striking commentary on the use to which aircraft may be put in fighting forest fires is furnished by Capt. F. C. Higgins' article in the Aeronautical Section of this issue.*

IT IS WELL recognized in Canada that forests, if they are to be kept from burning up, must have some kind of systematic protection during that portion of the year generally referred to as the "fire season." The extent of protection attempted largely depends upon the enlightenment of the owner of the timber, the value placed upon it and the fire danger or risk. This last is an extremely complex element made up of several factors which vary with the season, the character of the forest, the local causes of fire, and other local conditions which tend to favour or to obstruct the protection work. It is equally well recognized in the forested regions of Canada that the only kind of protection that has even a remote chance of success is patrol by a force of specially employed fire rangers. The patrol of timber-lands has been a feature of fire protection in certain parts of Canada for more than thirty years. In other parts it is only of recent origin, while very large areas in all parts of the country, bearing a young growth whose value and vital national importance are unrealized, are as yet wholly unprotected. A careful study of most of these patrol forces, however, reveals the fact that they are organized and operated on extremely individualistic lines. Some of the very largest operate almost without a directive staff and in no case has there as yet been developed a staff capable of making a close scientific study of this problem of fire protection, resolving it into its elements and building up on a basis of known facts a business-like organization and mode of procedure. In almost every case a forest protection force in Canada consists simply of an indefinite number of more or less qualified men hired each year for the fire season only, and sent into the woods with only the most meagre instructions. In general they are told to prevent or to detect and suppress, so far as possible, forest fires in a specified district. Between rangers even in adjoining districts there is little or no relationship. There is practically no differentiation of duties and no guidance or supervision except a very occasional visit of inspection, primarily to determine that they are actually present in their district and are not employed at some other work. Even this is successful only to a very limited extent because of the inherent difficulties of maintaining close personal supervision over a force which of necessity is widely scattered over a vast area of undeveloped country.

"THE FIRE DEMON"

What Canada Pays.

The total annual expenditure for forest protection by all agencies in Canada is probably not less than $1,500,000. Single agencies spend as much as $350,000 per annum and employ 800 to 1,000 men annually. The value of the resource protected is of immense importance to the nation since fully 65 per cent of the country is capable of producing no other form of useful commodity. This resource is the raw material for the second largest industry of Canada. From this may be gained some idea of the relative importance of a scientific study of the business of protecting forests from fire.

Analogy to Military Operations.

It requires but little knowledge of the operations involved in forest protection under conditions existing in Canada to appreciate the striking resemblances which exist between this work and military operations on a large scale. It is noted at once that there exist the same problems of transportation, of commissary and supply, of scouting and reconnaissance, of intercommunication, of camp management, and the handling of men on the fire-line. Also there are frequently involved problems in field engineering, and in animal management. Further, it is readily possible to divide the actual process of placing a forest fire under control by frontal attack, flanking trenches, or backfires into two main sets of operations namely tactical and strategical. The present is perhaps an opportune time to point out the vital importance of organization and discipline, of special training for individual units, of perfect equipment, and of a skilled and scientific directive staff in military operations. Months, even years, are spent in training men for the least responsible of military positions and we know that an army without this highly perfected organization and equipment, no matter how individually excellent, is a pitiable thing before a modern military machine. It is little realized, however, that forest protection, which in all its essential operations bears such a striking resemblance to military operations, is susceptible of just as intensive study and development and that an unspecialized fire-ranger staff is, in its own sphere, just as pitiable an object when compared to a highly specialized staff as is an untrained ill-equipped army when compared to our modern troops.

As is well known, the extent and perfection of control maintained in

modern military operations is largely the result on the one hand, of the perfection of functional control secured through the General Staff and on the other, of two elements of mechanical equipment, the gasolene engine as applied to transportation, and the telephone and telegraph as employed in intercommunication. It is one of the aims of this manual to indicate how these same highly developed means of intercommunication may be applied at small expense to the operation of directing forest protection forces.

Functions of Protection Force.

A careful analysis of the operations involved in the protection of forests from fire reveals the fact that a fire-control force exercises four principal functions. These may be called Prevention, Detection, Suppression, and Supervision. In an unspecialized staff, each member of the staff exercises all four functions. Naturally there is no organized staff so completely unspecialized that there is absolutely no differentiation of functions performed by different members, but nearly all of the forest protection forces of Canada are so little specialized that the overwhelming majority of the staff actually does have all these functions to perform. As in other industries so in forest protection, non-specialization means independence of action and lack of close co-operation. Thus we find that practically all fire rangers employed in Canadian forests are independent units, each supreme in his own district, performing invidually all functions of fire control, and neither assisting nor receiving assistance from any other unit.

Specialization Important

Where specialization has been adopted, however, the whole organization is radically different. Specialization is the basis of modern industry, and the gain in efficiency that resulted from the industrial revolution is no more striking than is the improvement that results from the adoption of similar specialization in forest protection. Obviously, no other result could reasonably be anticipated.

Specialization in forest protection is secured by employing separate units to perform each of the distinct functions revealed by the analysis of the operations of forest protection. It is neither possible, nor necessary, to differentiate functions absolutely in all cases, but instead of each member of the control force performing all functions each is given one as a primary function and exercises the others only to a very minor degree, if at all.

Prevention of Fire.

The function of Prevention, as the name would indicate, includes all those activities whose aim is to ensure that fires do not start in the forest. Statistics of the causes of forest fires, upon which all prevention plans must be based, show that for the eastern part of the country human agencies are responsible for at least 95 per cent of forest fires, while in the West about 80 per cent are thus caused. This difference is due to the lightning-caused fires which are relatively more numerous in the mountainous regions of the West. Fires due to human causes may be considered almost wholly preventable, and a forest protection staff must be prepared to make an exhaustive study of the cause of the fires with which it has to deal and to apply the necessary remedies. Prevention of forest fires involves a whole host of considerations mostly beyond the range of this discussion and even in actual application largely beyond the influence of the direct control forces in the woods. Certain preventive measures, however, belong primarily to the woods staff. Such, for instance, are advice and warning to forest travellers and tourists. This is of very great importance in many forested regions of Canada. A specialized forest protection force will have certain of its members specifically assigned to this duty wherever the directive staff determines, as a result of a careful study of fire records, that such preventive measures are needed.

Keeping Watch on Tourists

In maintaining this observation of tourists and other travellers a well-developed system of communication by which the patrol force is kept constantly informed of the entrance of parties into the forest and of their movements while there is of immense value. By means of it every person in the force is enabled to contribute indirectly to the prevention work and to assume this as a secondary function without in any way interfering with whatever happens to be his primary function.

Similarly, the supervision of "clearing" fires employed by settlers, an extremely frequent cause of disastrous forest fires, is preventive in nature, and many other activities of this kind must be provided for, according to local conditions. In all cases, however, it is necessary to emphasize that the fundamental basis for scientific and effective prevention work is an accurate knowledge of fire causes in any given region. This is best secured by rigid investigation of all fires that occur and the accumulation of statistics of causes over a period of years.

Detection of Fire.

The method of performing the function of Detection has to some degree become a distinctive characteristic of a specialized staff. In the usual type of organization with little or no internal co-operation or interdependence of units, each ranger must depend upon himself alone to detect and locate all fires in his district. To accomplish this he adopts various methods according to the nature of the country and forest, the causes of fires, and his own energy, experience, and ingenuity. To some extent the

(*Continued on page 735*)

Modern Forest Protection Methods.

THE Forestry Branch of the Department of the Interior, Ottawa, has issued an important work dealing with forest protection. Its author is Mr. W. N. Millar, formerly one of the inspectors of the Forestry Branch, and now associate professor of forestry in the Faculty of Forestry, University of Toronto. The work is called "Methods of Communication Adapted to Forest Protection" and it deals with the construction and use of telephones in forest reserves and national forests. A part of the book is devoted to semaphores, heliographs, flags, lanterns, etc., and there is also a code of signals. The book is of great value to all charged with forest administration but the chief interest to the layman and to those interested as Canadians in the protection of our forests is the insight it gives into modern methods of fighting forest fires. Forest fire-fighting has advanced possibly, more rapidly than city-fire-fighting in the past ten years, and in order to show why the forest engineer now demands rapid methods of communication, Professor Millar in the first chapter of his work explains the layout of a modern fire-fighting force. Extracts from this chapter are given herewith.

The Reindeer Industry in Canada

By E. A. WATSON, (Capt.) C.A.V.C.,
Chief Animal Pathologist, Health of Animals Branch, Ottawa.

TOWARDS the end of October, 1921, there was landed at Amadjuak, Baffin Island, a herd of domesticated Norwegian reindeer. The shipment was made by the Hudson's Bay Reindeer Company, and marks the beginning of an enterprise worthy of the traditions of the great company of "Gentlemen Adventurers" who have figured so prominently in Canadian history and development for two hundred and fifty years.

Further importations of reindeer are expected to follow, the plans of the company being to establish reindeer depots at various points in the northern territories of Canada, and to develop an animal industry which will provide the means of subsistence to the native population and a new and increasing source of meat supply for southern markets.

Reindeer in Canada's North Land

Identical with the cariboo species, the reindeer does not figure in the popular mind as a domesticated animal and, in this country particularly, is regarded more or less as a wild creature to be hunted and shot down for food by prospectors, trappers, hunters, and explorers or as trophy for the man with a rifle who has just the desire to kill. Indigenous to this country, the cariboo at one time inhabited the wooded swamps from Newfoundland to the Pacific Coast. Further north the arctic variety roamed in vast herds over the barren lands and the territories in Canada and Alaska north of the tree line. But in recent years reports of the failing numbers of the cariboo, and in many districts their complete disappearance, have come in from all quarters, from Esquimo and Indian tribes and experienced hunters alike. It would appear that the story of the vanishing buffalo and the starving Indians is to repeat itself with the cariboo and the northern tribes.

In northern Europe and Asia the Laplanders and tribes of Mongolian descent, as far back as their history can be traced, have lived on the native reindeer. These animals have furnished them with meat and milk, skins and clothing, with the means of transportation and the material for barter and exchange—in fact with practically all that was needed in their simple nomadic style of life. For ages past these people have been domesticating wild deer and raising herds of trained animals. But with the fringe of civilization penetrating their territories, with the advent of missionaries, traders, tourists, collectors, and sportsmen, and with the accompanying ruthless slaughter of reindeer, the Laplanders saw their means of self-support and existence threatened. Realizing the danger in time, they built up their domesticated herds and firmly established their one and only industry They now have reindeer in plenty for their own needs and export; and they furnish many of the Scandinavian and Russian cities with reindeer meat, which commands a price about equal with that of the best beef. To one not born to it, the Lappish life seems to be a hard one. But these people are of a hardy race and they love their mountainous plateaux, the great tundras, and the open life, whether it be in the treeless, snowy wastes of winter, when for three months the sun does not appear above the horizon, or during their sojourn on the fjord islands through the brief spring and the summer months of the midnight sun.

In April the flocks are brought from the interior of the coastal regions, and in many cases on to the islands. The deer enjoy the salt water and a swim of two miles or more across one of the fjords. They are carefully tended during the fawning season, and remain on the islands through the summer months to escape the plague of mosquitoes—the "grey terror" of Lapland—and grow fat. A cold rainy season is best for the deer. There is then an abundance of the moss on which the animals feed and thrive so well, and in September when the return journey to the winter ranges in the interior is commenced, they should be in a sleek and well-rounded off condition with a slab of back-fat which will be needed and used up during the long, lean months of winter. It is said that a full-grown male deer should have in September a slab of back-fat three inches or more in thickness.

In summer the Laps move with pack-reindeer; but in the winter time, when most of the overland travel and work is carried on, sledge-reindeer are used entirely. The flocks are then concentrated in the vicinity of the Lap villages, and the best and strongest male animals are broken to the harness. The sledge, called a pulka, is made of wood and shaped like a little narrow boat with pointed bow and square stern and with a rounded and keel-like bottom. It is usually made rather less than seven feet in length, though some measure up to nine feet, and is just wide enough for one person to sit in. A good draught reindeer will draw a load of from 250 to 300 pounds weight according to the condition of the snow. Winter transport and communication between the widely separated Lappish communities, to and from the coast with market produce and winter supplies across Norwegian, Swedish, Finnish, and Russian Lapland, and the carrying of the overland mails, is done entirely with reindeer. The usual custom is to form a transport column of reindeer and pulka tied together in a single file. This is called a "radio." On October 1 of last year, after the first heavy snowfall, the writer met several of these "radio" proceeding from the coast to the interior with the fir t loads of winter supplies. The snow was soft and the going slow and difficult. But when the snow is packed hard, travel is easy and rapid, and it is possible to cover 65 to 70 miles a day. A great advantage of reindeer transport is that it is seldom necessary to carry food for the animals. They find it for themselves at the halting places en route, digging

deep down through the snow to get the coveted moss. Furthermore, they have a reserve power which enables them to cover great distances with little or no food at all. With his remarkable spreading hoof a reindeer supports himself well on the crusted snow or, as in the summer season, picks his way safely and quickly among the mountain rocks and swamps where any other domesticated animal would find it hard to keep a footing.

Apart from his adaptability and usefulness as a beast of burden, the reindeer is a valuable food-producing animal. A Lapp, Johan Turi, has written in his book of Lappish texts that:—

> "Man shall tend the reindeer, and the reindeer shall again provide livelihood for man, as to clothing and food. And man shall move with the reindeer back and forth, south and north; the pack-reindeer he uses as a means of transport, and the other loose reindeer are the herd."

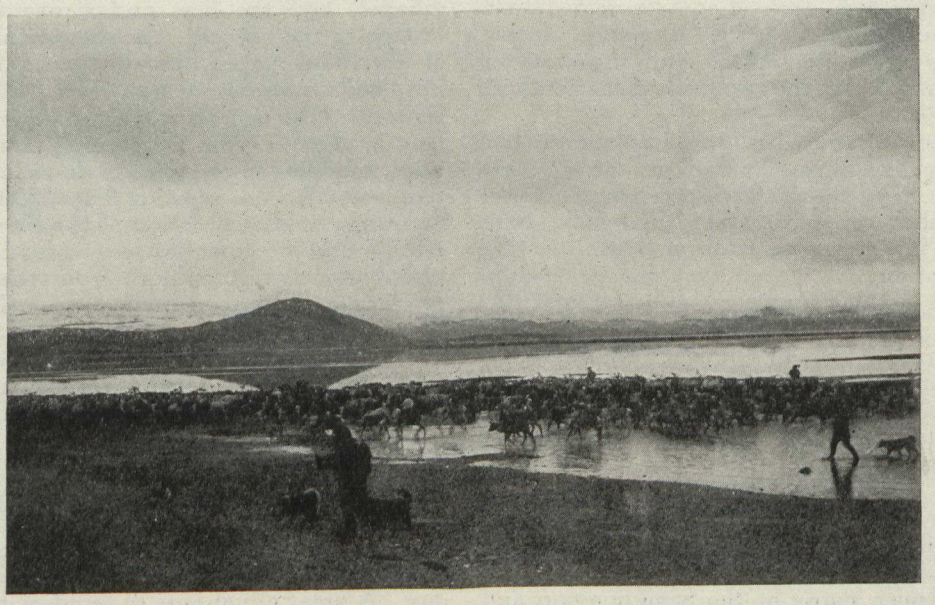
True it is that the reindeer is unique among man's animals in that it furnishes altogether food, clothing and the means of transport. There is no other animal whose cost of maintenance is so small and whose return to man so relatively large.

This animal then appears to be admirably suited for the stocking of the vast non-producing lands of Northern Canada. It is known that these lands possess considerable natural resources and untouched wealth in oil and minerals. The unsolved problem of food and transportation has made this an inaccessible field of exploitation up to the present time. The reindeer industry may be the means of opening the way to progress and development in the Northland.

It should be mentioned here that this importation of reindeer by the Hudson's Bay Company is not the first experiment of its kind on this continent. In 1898 the United States government imported reindeer into the Yukon territory for the relief of the miners, and drove a herd up into Alaska for the relief of shipwrecked crews of whaling ships. They then promoted the industry among the Esquimo tribes and mission stations, and by all accounts the herds have multiplied rapidly and now number many thousands of animals. Increasing quantities of reindeer meat are shipped south annually and marketed in United States cities. Some fifteen years ago a small herd of reindeer was shipped from Norway to Dr. Grenfell's mission on the coast of Labrador. It is said that the herd prospered well for the two or three years it remained under the care of Lap herders, but became scattered and fell to pieces after the return of the Laps to their native land.

The Hudson's Bay Company wisely arranged for experienced Lap herders with their families to accompany the expedition to Baffin Island. A depot of supplies, building material and equipment has been established at Amadjuak for the Lap settlement. Pulka and skis for travel, sport and recreation, medical stores, books and reading matter have also been provided, the company anticipating the needs and requirements of these people, desiring their welfare and that they should form a happy, useful and contented colony.

The Department of Agriculture is interested in the reindeer industry as in all branches of live stock. Reindeer, hardy animals as they are, are subject to certain diseases and parasitical infestations. The writer, acting under the instructions of the Veterinary Director General, was sent to Norway to co-operate with the Hudson's Bay Company in guarding against the introduction of disease with the imported animals and in giving the expedition a fair start and prospect of success. The conditions of the industry in Lapland were studied and a thorough inspection of the animals was made while they were being gathered up and again before actual embarkation. Six hundred and twenty-eight reindeers with a clean bill of health sailed for Baffin Land on the Hudson's Bay Company's steamship *Nascopie*, and excepting some casualties on the rough voyage across, were landed in good condition. The venture will be followed with much interest and hope for its success. Such an enterprise is a costly one and the Hudson's Bay Company is to be congratulated on the courage and thoroughness with which it has undertaken it. The reinder industry may prove as applicable for parts of northern Quebec and New Ontario as for the lands farther north.



Hudson's Bay Company herd of Lapland Reindeer crossing the Alten River, Finmark, for embarkation to Baffin Land, Canada.

More Prairie Population—One Way to Win It

A talk on the secret of success in farm irrigation - Forest fire damage on watersheds imperils supply of water so necessary for irrigation.

By ARCHIBALD MITCHELL, Lecturer of the Canadian Forestry Association.

IN THESE days of irrigation development in southern and central Alberta, too much importance cannot be placed on the maintenance of the Forest on the Eastern slopes of the Rocky Mountains.

Irrigation on these farms is not a localized matter for the application of water to another half-million acres of first class land in Southern Alberta, with the probable addition of as much more in the near future, is something that is of no little moment to the east as well as the west.

Irrigation farming is intensive farming; and intensive farming means many small farms producing to the utmost, the work of many families.

A Nature Benefit

Many families on the land means the consumption of much manufactured goods from Eastern Canada and the development of a chain of industry and prosperity which will embrace eastern factories as well as western farms, not to mention the railroads that link them together. It means more, too, for irrigation on a farm means a crop every year, and regular annual crops means the assurance of that steady round of business that is the aim and the mainstay of every industrial concern, no matter what it is, or where.

The Source of Water.

But! and here is the important matter, and one that is so often lost sight of. All this depends on the maintaining of a steady flow of water in the irrigation canals during the irrigation season, the months of May, June, July, August and September.

The ditches are not enough; there must be water in them and enough water, too, to do the work required.

Occasional occurrences sometimes point the way to general conclusions and in the dry summer of 1919, this was brought out very clearly in connection with this same matter of irrigation.

A Lesson in Point.

A friend of the writer had occasion to go and come by car several times that summer some hundreds of miles, south of the line. On his trips he crossed and re-crossed no fewer than five different irrigation systems, and as the summer went on he found less and less water in these ditches until several of them were delivering not more than half the necessary supply to the farms depending on them. On the Canadian side, everything was as usual and no irrigated farm suffered because of shortness of the water supply. The canals were carrying their usual quantity even in the dryest months. The difference was very striking, but to any one who has seen the difference between the sparsely forested watersheds of Montana and the denser forests of the eastern slopes of the Canadian Rockies, (the sources of our rivers) it was not surprising.

The snows of winter were rapidly melted and lost down the southern streams, while in Canada the closer forest cover retarded both the melting and the flow, so that the supply of water carried down by the rivers and delivered to the canals was very little different from a normal year.

The Future of Irrigation.

The forests made the difference; and in view of these new irrigation schemes, how important it surely is, that every precaution possible be taken to preserve and perpetuate them.

Irrigation is only in its infancy in Western Canada. Only one or two of the tributaries of the South Saskatchewan have been tapped so far, but without any doubt the day is not so far distant when the waters of both the North and South main Saskatchewan Rivers, will be called upon to do their full share, and that not only in Alberta, but also in Saskatchewan.

Must Preserve the Forest

The forest has been called 'Nature's' Balance Wheel", but on the Western border of Alberta it is more, for it is destined to be the centre upon which the prosperity of a great part of the country will turn; first the farms, then the towns and cities tributary to them. It is the store-house of the life-blood of the land, and whatever can be done to preserve it from destruction and maintain and develop it in perpetuity is well worth the interest and support of every thinking Canadian.

BY MOTOR TO THE MOUNTAINS

The highway from Calgary to Banff—One of the modern improvements which each year is attracting a greater number of transcontinental tourists.

Packs, Packing and Pack Saddles

A Breezy and Instructive Talk by an Expert on One of the Great Essentials of Wilderness Travel

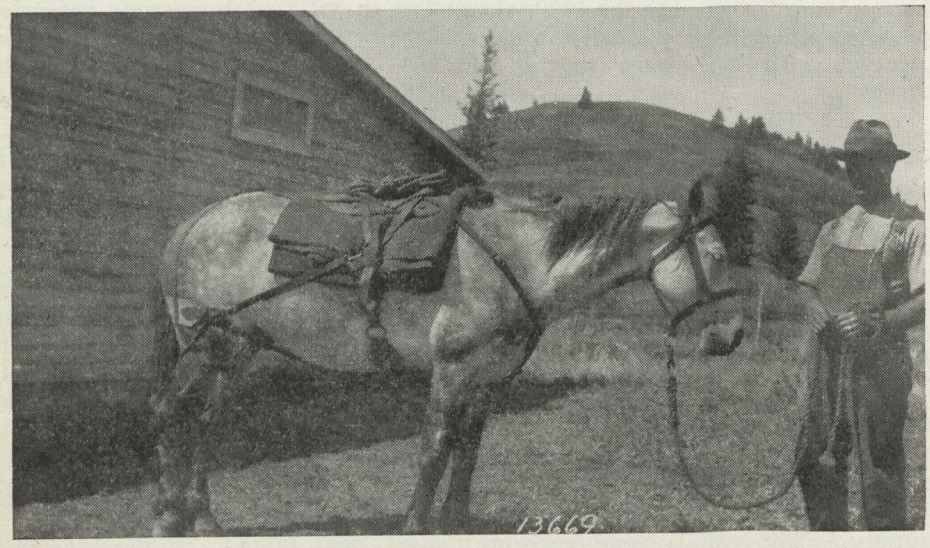
by W. N. MILLAR

THERE are but three fundamental requirements for successful wilderness travel. The first is the ability to find one's way about. The second is the ability to cook. The third is the ability to transport one's necessary impedimenta. It is this third essential that is to be discussed in this article.

A well-known writer on woodcraft has pointed out that of all the numerous methods of wilderness travel, only one, that of pack horse transportation, calls for a high degree of individual skill. Given the requisite strength and persistence almost any tenderfoot can pack on his own back or load and paddle a canoe or drag a hand sled. But the successful packing of horses or mules is in a class by itself. It might be well to point out at the start that while certain elements of packing may be learned by reading and observation, others from diagrams and experimentation, without actual experience with the packer's equipment yet the kind of knowledge gained in this way is almost valueless until supplemented by an actual experience with horses that can be gained only by personal association with pack animals on the trail.

The question of pack saddles and accessory equipment is not a difficult one. A skillful packer will pack successfully with almost any saddle or in a pinch will get along with none at all, but as in everything else, the best results are secured with the better equipments. The writer has a preference for the type of saddle known as the Decker. This is a modification of the common sawbuck saddle in which the forks have been replaced by steel bows. The advantages are virtual indestructibility and a certain leeway to alter the shape of the saddle so as to secure a better fit if necessary.

Pack-saddle rigging is much more varied than are the saddles themselves.



Decker pack saddle equipped with improved Britten rig.—An off side view.

Single and double cinch rigs, with and without breast and breeching straps or with only breeching and no breast straps are all in use. For light or moderate loads the writer has found the double cinch without breast or breeching straps entirely satisfactory even in mountain country and would use this equipment on account of its simplicity whenever his pack train was numerous enough to allow of light packs. If, however, he wished to reduce the number of horses and increase their loads,—a practice not to be recommended,—then he would employ the Britten rig and give most careful attention to the adjustment of saddles and rigging to each individual horse.

Besides saddles, a pack outfit includes much other equipment. Saddle blankets are essential. A packer does well to treat his horses in this regard just as well as he does himself. The best blankets are none too good. Two are necessary, a good grade of close woven wool such as the army blanket for a sweat pad and over this a single Hudson Bay blanket, that is the regular four-point blanket cut in half for a top pad.

Satisfactory side packs or alforjas are almost impossible to buy. The best procedure is to get the heaviest canvas side packs available and then reinforce the ends with leather and the top edge with a ⅜ inch rope sewed in all around. Sling rope is 20 to 24 feet long and ¼ or ⅜ inch in diameter. Lash ropes are 36 feet long and ½ inch in diameter. Lash

A lone packer adjusting the side pack.

cinches may be of canvas heavily stitched, about 6 inches wide and reinforced at both ends with leather pads under hook and cinch ring. Rope splicing must be included among the packers' accomplishments, not merely to make repairs, but also to finish off rope ends, loops, etc., in the neatest and most durable manner. For this purpose a marlin spike fashioned out of a Rocky Mountain goat horn is unsurpassed. A few pairs of hobbles for the wandering members of the train, a couple extra large size cowbells with suitable straps and pack covers 6 feet by 6 feet of medium weight water proof canvas hemmed on all four sides complete the essential packing equipment.

How to Pack Properly

The art of packing must necessarily be considered under three heads. These are (1) the assembling of packs, (2) the hitch and (3) the care of horses. The first two are easily acquired, but unfortunately the mere ability to make up side and top packs and lash them on a horse never so securely does not in itself make one a packer.

The whole secret of correct assembly of packs for horse transport lies in making each of a pair of side packs as nearly as possible of the same weight, size and shape as its fellow. Some variation in size and shape is permissible within limits that only experience will teach but a variation in weight of only a few pounds unless compensated by the position of the top pack will surely cause trouble in the course of a day's travel. Beginners, therefore, cannot be too careful with weight distribution. Packs should be 'hefted' again and again and small articles transferred from one to another untill the required balance is secured. As experience is gained, skill in disposing the top pack so as to compensate for any slight inequality in weight of side packs will be secured and thereby much time will be saved. Top packs should contain the light bulky materials such as bedding and tents. They should be well flattened down and centered perfectly over the saddle.

Placing the Packs.

Two men working together pack much more quickly than two working alone. Each man, however, should be thoroughly skilled in all movements on both sides of the horse so that he may work on the 'near' or the 'off' side indiscriminately, although ordinarily a pair of packers will each work only the one side of all the horses they handle. The process of packing after saddling is completed consists first of placing the side packs. Each man swings one of these into place and holding it with one hand encloses it in the bight of the sling rope which he then secures with a sling rope hitch. A quick glance from the rear by one packer then assures that both packs are on the same level. During this interval the other packer has swung the top pack into place. Both assist, in settling it properly on top of the load. Another quick glance from the rear by the 'near' packer assures its correct placing while the 'off' packer ties a loop in the sling rope at the proper place. This is then thrown over the pack, the other sling passed through it and with the 'off' packer bearing down on his side pack to prevent shifting the 'near' packer tightens up on the sling rope and secures the end on top of the load. While he is making this end secure the 'off' packer picks up the pack cover, both pass it over the load, tuck in their respective sides and begin the hitch.

A pack horse with ordinary outfit

Adjusting the Diamond Hitch

To the complete novice there is only one packing hitch, the famous Diamond Hitch. Off in a class by himself is the obnoxious person who has gained enough superficial knowledge of packing by seeing others packing and listening to real packers wrangle over the virtues of their favorite hitches to know that there are two hitches, the 'Genuine' Diamond Hitch and a lot of hybrid ties of no real standing in packing circles contemptuously called Squaw hitches. The real facts are that not only are there several forms of the Diamond Hitch itself, but there are also several distinct ways of tying almost every one of these different forms of the Diamond. In addition there are a number of hitches every bit as secure as the Diamond hitch but adapted for the most part to special

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Are You A User of Water Power? Here's Evidence for You

The Effect of Forests on Water Powers

Proof Abounds that Destruction of Forest Cover Injures the Commercial Value of Streams

By E. Scott Rivett, Electrical Engineer, Montreal

IT IS well-known that the equalization of the flow of rivers is largely dependent on wooded lands, especially in mountainous districts, or in districts where precipitation is not uniform throughout the year, or where extreme frost prevents the flow of moisture during the winter.

This importance of forests around the water heads of streams utilised for power purposes is sometimes overlooked—or ignored—by engineers designing small hydraulic plants. There is nothing more annoying at a water-power plant than to have water rushing to waste over the dam during springtime, and then later in the year to find the plant can only take part load owing to low water. Another trouble, which is the direct result of deforestation, is the quantity of mud and silt brought down during the time of spate. Apart from the wear on bearings, etc., caused by this sand, there is always the possibility of water-gates and wheel channels getting silted up, with the subsequent expense of a diver and perhaps the temporary shutting down of the plant in order to clear the blocked passages.

Precise figures on this subject are hard to obtain although the principle is generally accepted by water-power engineers. The following particulars from Wallace, Idaho, seem to show that not only equalization of flow but also the yearly average flow is affected by the destruction of forests. At Wallace, the watershed which furnishes the city's water supply was burned down in 1910. A bulletin of the United States Forest Service states that the basin had an area of about 2,000 acres, formerly well-timbered with trees from 50 to 200 years old, and that these were almost wholly destroyed in the year mentioned. Before the fire the stream flow was never below 1,000 miner's inches. Since then it has fallen to 250 miner's inches and the company furnishing the water, light, and power has been compelled to spend considerable sums of money annually in developing power from steam and using part of it in pumping water. Records of the weather bureau at Wallace show that the precipitation has been about normal. Hence the towns-people think the unevenness of flow must be due to the destruction of the timber and not to any change in climate or rainfall.

Similar troubles are not unknown in older countries than ours, and the following extracts from a book—"La Houille Blanche" by MM. Guieu and Babey—published last year in Paris, France, show that reforestation is the remedy there, as here.

"Great variations of stream flow are detrimental to full development of the water power of a stream, but do not form an unsurmountable obstacle. Some measures allow regularization to be effected among which the most important is reforestation This method has been practised for some years in the French Alps.

"The influence of vegetation on the regularization of stream flow is not now disputed, the Engineer of Roads and Bridges, Department Hautes-Alpes, Surrel, has established the four following principles:

(1). The presence of a forest on a soil prevents the occurrence of torrential floods.

(2). Deforestation renders the soil a prey to floods.

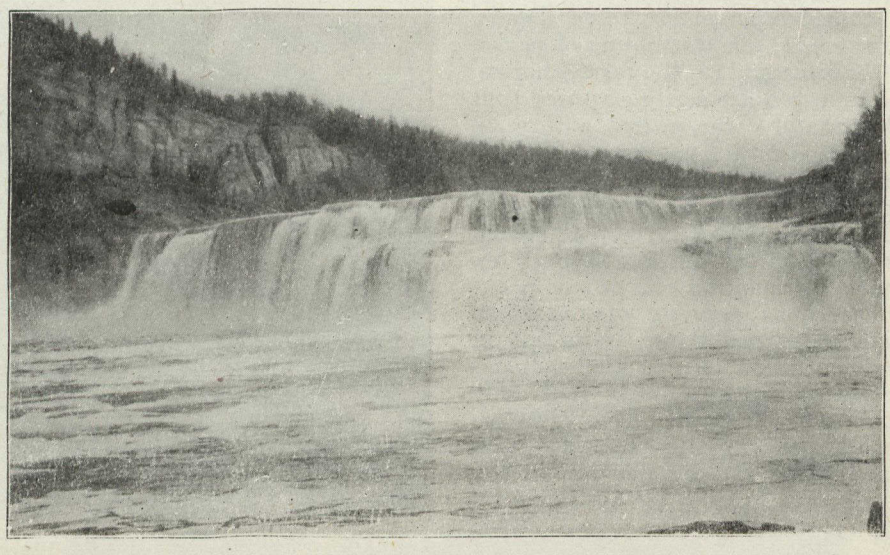
(3). Development of forests helps to reduce floods.

(4). Cutting of forests increases the violence of floods and may even cause them to re-appear."

"Reforestation, to be efficacious, should follow certain rules, according to M. Mongin, Inspector of Waters and Forests. The trees which it is proposed to establish should:

1. Possess roots powerful enough to penetrate the innumerable interstices of the soil, thus rendering it more permeable and protecting it from being carried away.

2. Present a covering complete enough to protect the surface against meteorological influences.



Canada's unequalled water power resources must be safeguarded by the maintenance of her water-shed forests.

3. Furnish a humus in increasing quantity, destined on the one hand to fertilize the soil and increase vegetable growth, and on the other hand to increase the regularization of the flow of streams and to steady the melting of snow.

4. Maintain and perpetuate these beneficial effects and further develop them in the course of time.

"Long experience has established that resinous trees are the best for reforestation for the purpose of stream flow regularization. Besides retaining a large quantity of water in their foliage, they make healthy and dry top layer of the soil, they make the climate more uniform, and also break the violence of winds which wither certain Alpine valleys.

"Planting should be done by means of very young trees about four inches high. Trees are planted in twos, four feet apart, which gives about 5,700 plants to the acre. The best season for planting is generally in spring."

Sweden's Royal Road to Prosperity

by GUSTAVE C. PICHÉ,
Chief of Forestry Service of Quebec Province.

OF THE different countries of Europe, which have practised forestry for a long period, Sweden is undoubtedly one of the most interesting to us, owing to the fact that the general conditions of soil, climate and forest composition and even of topography, are almost similar to ours. Therefore, I have thought it would be more advisable to limit the scope of this paper to a study of what is now being done in that part of the Scandinavian Peninsula, deducting from same a programme of reforms, which should be undertaken in the near future.

Sweden is a typical forest country, as most of its area can only be used for the growing of trees. Like Quebec a great part of its northern lands are covered with heath and glaciers, whilst the southern section is occupied by prosperous farmers and landowners.

Of the total area of Sweden, a little over one-half is composed of productive forests, giving to this country approximately 960 acres of productive forest land per 100 inhabitants. Excepting Finland, Sweden has the largest area of productive forests per capita, and also the largest forests of Europe.

It is in the northern resinous forest, that we find the most interesting types of forest, and it is there one can study with greater advantage the methods employed to manage the forest, to remove the crop and utilize same at the mills.

Sweden's timber, a never-failing national asset.
Le bois de Suède, une ressource qui ne fait jamais défault

One of the big advantages that the lumbermen meet in Sweden is that the country has been settled for many hundred centuries. In fact, most of the good farm lands, south of the polar circle, have already been cleared and are cultivated.

The rivers of Sweden are characterized by the fact that in the North their trend is S. S. E. descending, more or less rapidly, from the mountains. They are well adapted for the driving of logs. This enables the lumberman to remove cheaply all his products towards the sea port. I am much surprised to learn that the Baltic is not a sea, but a lake, as it practically has no tide, a fact which does not complicate the sorting of the logs and their handling in the different Fjords, on the sides of which are built the various wood-working establishments.

Many of the large companies hold extensive private forests. The Mo and Demjo has over 1,500,000 acres of forest lands in fee simple. They also buy part of the forest crop, which the Government puts up for sale every year in the various districts (Revirs.)

Where Foresters Are Used.

The organization of each company is very interesting, as we find that the management is very anxious to give due attention to all the different aspects of the business. I was agreeably surprised to see that the foresters are called to direct all the lumbering operations, whereas in this good country of ours and the United States, we

still believe that they are yet too theoretical to tackle such problems. We hope that our American and Canadian concerns some day will give a chance to the foresters to direct the operations, which they ought to be able to conduct, at least as well as the men who have graduated from the axe. I have also been highly pleased to hear the great compliments paid by the lumbermen to the professors of the various forestry schools, and the esteem and the praises which they give to their own foresters. I found that the chief forester there was the man who not only looks after the raising of the forest crop, that he is not only asked to make the inventory of the forest and to plant a few trees every year, but that he is also in charge of all the lumbering operations, even of the drive, with the result that he is a real master in his forest and gives better results than when he is limited only to one phase of the operations.

The utilization of the trees aims to be as conservative as practical. The stumps are always very low, not more than half a foot in height, but I have seen cuttings, which were not more than a couple of decades old, where the stumps had two or three feet in height. I have found that if they were removing all that they could from the trees in the accessible regions, even converting the tops into charcoal, in the remote sections of the Norrlands, there were places where tops, measuring six inches in diameter, were left behind, because they could not find any market for these products.

The lumbering is generally done by small jobbers. Very seldom, they employ the Company camp system as done in America.

After the tree has been cut, the limbs are immediately removed, and an expert scaler comes along who indicates by notches the places where they may cut the bole into logs. I believe that this system enables them to get a better class of logs, but it certainly yields more material out of their trees, than our present rigid method of making logs of a fixed length. I may also mention that, as a rule, the forest is kept very clean. That is, we seldom see trees of poor appearance or diseased, or frost cracked, as we do find here, because when they make their operations, instead of leaving the poor trees behind as we do, they remove them so as to maintain the forests in a good state of health, with the result that the future crops will be composed of good and sound trees instead of straggling ones, as we are exposing ourselves to by the poor selection made.

They have a great advantage over us by the fact that the composition of their forests is very simple; they have practically only two merchantable species, spruce and pine, whereas we have several varieties of pine, of spruce, also balsam, and many other species, all struggling to replace the other, increasing, thereby our problems of regeneration.

Stopping Fires in Sweden

But where the Swedes have us beaten to death, is in their control of forest fires. One can travel for days on one of their railways without noticing on each side of the track any extensive section of burnt over forest, as we do in America and Canada. Everywhere, the forest is green and in a healthy condition. When you travel through their country, you have always before you the same beautiful and refreshing landscape; all the mountains are dotted with green patches. and nowhere can one find large sections covered with charred tree, or blown down trees and bare rocks, as we have here the regret to see over thousands of miles. During my stay, last summer, they suffered from drought as bad as we did, but the country was not covered with the clouds of smoke we had the misfortune of having. Yet they did not seem to fear fire, nor to have formidable organizations as we must resort to, but every man knew what a forest fire meant to his country and with their love for their fatherland, it was not necessary to drag any man by law to fight a fire. Whenever there was a report of a fire, immediately every farmer of the neighbourhood left everything, offering his services to fight the plague, and, if the local ranger found that he was not able to put out the fire with the men that he could dispose of, he would immediately wire to the Governor of the Province (Lan) to get additional help, and a regiment of soldiers or more were soon sent by special train to extinguish the fire. I believe that the Swedes have succeeded by putting out the fire of their forests because everyone of them loves the forest and realizes what the forest means to them, as almost one-half of the export trade of Sweden is formed by forest products. Instead of preventing the people from settling in forest districts, they have taken the problem in their hands, and the lumbermen are helping and directing the settler where he can establish himself, so as to be of help in case of need, and also to work at the removal of the crop. I believe we should copy these examples, and establish within our forest sections, groups of colonists who will help to prevent and combat fires. We must also have better communications, that is a better road system and a complete telephone system so that in case of danger, help canbe summoned quickly, and not days after the start of the fire. Our organizations have achieved great progress, but this is not enough, and you will admit with me that when we think we that have lost, last summer, nearly 1,200 square miles of forests, we must take the means to prevent the repetition of such a calamity.

Replanting

Not satisfied with protecting effectively their forest wealth, the Swedes have realized that it is also necessary to help nature in its work by planting trees where, for one reason or the other, these do not grow quickly enough. Also to prevent devastating cutting of private lands forest commissions were established in each province to control the lumbering operations of private owners, and when it is found that the forest has been cut in such a manner that the reproduction is in danger. then the commission compels the owner to have his land reforested at his expense.

I was also much interested to see the precautions taken to avoid the brushing of logs in the passing of streams and rapids. The Swedes will not hesitate to make a long sluice to float logs where there is danger of their suffering breakage at the ends. Furthermore, they are not afraid of making logs as long as possible, whereas, here, we stick to the small sizes. As the average length of the logs made on the Crown lands here is about twelve feet, we find that the overlength of six inches, which is tolerated, represents as much as five per cent of the total cut. In other words, every year, fifty million feet of good lumber is wasted during the driving operations, because we have not yet devised all the improvements to avoid brushing. I think this forms the interest of a very large sum, which could be used profitably to improve our driving systems.

Driving is done in about the same way as here, but in the lower parts of the rivers, where there are several companies operating the driving, the sorting of the logs is made in common. We have found a very interesting device for the bund-

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Les forêts et la prospérité de la Suède

par GUSTAVE C. PICHÉ, chef du service forestier de la province de Québec *(traduit de l'anglais)*

NOTE DE LA RÉDACTION.—*Etant donnée l'importance du travail de M. Piché sur les méthodes que l'on emploie en Suède, dans l'industrie forestière, et sur les avantages que nous pourrions retirer de leur mise en pratique, au Canada, nous publions cette étude en français et en anglais. En plus, nous faisons ceci par courtoisie à l'endroit de nos lecteurs canadiens-français et afin de leur rendre un meilleur service. A l'avenir, nous publierons, tous les mois, un article en français.*

DE TOUS les pays d'Europe qui sont engagés depuis longtemps dans l'industrie forestière, la Suède est certainement le plus intéressant pour nous, à cause des conditions générales de son sol, de son climat, de ses forêts et même de sa topographie, qui sont presque identiques à celles du Canada. C'est pourquoi j'ai cru bon de donner dans cette étude un aperçu de ce qui se fait dans cette partie de la péninsule scandinave pour en tirer un programme de réformes que nous devrions mettre en œuvre dans un avenir rapproché.

La Suède est le type du pays forestier, étant donné que la plus grande partie de sa superficie ne peut être utilisée que pour la croissance des arbres. Comme la province de Québec, une grande étendue de sa partie nord est couverte de broussailles et de glaciers, tandis que la partie sud est occupée par des fermiers et des propriétaires prospères.

De la superficie totale de la Suède, un peu plus de la moitié est couverte de forêts productives, soit environ 960 acres de terrain boisé pour chaque 100 habitants. A l'exception de la Finlande, c'est la Suède qui contient la plus grande étendue de forêts *per capita* et aussi les plus grandes forêts de l'Europe.

C'est dans la forêt résineuse du nord que nous trouvons les genres de forêts les plus intéressants, et c'est là que l'on peut étudier plus avantageusement les méthodes dont on se sert dans l'administration des forêts, dans l'abatage du bois et l'utilisation de ce produit dans les différentes usines.

La Suède est habitée depuis plusieurs siècles; ceci constitue un grand avantage pour ceux qui sont engagés dans l'industrie du bois. En effet, la plupart des bons terrains agricoles, au sud du cercle polaire, sont déjà défrichés et cultivés.

Ce qui rend les rivières de la Suède remarquables, c'est qu'au nord elles coulent dans une direction sud-est, en descendant des montagnes avec un courant plus ou moins rapide. Elles offrent d'excellentes conditions pour le flottage des billots. Ceci permet à l'industriel de transporter à bon marché son bois jusqu'au port de mer. J'ai été surpris d'apprendre que la Baltique n'est pas une mer mais bien un lac; il n'y a pour ainsi dire aucun courant ni aucune marée. A raison de ceci, le triage des billots et leur manutention dans les différents fjords se font avec beaucoup de facilité. Sur les rives de ces petites baies sont établies les scieries et les usines de l'industrie.

Plusieurs des grandes compagnies possèdent de vastes forêts. Le Mo et Demjo possèdent plus de 1,500,000 acres de terrain boisé à titre de propriété libre; ils achètent en plus une partie de la moisson forestière que le gouvernement met en vente, tous les ans, dans les différents districts.

L'organisation de chaque compagnie est très intéressante; la direction s'occupe avec beaucoup d'attention des affaires sur toutes leurs faces. J'ai été agréablement surpris d'y constater que les ingénieurs forestiers sont appelés à diriger les opérations de l'industrie du bois. Dans notre beau pays et aux Etas-Unis, on croit encore que les ingénieurs forestiers sont trop théoriciens pour mener à bonne fin de telles entreprises. Nous espérons qu'un bon jour, les compagnies américaines et canadiennes fourniront l'occasion aux ingénieurs forestiers de diriger des opérations de ce genre, travail dont ils peuvent s'acquitter avec au moins autant de succès que l'homme qui n'a jamais fait autre chose que manier sa hache. J'ai été aussi très enchanté d'entendre les industriels louer vivement les professeurs des diverses écoles forestières et exprimer beaucoup de louanges à l'endroit de leurs propres ingénieurs forestiers qu'ils estiment sincèrement. L'ingénieur forestier en chef est appelé non seulement à surveiller la croissance des moissons forestières, à s'occuper de l'inventaire de la forêt et du reboisement qui se pratique tous les ans, mais il doit aussi voir à toutes les opérations de l'industrie, même au flottage des billots. C'est ainsi qu'il devient maître suprême de sa forêt et qu'il est en mesure de produire de bien meilleurs résultats que si ses activités étaient limitées à une phase seulement des opérations.

Dans l'utilisation des arbres, on s'efforce à être aussi conservateur que pratique. Les souches sont d'ordinaire très basses, de pas plus de six pouces de hauteur. J'ai vu un endroit où l'on avait fait de l'abatage, il y a une vingtaine d'années; les souches ont de deux à trois pieds de hauteur. J'ai aussi constaté que, dans les régions accessibles, on utilise toutes les parties de l'arbre; on fait même du charbon de bois avec les têtes. Cependant, dans les régions de l'extrême nord, des têtes d'arbres de six pouces de diamètre sont laissées sur le terrain, étant donné qu'on ne peut trouver de marché pour en disposer.

En général, l'industrie est entre les mains de petits entrepreneurs. Ils se servent rarement du système en vogue en Amérique qui consiste à ériger des camps de chantiers sur les lieux des opérations.

Après qu'on a abattu l'arbre, on le dépouille immédiatement de ses branches. Ensuite un mesureur expert indique, par des entailles sur le tronc, en combien de billots on doit couper l'arbre. Je suis d'avis que ce système produit une meilleure qualité de billots; on obtient certainement par ce moyen le maximum de rendement de l'arbre, beaucoup plus qu'avec notre système rigoureux de couper tous les billots d'une longueur déterminée d'avance. Je dois ajouter que, règle générale, la forêt est tenue dans un état de propreté remarquable, c'est-à-dire que nous y voyons rarement des arbres d'apparence médiocre, des arbres rabougris ou fendus par la gelée, comme nous en trouvons en ce pays. Cet état de choses est dû au fait qu'au cours des opérations, au lieu de laisser debout les arbres médiocres, comme nous le faisons, ces gens les enlèvent les premiers afin de maintenir les forêts en bon état de santé. Il en résulte que les moissons futures de la forêt consisteront en arbres sains et forts au lieu d'arbres rabougris que nous aurons toujours comme résultat de notre système d'abatage.

Ils ont un grand avantage que nous n'avons pas: la composition de leurs forêts est très simple. Ils ne possèdent pour ainsi dire que deux essences de bois, l'épinette et le pin, tandis que nous avons plusieurs variétés de pin, d'épinette et de sapin, ainsi que beaucoup d'autres essences, tous ces arbres luttant les uns contre les autres dans leurs efforts pour prendre racine dans le sol, rendant d'autant plus difficile notre problème de la conservation des forêts.

Mais là où la Suède nous bat à plate couture, c'est dans la prévention et le contrôle des feux de forêts. On peut voyager durant des journées entières sur une de ses voies ferrées

sans voir sur chaque côté de la route des sections de terrains boisés ravagés par l'incendie, comme on en voit tant en Amérique et au Canada. Partout la forêt est verte et vigoureuse. Quand vous voyagez dans ce pays vous avez toujours sous les yeux un paysage qui vous fascine et vous réjouit; toutes les montagnes sont revêtues de verdure et on n'aperçoit nulle part de grandes étendues de bois brûlés ou d'arbres tombés ou des parties désertes, comme nous en voyons malheureusement sur des milliers de milles en notre pays. Pendant mon séjour en Suède, l'été dernier, ce pays a souffert d'une sécheresse aussi intense que celle qui a sévi au Canada, mais on ne voyait pas des nuages de fumée suspendus au-dessus du sol, comme nous en voyons ici. Les gens ne semblaient pas craindre les feux et n'avaient pas les organisations formidables que nous possédons pour la protection des forêts contre les incendies, mais chacun savait combien désastreux sont les feux pour le pays, et, à cause de leur grand amour pour leur patrie, on n'avait pas besoin de forcer par la loi les citoyens à se jeter dans la lutte contre les feux. Quand on entendait parler d'un feu, tous les fermiers des environs abandonnaient immédiatement leurs travaux et offraient leurs services pour enrayer le fléau, et si le garde-forestier de l'endroit se trouvait incapable d'éteindre le feu avec les hommes qu'il avait ainsi à sa disposition, il envoyait un message télégraphique au gouverneur de la province (Lan) lui demandant d'envoyer d'autres hommes, et, aussitôt après, un régiment ou plus de soldats arrivaient sur les lieux par train spécial pour éteindre l'incendie. Je suis d'avis que la raison pour laquelle les Suédois tiennent tant à faire la guerre aux feux de forêts, c'est que tous ont un culte pour la forêt; ils savent que leurs ressources forestières sont de suprême importance, que presque la moitié de l'exportation de la Suède consiste en produits de la forêt. Au lieu d'empêcher les colons de s'établir dans les districts boisés, on a envisagé la situation d'une autre manière; ceux qui sont engagés dans l'industrie du bois assistent les colons en les dirigeant dans les endroits où ils peuvent s'établir tout en étant dans la position d'être utiles en cas d'urgence et d'aider à l'abatage des arbres. Je suis d'avis que nous devrions suivre cet exemple en établissant, dans nos régions forestières, des groupements de colons qui seront prêts à prêter main-forte dans la protection des forêts contre les feux. Il nous faut aussi de meilleurs moyens de communication, c'est-à-dire des meilleures routes et un système téléphonique parfait, afin qu'en cas de danger, on puisse demander immédiatement de l'aide et ne pas être obligé d'attendre plusieurs jours pour commencer la lutte contre les flammes. Nos organisations ont obtenu des succès considérables, mais nous n'avons pas encore accompli suffisamment. Quand vous savez que, l'été dernier, nous avons perdu presque 1,200 milles carrés de forêt, vous conviendrez avec moi qu'il est absolument nécessaire que nous prenions les moyens de prévenir une répétition d'un tel désastre.

Non satisfaits de protéger avec succès leurs richesses forestières, les Suédois ont réalisé qu'il était aussi nécessaire d'aider la nature dans son œuvre en plantant des arbres là où, pour une raison quelconque, ils ne poussent pas suffisamment épais. De plus, afin d'empêcher l'abatage désastreux sur les terrains privés, on a établi dans chaque province des commissions forestières avec la mission de contrôler les opérations sur les propriétés privées. Quand on s'aperçoit que la forêt a été abattue de manière à mettre la reproduction en danger, la commission exige que le propriétaire reboise son terrain à ses propres frais.

Les précautions prises pour empêcher les bouts des billots de se briser dans la descente des ruisseaux et des rapides m'ont vivement intéressé. Les Suédois n'hésitent pas à construire des longs glissoirs pour le passage des billots dans des endroits où ils seraient en danger de se briser. De plus, ils ne craignent pas de couper leurs billots aussi longs que possible, tandis qu'ici, nous avons un faible pour les petites longueurs. Etant donné que la longueur moyenne des billots coupés sur les terres de la Couronne, au Canada, est de douze pieds et qu'on tolère six pouces de plus par billot, nous constatons que cet excédent représente cinq pour cent de la coupe totale. En d'autres termes, il se gaspille chaque année cinquante millions de pieds de bon bois dans le flottage des billots, parce que nous n'avons pas encore trouvé les moyens d'empêcher les bouts des billots de s'aplatir dans la descente des rapides. Je suis d'avis que ceci représente l'intérêt sur une somme très considérable que nous pourrions utiliser avec profit dans le but d'améliorer notre système de flottage du bois.

Le flottage des billots se fait à peu près de la même manière qu'au Canada, mais dans les régions inférieures des cours d'eau, là où plusieurs compagnies sont engagées dans ces opérations, le triage du bois se fait en commun. On a trouvé un plan intéressant qui permet de faire le rassemblement des billots promptement et à bon marché. Je crois que cet appareil mécanique peut être utilisé avec avantage dans le remorquage des billots à travers les lacs et les mers. Ce qui nous a aussi vivement intéressés c'est le soin avec lequel les Suédois font le triage des billots, en les arrangeant de manière à pouvoir scier en même temps des billots de mêmes dimensions.

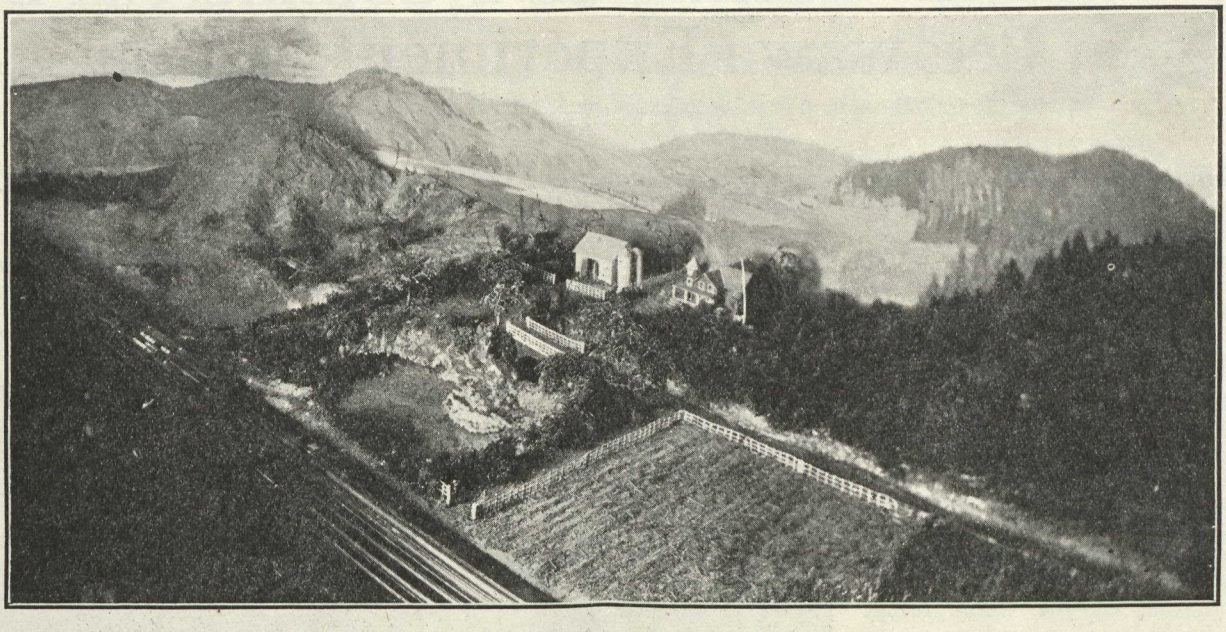
Je crois que ce court aperçu vous donnera une bonne idée de ce que font nos principaux concurrents dans le commerce du bois, de la pulpe et du papier. Le peuple suédois a l'intention de s'occuper de cette industrie pour toujours. Il a à coup sûr pris tous les moyens pour conserver et améliorer ses forêts, tandis qu'il s'est assuré l'aide de techniciens, un facteur qui a beaucoup contribué au développement du commerce et des industries de l'Allemagne.

Somme toute, je dois dire que si nous tenons à améliorer ce que nous avons, nous devons d'abord protéger ce qui nous reste; il faut enrayer les feux de forêts. Ensuite, il faut faire un inventaire complet de nos forêts afin que nous sachions ce qui nous reste. En plus, il serait sage de restaurer les terrains déserts au moyen d'une judicieuse méthode de reboisement. On peut améliorer le rendement des jeunes arbres en les éclaircissant convenablement.

Afin de mettre cette politique à exécution, on a besoin d'un grand nombre d'hommes. Des ingénieurs forestiers et des gardes-forestiers sont absolument nécessaires, et le gouvernement et les industriels devraient s'entendre pour recruter ces hommes aussitôt que possible. On devrait établir une école pour l'entraînement des gardes-forestiers.

Il va sans dire que les opérations de l'industrie du bois devraient être pratiquées plus économiquement. Nos moyens ne nous permettent pas de gaspiller autant de matériaux que nous le faisons actuellement. Les têtes d'arbres devront être plus petites et les souches plus basses qu'à présent. On devra enlever les arbres défectueux afin qu'ils ne puissent pas porter des graines et reproduire une classe d'arbres bâtards. Il faut combattre le fléau des insectes. Nous devons tenir nos forêts en état de propreté en employant les mesures les plus efficaces et les plus opportunes. Tout ceci constitue un immense programme de réformes, mais je suis d'avis que nous sommes de taille à l'entreprendre. S'il y a dans toute l'Amérique un endroit où l'on peut mettre en pratique une organisation efficace pour la conservation des forêts, c'est bien dans Québec, où nous avons des gens progressistes qui sont prêts à se mettre à la tâche.

Importance of Forest Growth on Mountainsides to Valley Farm Lands



THE NEW Erosion Model just completed for the Canadian Forestry Association's "Forest Exhibits' Car", here tells the story in graphic form of the evil effects of stripping tree growth from the watershed areas that govern our Canadian rivers.

The model, nine feet in length, built and colored with great beauty and lifelikeness, is divided into two sections, showing contrasting conditions of forest growth. The left hand portion, as will be seen from the above photographic engraving, illustrates the wretched results following upon the destruction of forests on steep hillsides. Erosion of soil has proceeded to such a dire extent that the agricultural lands in the valleys are totally ruined, being overlaid with boulders and debris, with the original fertile soil washed out and wasted. The remains of a once prosperous farm, are visible. Bridges are broken down, and the general signs of barrenness and unproductiveness are everywhere to be noticed.

On the right hand side, however, the forest growth on the hillsides has been retained, with the happy result of a well-regulated run-off of water, deep and uniform streams, a highly fertile and prosperous farm, with well cultivated fields, a fine home and farm buildings.

By a mechanical arrangement, a rain fall is produced from a masked portion of the clouds above, so that the onlooker can see for himself how the rain and melting snows are a source of devastation on a deforested mountain and valley section while acting as a source of enrichment and blessing on a forested area. The rainfall looks most natural and the general educational effect is graphic and impressive.

The above photograph was made in a semi-dark railway car and gives only a scant idea of the attractiveness of the model. The maker was Mr. W. C. Willmore, Ottawa, and scenic effects were by Mr. Alan Beddoe, Ottawa.

Sweden's Royal Road to Prosperity

(*Concluded from page 720*)

ling of logs quickly and cheaply. I believe this mechanical device could be used profitably for the towing of logs across lakes and oversea. We were also much interested to notice the great trouble which the Swedes take to sort their logs, so as to saw, at the same time, logs of the same diameter.

I believe this rapid outline will give you a fair idea of what our main competitors in the lumber, pulp and paper trades are doing. The Swedish people intend to remain in this trade for ever. They certainly have taken the means to preserve and improve their forests, whilst they have also secured the technical help which has done so much to promote the advancement of the German trade and industries.

To sum up, I may say that if we want really to improve what we have, we must first of all protect what we have left: the fire menace must be eliminated. Then we must make a thorough inventory of our forests, so as to know what we have left. Then it would be advisable to reclaim all the waste lands by judicious plantations. The increment of the young stands may be improved by proper thinnings.

To carry out efficiently this policy a large number of men is needed. Foresters and rangers are absolutely necessary, and the Government and the lumbermen must co-operate fully together to recruit these men as quickly as possible. A ranger's school is necessary.

It is needless to say the lumbering will have to be carried on more economically. We cannot afford to lose so much material as we do now. The tops must be smaller and the stumps not quite as high as they are. The defective trees must be removed so that they will not seed and produce an abortive class of trees. We must fight the insect pests. We must keep the forest clean, taking the measures which will be more efficient and timely. It is a rather vast programme of reforms, but I believe we are big enough to tackle it, and if there is any part in America where modern and efficient forestry business can be conducted, it is here in Quebec, where we have a progressive group of lumbermen who are really anxious and ready to go ahead.

Improvement Cutting on a Commercial Basis at Petawawa Experiment Station

by J. C. VENESS

IN THE white pine region of the east, a common forest type following fire is a mixture of poplar and birch with pine, spruce or other soft woods. Generally the more valuable softwoods are slower getting established, and while they eventually come through the poplar or birch, the productivity of the land is very much lower than it would be if the same area were covered with the more valuable softwoods only. In this type of forest the softwoods may be held back for a long time or they may be so scattered that it does not pay to log them when they are of sufficient size, and one of the main forest research problems that we have, is to explore the possibility of improving the condition of any forest of this nature that has been established. Where there is a strong softwood growth mixed in with or under the poplar and birch, there is little doubt that the removal of the poplar and birch would be of benefit to the softwoods already established; where there are a few scattered softwoods only, the problem becomes one of securing from these scattered seed trees a young growth of softwoods.

Very much suppressed softwoods released from heavy shade of poplar and birch, by removal of all large poplar. The small softwoods here are of approximately the same age as the poplar.

Fall hauling, showing class of poplar utilized for match stock.

If anything is to be done to improve the condition of this kind of forest, it is essential that all or a proportion of the poplar and birch should be removed, and while it is necessary to discover the proper method of cutting to get the desired results, the chief difficulty is connected with the utilization of the poplar and birch when cut. In certain districts the market for poplar is good; it is cut for pulpwood, box shooks, for manufacture into matches, and, to a limited extent, for excelsior. The market for white birch is not so varied, the main use being for spoolwood.

Experimental cuttings of this nature have been carried on at the Petawawa Forest Experiment Station, located on the Petawawa Military Reserve. There are considerable areas of the poplar-birch softwood type of forest, and while there is at present a very limited market for white birch, there is a market for poplar in the neighborhood, and the proportion of poplar is generally large enough to warrant the cutting of the poplar alone. These experimental cuttings were carried on with four main objects:

(1) Freeing of the small growth of softwoods by removal of the poplar and birch.

(2) Opening up of the forest to allow of the establishment of new softwood growth.

(3) Experiments in brush disposal.

(4) Demonstration of the possibility of carrying on experimental cuttings on a commercial basis.

An area of 150 acres was selected for cutting on which it was possible to carry out these experiments. The cutting was to be made on a commercial basis, and it was necessary to sell the material on the stump. Cutting regulations were drawn up and the sale advertised in Pembroke, Chalk River and Petawawa. The material was intended for manufacturing into matches, and since the minimum size accepted by company, was seven inches inside bark, and as the utilization of this larger material alone would have resulted in considerable waste in tops and in largely increased fire danger, it was necessary to provide for the utilization of all material to as low a limit as possible; the only available market for the small stuff was as fuel wood and provision was made for use as fuel wood of all material down to

(*Concluded on next page*)

Planting Up Your Home Town

Some suggestions gleaned from experiences of the Community Planners in Montreal West and presented for the information of others similarly minded

THROUGHOUT Canada there are few other such outstanding instances of what may be accomplished in the way of Town Planning by a numerically limited but intensely loyal citizenry as is furnished by the Corporation of Montreal West. With no thought of unduly stressing the advantages of the town as a residential centre but rather with the idea of supplying some information of potential value to other young and ambitious Candian municipalities, some of the facts in connection with the town's origin and growth have been secured from those who have been active in its history which dates back a brief quarter century.

With a present population of approximately 2,000, men, women and children, Montreal West, undoubtedly presents more desirable features and less undesirable ones than towns and cities many times its size throughout the Dominion. With a total area of nearly 400 acres, the town possesses 8 miles of streets consisting of asphalt roads with concrete sidewalks on both sides, these being the only kinds of road and walk materials used anywhere in the town. The streets, are planted on either side with trees intermingled Norway Maple and Elm, there being approximately 3,500 of these on the streets and in the parks, of which latter there is an area of about ten acres. Along the railroad tracks, which in many towns and cities are sections little noted for beauty are planted rows of Golden Elder Hedge with Lombardi poplars growing at 30 feet intervals. In the parks and on the boulevards are set out each year about 2,000 shrubs and nearly 20,000 plants. The placing of these is rendered possible by a Municipal Conservatory and Green House which is a highly decorative and educative annex to the Town Hall. The erection of this building which was just completed in the fall of 1921, by Lord and Burnham Co., bids fair to turn the citizens of Montreal West into an army of horticulturists. The Conservatory is conducted as an educational medium for young and old while the Growing House supplies the flowering plants and foliage for the parks and conservatory. The building which opens directly into the Town Hall proper is of curved eave construction, the conservatory being 25' x 25' and the Growing House 50' x 25' in dimension.

Mr. Robert Millar, General Superintendent of the Town has direct supervision of Roads, Town Hall and Parks and to his zeal in the interest of these departments is undoubtedly due much of credit for the results that have been attained. Mr. Millar is a gardener and an horticulturist by birth, training and inclination. Some of the points which have been evolved from his large experience are worth setting down. In tree-planting on streets, he advises that as a start the young trees be planted at 25 feet intervals. After two years when the trees indicate that they are thriving, alternate trees should be removed and transplanted elsewhere, leaving a space of 50 feet between the permanent trees. One of the chief requisites in Town Planning, he says, is in the early stages of a town's history to leave plenty of open spaces. Width of streets should be a minimum of 50 feet with boulevards maintained by the Municipality. Houses should be built at least 15 feet back from the street line with an additional allowance of 10 feet at street intersections.

Among the various features of Montreal West which serve to stimulate community spirit so essential in a town planning enterprise are the Municipal Bowling Greens, Tennis Courts, Curling Rinks, Playgrounds and Bowling Alleys. These latter are situated in the Town Hall, beneath the Conservatory and the revenue obtained from them and the Music Room and Assembly Hall also located in the Municipal building, carries the entire expense of the building.

Montreal West is governed by a Mayor and Board of Commissioners. Mr. James Ballantyne has occupied the Mayoral Chair for the past 12 years, while the Commissioners are: A. B. Otter, Chris. H. Goulden, Harry Aird and Thomas Hall. Other devoted officials who keep the municipal wheels in motion are: Chas. I. Fraser, Secretary-Treasurer and J. H. Matthewson, Chief of Police.

Improvement Cutting on a Commercial Basis at Petawawa Experiment Station

(*Concluded from preceding page*)

three inches, not used for match stock. Provision was also made for brush to be lopped and scattered and for proper care to be exercised in cutting, so that the softwood growth should be injured as little as possible. Three tenders were received and the highest one accepted.

About 400 cords of match stock and 200 cords of fuel wood were cut off the area; the sale regulations were, on the whole, carried out in a satisfactory manner; brush was lopped and scattered, and, while it is a question whether brush burning would not have been better, it was considered advisable to give the lopping method a trial.

The main objects of the cutting have been carried out; the forest has been opened up to free small softwoods, and provide more suitable conditions for the establishment of young growth, and the possibility, under favourable conditions, of carrying out experimental cuttings on a commercial basis has been demontrated.

SCATTERED PINE LEFT AFTER REMOVAL OF LARGE POPLAR.

Note thin, undeveloped crowns of the pine, due to crowding of the poplar; note successful slash disposal.

Strength and Adaptability of B. C. Woods

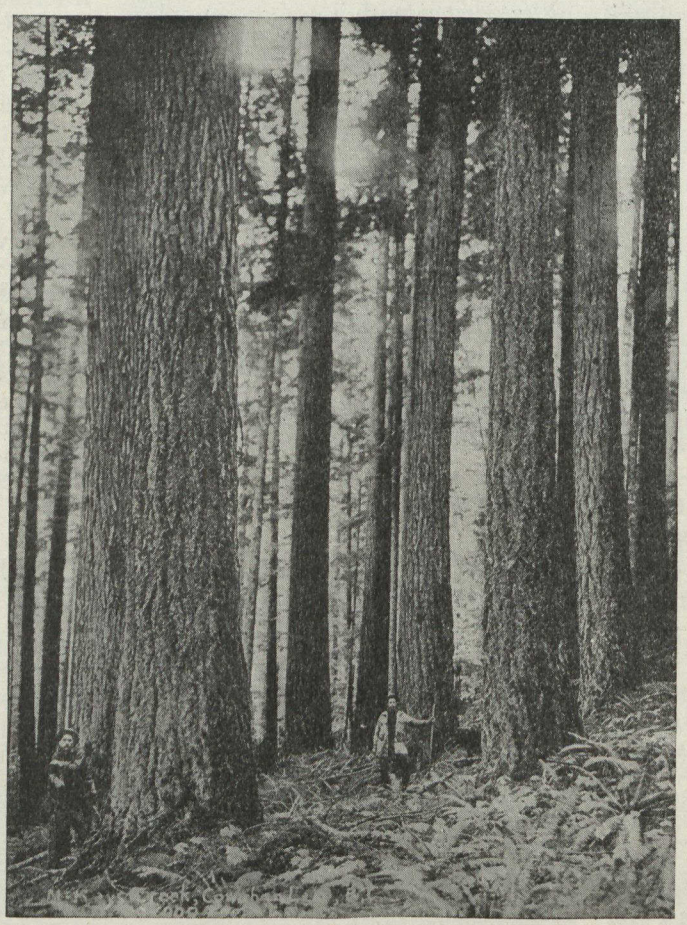
By Wm. Turnbull, B. C. Lumber Commissioner in an address given at London, England.

(*Continued from March issue*)

YOU might be interested to learn that city engineers in Canada and the United States are to-day giving exactly the same working stresses for Douglas fir and pitch pine, after years of experience of both woods. Hundreds of tests carried out by the U. S. Forest Products Laboratories show Douglas fir to be equal in strength to Southern pines in fact in elastic limit to be 10 per cent stronger. Douglas fir is the strongest wood in the world for its weight. Railroad companies in Eastern Canada use much of it in car construction for cills, etc. However, I am probably wasting your time in dwelling on these points, as you are all familiar with the qualities of this wood. As time goes on and pitch pine disappears, as it is rapidly doing you will become still more familiar with Douglas fir. Ten years hence most of your large structural timbers will come from the Pacific Coast. Long-leaf pine, on which pitch pine built up its great reputation, is now but a name for dense yellow pine of any of the three varieties. The Southern pine people are grading their timbers with fine discretion on a density basis, calling the three grades Long-leaf, Short-leaf, and Loblolly, though all three are to-day quite frequently of the Short-leaf variety.

Besides being invaluable as a structural timber, Douglas fir, sawn edge-grain, makes a very fine flooring, wearing evenly and taking a splendid polish. In Canada, we use much more wood-panelling in our houses than you do here, and for this purpose and other interior finish, Douglas fir is the most popular wood. The figuring is distinctive, and when the grain is fine and "curly" a remarkably beautiful effect is obtained. It finishes and polishes splendidly. The best effects are, of course, obtained from veneer-cut panelling, as panels may be matched very closely.

We now come to Sitka spruce, the best known of our spruces. It is found throughout the Douglas fir region, but is at its best on the north Vancouver Island and north of the fir belt on the Queen Charlotte Islands, particularly on Graham and Moresby Islands of that group. From Graham and Moresby Islands, British Columbia shipped during the war enough Sitka spruce to construct 20,000 aeroplanes. Your timber research men here found that Sitka spruce met their requirements of lightness with strength, toughness, even grain and freedom from splitting. When active fighting ceased the Imperial Munitions Board immediately dropped operations and lost interest in spruce. Many millions of feet of the cream of our spruce lay in the woods and the water, the latter subject to teredo attack. This large stock of splendid material was ultimately sold at salvage prices to be sawn into lumber and chewed up into pulp to make paper. Possibly this was the best plan of disposal at the moment, but it seems a pity that such quantities of valuable aeroplane stock should be devoted to giving racing results to the public. I venture to think that the Germans or the Japanese would have valued it more highly. The Japanese have been, and are casting longing eyes on our Sitka spruce.



Douglas Fir in British Columbia Forests

To-day, much Sitka spruce is going into pulp, but it is also being made into boxes of all sizes. Its freedom from taste or smell makes it invaluable for containing foodstuffs. It is also being used for framing, sheathing and sub-flooring, while it is more than useful as core stock for veneered articles. It is also one of the most resonant of woods, because the fibres are long and regularly arranged, and is now being used in making piano sounding-boards, cabinet gramophone horns, and I find in Britain that it is in high favour with violin makers. Like most British Columbia woods, it is obtained in large sizes, much of it clear.

Western hemlock is not so well known over here as it is in Canada. It constitutes 18.3 per cent. of our commercial timber, and, like the others, grows to large sizes. Even in Canada, its good qualities and value are not so well known as they will be. To-day, much of our hemlock goes into pulp, for which it is admirably suited, but for ordinary building purposes it is equally as useful as Douglas fir. It has 88 per cent. of the strength of its bigger brother, and is therefore not suitable for the heaviest type of construction, but it makes excellent siding, flooring, ceiling, scantling, inside joists, etc. For sash and door fixtures, turned stock, panelling, etc., it has exceptional merit.

Western hemlock is usually light in colour, and contains no pitch or resin. It dresses to a smooth, satin-like surface, capable of taking a very high polish and is not easily scratched.

To be continued in next issue.

Hedges to Improve Canadian Homes

By W. T. MACOUN, Dominion Horticulturist.

ONE OF the many experiments conducted at the Dominion Experimental Farms and Stations has been the comparison of different species of trees and shrubs for hedge purposes in order to learn the good and bad points of each and to determine which were best in the part of Canada in which they were tested. A single row of each species fifty feet in length is used in the experiment. These hedges have made an extremely interesting and useful feature at the Farms, and, it is believed, have had much influence in inducing Canadians to improve their home-grounds by planting them. At the Central Experimental Farm, Ottawa, there are now eighty-four of these sample hedges, and it is doubtful if anywhere else there is as large a number. Many species have been tested during the past thirty years and discarded and replaced by others. Readers of the *Canadian Forestry Magazine* living in different parts of Canada will find such sample hedges at the following Experimental Farms and Stations, and information in regard to the success of other species than those mentioned in this article may be obtained from the Superintendents:—Charlottetown, P. E. I.; Nappan, N.S.; Kentville, N.S.; Fredericton, N.B.; Cap Rouge, P.Q.; Lennoxville, P.Q.,; Brandon, Man.; Indian Head, Sask.; Rosthern, Sask.; Scott, Sask.; Lethbridge, Alta.; Lacombe, Alta.; Agassiz, B.C.; Summerland, B.C.; Invermere, B.C.; Sidney, B.C.

Method of Planting.

The plants for each of these hedges are set, in a row, eighteen inches apart, which has been found a satisfactory method on the whole. It has been found best in starting a hedge to use small plants from one and one-half to three feet in height. The soil for the plants is first dug and levelled or raked and, if thought necessary, well-rotted manure is thoroughly incorporated with it before planting, but no manure is put in the trench which is opened for the plants. Usually it has not been necessary to use any manure at the time of planting, as the soil is fairly good. The trees are planted a little deeper, say from one to two inches, than they had been in the nursery from which they came. This is to provide for some heaving the first winter and also to make certain that they are not planted too shallow. Early spring planting both for evergreens and deciduous species has been found the best and summer planting of evergreens is not recommended. The soil should be tramped in well about the roots so as to ensure their quick contact with moist soil. After planting the plants should be pruned back to the same height if they are uneven in growth.

The hedges are pruned regularly each year, the usual time for pruning being after most of the growth has been made. For some sorts this is early in June, whereas for others it is late in June or early July. By pruning at this time there is usually a little more growth made which covers the wounds made in pruning and the hedge looks neat until nearly the same time next year. Some kinds require a second pruning late in summer as odd shoots grow up which should be removed to keep the hedge looking neat, and with a few sorts there is a fairly strong second growth.

The shape of hedge which has been found most pleasing to the eye and at the same time ensures the branches remaining alive almost or quite to the ground is one with the broadest part of the hedge at the ground, gradually narrowing towards the top, but the top being rounded instead of being pruned to a sharp point.

While a large number of species have been tried those which are satisfactory for many years are relatively few. The chief defect of most of the hedges is that they become too open at the base, while others require too much pruning.

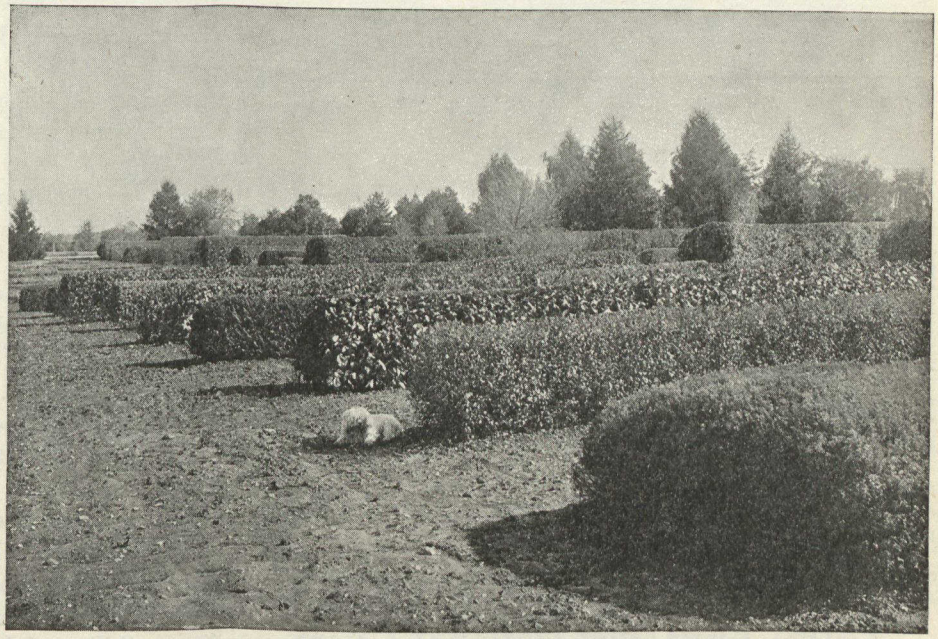


Photo by Dr. Frank T Shutt

General view of the experimental hedges at the Central Experimental Farm, Ottawa,

Prairie Conditions.

For the prairie provinces the different species of Caragana are among the best for hedge purposes, most of the others described below being too tender. Trees and shrubs native to the prairies make good hedges, and among those which may be mentioned are the Box Elder, Green Ash, White Spruce, Hawthorn, Buffalo Berry, Saskatoon and Wolfberry. In addition to those described some plants which make good hedges in the coast regions of British Columbia are Laurel, Holly, Box, and Californian Privet.

Tall Deciduous Hedges.—Where a tall hedge is required one of the following might be used with good effect: Siberian Pea Tree, Honey Locust, Josika Lilac, Common Buckthorn. The white, yellow and black birches have also made good hedges at Ottawa and stand pruning well.

Siberian Pea Tree (*Caragana arborescens*).—This is, perhaps, the best of all deciduous hedges for the colder parts of Canada. It is very hardy and a fast grower and its leaves, which

(*Continued on page 747*)

E D I T O R I A L

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Forest Fires, our National Guest

TO propose that the question "What shall we do about our Forest Fires?" shall take precedence to every other problem now before the Canadian people may sound like an everyday exaggeration of a "single track" enthusiast. It is a failing of those identified with propaganda, of course, to see only one issue upon the screen of public affairs. No doubt, the student of immigration is puzzled that every passer-by is not button-holing his neighbor with talk on new population. The tax reformer similarly contents himself with a vision of an untroubled world founded upon his solitary keystone. Those who have read "If Winter Comes" will recall the protest of Mark Sabre against the domination of partisan half-truths and his despair of a world in which the public turns lazily to any vociferous ballyhoo, scorning to notice the conservative thinker who sees more than a single aspect of any proposition.

Greater Opposition Might Be Desirable

Those responsible for forestry propaganda, however, may rightly claim that they ask nothing more than a cautious jury-box decision on the part of the Canadian people. The weakness of forest conservation as a subject of public debate is that it is "non-controversial." If only some obliging citizen would organise an anti-forestry society and hold meetings and denounce and view-with-alarm, the proponents of forestry surely would feel overjoyed. Dr. Fernow, the "Dean" of Forestry in America, used to say that the public was little interested in any subject that contained so little chance of fricton and that the claims of the forest conservationist would be far more acceptable to the generality of people if a little frenzied opposition would only show its head. The trouble seems to be that having preached to ourselves for so many years the gospel of the "inexhaustible forest" and the "land of unimagined riches," we have yet to learn that nowhere on earth can a nation get something for nothing.

Trustees for the Next Generation

We must learn that we, the inheritors of a forest estate, are at the same time trustees for the next generation. Waste will breed want, as certainly as the sun rises. Canada already has paid a temendous forfeit for the forest waste of the past fifty years. We have paid in decreased foreign trade, in decreased employment, in a lethargic growth of population. Is there an informed student of Canadian forest conditions who will doubt that were we today in possession of the vast forests sacrificed to smoke and charcoal since 1875 the nation's economic position would be incredibly improved. We would be in a far more advantageous position in timber trade through greater accessibility of forests and an abundance of high priced woods, and the menace of wood exhaustion now facing our industries would be just a dim possibility.

Wherever one may look, or listen, there crops up that perennial false opinion that Canada's forests are an undrainable BANK ACCOUNT and that we Canadians have no more call to worry than has an English remittance man fanning himself in the Fiji Islands.

We Must Face Our Responsibilities

The ugly facts must be faced. Canada's forests have been destroyed by fire nine or ten times faster than they have been utilized for lumber or paper making. The natural growth is not even one quarter what the axe takes away. Put those facts on your adding-and-subtracting machine and reckon up the consequences.

The people of Canada must make up their minds to one thing: **to possess forests costs money.** The menace of from five to ten thousand annual forest fires must be countered by greater public expenditures and far keener administrative efficiency. We must be prepared to **spend** in order that we may **keep** the forests as a Canadian resource. If we do not spend an extra dollar now, while timber still remains in the country, we will inevitably and automatically spend a hundred dollars to buy back from abroad for our daily necessities, the forest materials we tossed away during our period of spread-eagle prodigality.

Prairie Potatoes ! !

IF ANY reader of the "Canadian Forestry Magazine," living in the Prairie Provinces, looks upon a shelter belt of trees as merely a sentimental matter and "too costly for a poor farmer," let him read the following remarkable statement.

Mr. M. J. Tinline, Superintendent of the Experimental Farm at Scott, Saskatchewan, tested out the comparative yields of two varieties of potatoes in 1920 and 1921. One plot was grown inside a shelter belt and the other in the open field. The difference in yields is so striking that the "Forestry Magazine" would like to hear from other Western readers as to their own experiences.

	Inside Shelter Belt.	In Field.
1920—Gold Coin	479 bush.	166 bush.
1920—Everitt	413 "	121 "
1921—Gold Coin	761 "	249 "
1921—Everitt	576 "	156 "

"In the 1920 crop" says Mr. Tinline "I do not know of any other factor that entered to influence the crop yields other than the fact that they were grown inside the wind breaks. As far as I am aware this land had received no manure previous to that time. But the snow does collect to quite a depth during the winter months, the hedges being seven or eight feet high. In 1921 two factors might enter in to increase the yields in between the hedges; one, was the fact that this land had received some manure, and the other that it has been customary to plough this piece of land deeper than we usually plough in the fields. The field crops each year were grown on land that had been summer-fallowed the previous season. Our soil here is a chocolate clay loam. In as far as dates of planting were concerned, in neither year would the date of planting between garden and field lots be more than two days."

EVOLUTION OF MAPLE SUGAR INDUSTRY

THE OLD ORDER PASSETH

The "good old way" of making Canada's maple sugar crop is quickly surrendering to more hygienic and profitable methods. Photograph shows a Quebec maple sugar plant of the old style, with the boiling process done in open.

MODERN METHODS NOW EMPLOYED

Some of the big maple bushes of Quebec are now equipped with an elaborate plant resulting in cleaner and better sugar and syrup. Note the covered pails at the trees. The sap is transported to the boiling down house seen in the right distance by pipe lines, which are fitted with funnels at intervals. Maple sugar today brings the farmers of Eastern Canada from eight to ten million dollars a year.

Tree Planting - A Form of Surgical Operation

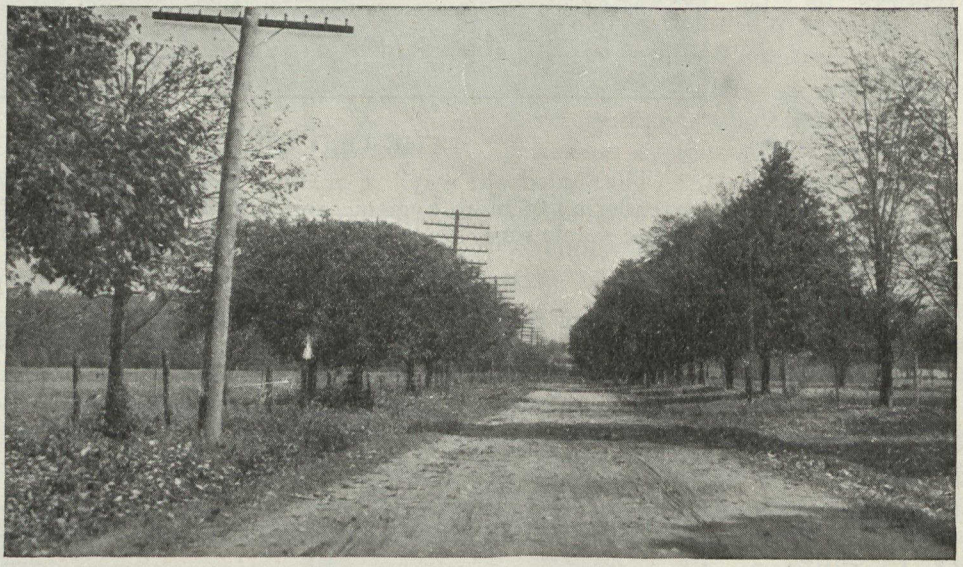
Seasonable advice concerning main points to be considered when setting out trees— Some "Dont's" to be observed in various stages of the work.

By B. R. Morton, B. Sc. F., Dominion Forestry Branch.

THE RETURN of Spring brings with it a renewed interest in Tree Planting and since, in the words of Dr. Fernow, late Dean of the Faculty of Forestry at Toronto."*Transplanting a tree from one site to another is a surgical operation, during which the patient needs special attention*", it may not be out of place to again call the attention of the readers of the Canadian Forestry Magazine to the main points to be considered when setting out trees.

Spring planting should begin as soon as possible after the ground is thawed out and dried sufficiently to work the soil. It should not be attempted after the winter buds begin to open. While the actual date will vary with the season and locality, it may be said in general that April and early May is the proper time.

In selecting a tree it is of great importance to secure a compact root system. The more small roots a tree has, the greater its chance of surviving the shock of transplanting and the more rapid will be its growth. While a large top may often be desirable, a tree with heavy branches and few roots will be slow to establish itself, if it survives the transplanting at all.



Tree-Planting Transforms Country Roads

Directions for "Top" Pruning.

No matter how carefully a tree has been dug up, many roots are certain to be broken off or injured and it is therefore nearly always necessary to remove a proportional number of branches since a tree which has lost many of its feeding roots cannot meet the demand made by the top for water. The larger the tree, the greater is the proportion of the root system lost and the more severe is the top pruning required. While it is not possible to lay down a very definite rule in regard to the amount of top which should be removed, since each tree is a problem in itself, still it may be said that young trees, of the size usually set out for shade purposes, need not have more than four fifths of their past season's growth removed, provided they have not lost too much root in being dug up. In pruning the top, the branches should be cut just above some strong winter bud and care should be taken to prune equally on all sides to retain the symmetry of the tree if possible. All cuts should be made sharp and clean. This cutting of the top is best done before the tree is planted as the condition of the root system is then fresh in mind. It is also important to trim off with a smooth cut all broken and badly injured roots.

Where one has a choice it is well to select such trees that have a well-developed single leader or main-stem. Where there are two or more leaders a crotched tree may develop, having all the weaknesses of that undesirable type. However, by careful pruning as the tree develops, the central stem can sometimes be encouraged to become the leader. The ideal street or lawn tree is one with a straight leader like a whip-stalk or fishing pole. Care should be taken not to cut off this leader when pruning as just described above. For planting adjoining walks where head room is required for pedestrians, a straight-stemmed tree from one to one-and-one half inches in diameter at breast height and clear of branches for at least seven feet from the ground will be found most suitable.

"Puddling" and "Heeling-In"

When trees are bought from a nursery they usually arrive in bales or boxes with their roots packed in wet moss and wrapped in burlap. Their stems are surrounded with straw and also wrapped and tied. They should be immediatelyunpacked "puddled" and "heeled in" until ready to be taken up for planting. "Puddling" consists of dipping the roots in a mixture of clay and water, about the consistency of ordinary paint. This forms a coating over the roots and aids in preventing them from drying out. The "heeling-in" consists in digging a trench sufficiently deep to contain the roots and then covering them in this, with a layer of moist earth.

In taking up trees which are to be transplanted as much earth as possible should be removed with the roots. This prevents the roots from drying out. Remove as much of the root system intact as is practicable. If the tree is to be removed to any distance it may be well to wrap the ball of earth in canvas and tie in such a manner as to prevent its being shaken off. At no stage in the taking up, transplanting or planting should the roots of the tree be allowed to become dry. This is important. Many trees are dead before they have been set in the ground because proper precautions have not been taken in this regard. The planting should be done as soon as possible after the tree is taken up.

Planting the Tree.

In making the hole in which the tree is to be set, care should be taken to have it considerably wider and deeper than is necessary to accommodate the roots. Before placing the tree the hole should be partly filled with good garden loam or the surface soil which has been removed and set aside when making the hole. Sufficient of this richer soil is filled in to bring the tree to the same level at which it stood before being taken up. Do not plant too deep. Roots need air. Allow the roots to spread naturally in the hole. Do not bend or crumple them up. If the ball of earth has been removed with the tree, plant earth and all. After placing the tree and spreading the roots naturally fill in the remaining space with good soil. Put in a little at a time and pack firmly before adding more. Be sure that the earth is well packed and in contact with the roots. Level off the surface and leave an inch or so of loose earth on top to act as a mulch.

In setting a tree, care should be taken from the very start to see that the stem is kept perfectly vertical. Any attempt made to straighten it after the planting is done is liable to injure the tree and loosen the soil. To insure the tree being set straight, it is well to have one person hold it, while another does the packing.

Support Young Tree.

After the earth has been filled in it is advisable to support the tree by means of a stake until it has developed new roots into the surrounding soil. A single stake is usually sufficient, where there is little danger from damage by children, vehicles or live stock. Otherwise a secure crate the full height of the trunk should be constructed about it. The single stake should be long and rigid enough to be driven two feet or more into the ground and still support the tree six or seven feet above the ground. The tree should be attached to the stake in several places by means of cloth strips or pieces of rope. Any chafing may be minimized by the use of a piece of old rubber hose through which the rope has been run and then bent around the tree trunk. Keep the tree well watered during the first season and after as often as may seem necessary.

Giant Cedar, Stanley Park, Vancouver, B. C.

A Successful Wooden Railroad

RAILROADS with wooden rails have come into use for logging and other purposes, as a substitute for steel railroads, but have not proved very practicable. The rails wear out rapidly, which is detrimental to the economy of the railroad, and besides these roads have not proved safe in working, owing to a strong tendency to derailment.

A wooden railroad not hampered with the above drawbacks can obviously compete in many cases with a steel railroad.

With the *Widegren Wood Railroad* now in use in Sweden, these drawbacks are eliminated to the greatest possible extent. The wear of the rails is, for wood of ordinary hardness, practically none, and the danger of derailment may be considered as entirely excluded.

A Swedish wooden railroad made possible by the invention of a peculiar car wheel, not flanged, which obviates wear and operates with remarkable safety. The wheels are rubber-tired. (See accompanying article.)

This distinct improvement in the wooden type of railroads has been attained by the introduction of an altogether new design of wheel. The wheels have no flanges, but are perfectly cylindrical and equipped with solid rubber tyres. To guide the wheels on the rails there has been introduced a special guiding-device. This device guides automatically in each direction without any tendency to fastening in the curves. The wheels can travel over the sharpest curves and can pass even angles in the track, practically without any increase in rolling resistance and without the slightest tendency to derailing. Both rails are slightly sawn or hewed on the top, and one of them also at the sides.

Apart from having the advantage of slight wear of rails and of great safety in working, the design of wheel in question involves some distinct advantages regarding the construction of the track. The gauge need not be adjusted exactly, but can vary considerably, thus making it possible to use crooked logs as rails. Bends in the track need not be curved, but the logs are laid at angles to each other so that the "curve," since it is formed by a suite of logs, will represent an open polygon. The construction of the track does not require any great accuracy or much skilled labor.

Further it may be stated with regard to the construction of the track, that we have built our roads without making a road-bed, the rails being laid on trestles standing on cross-ties. Owing to the rigidity of the wooden rails the trestles can be placed at rather great intervals, the ground being somewhat cleared only where the cross-ties are to be laid.

In regard to the rolling stock it may be mentioned that the locomotive has a 35 H. P. motor and weighs, including dead weight, 5 tons. A locomotive at 8 to 10 tons and 100 H.P. is now under construction. The motors of the locomotives have hitherto been gasolene-driven, but motors can of course, be used, running on other kinds of fuel-oil. For the tropics expecially, it may be of interest to know that locomotives can have motors driven with nonpurified palm-oil.

The locomotives, the wheels and guiding-device excepted, are designed somewhat similarly to ordinary heavy automobile trucks. To facilitate the transportation of the locomotives to the railroad over rough ground lacking transporting facilities, the locomotives are designed so that they can be taken apart in suitable units.

The cars weigh about 2 tons and load about 6 tons each. They are not provided with trucks but have 4 wheels only. Owing to the design of wheel and guiding-device they can be of any length and still pass curves without difficulty.

The cars, as far as logging is concerned at least, are made of timber available at the place where they are to be operated, only the wheels and axles being transported there.

Finally it may be mentioned that the operating speed of the railroad has reached 25 to 30 kilometres (about 15 to 18 miles) per hour, that steep grades can be operated and that turnouts and road crossings can easily be arranged.

Protection Methods in Canada's Forests

(*Continued from page 712*)

relies upon reports received from various volunteer sources, supplementing this with patrol of routes of travel, and, if the region is favourable with observations from commanding peaks, ridges, or even unusually tall trees. If he sights a smoke from a distance he can determine its location only by his knowledge of the country, aided by a map if he has one and knows how to use it. In most cases his determination is likely to be only a mere approximation and much time is lost in searching for the fire and making the exact location. This done, he must then undertake its suppression either alone or with such assistance, often inadequate, as he is able to summon to his aid. During the Suppression period, the protection of his district will most likely be left entirely to chance. The fatal weakness of this system is the slowness and uncertainty with which it operates. One of the most efficient fire-preventive organizations in the world has as its motto "Minutes Count" and nowhere in the course of a fire do they count more disastrously than in the first few hours. Practically all forest fires start as mere sparks. A neglected or half-extinguished camp-fire, a carelessly dropped match, the spark from a pipe or an engine, or some other similar insignificant source gives rise to the great bulk of disastrous fires. At the start and for some little time afterward, according to the weather, the season, and other local conditions, all such fires are easily within the power of one man to extinguish. But as they increase in size they increase even more rapidly in intensity. What was at first only a spark soon becomes a conflagration which only a very large crew of men can make headway against. The lesson, therefore, that every ranger has learned is that the way to prevent large fires is to extinguish them when they are small—an obvious lesson, the accomplishment of which task is the primary purpose of specialization in forest protection.

There are in general but two ways to ensure that all fires will be extinguished in their incipiency. The one is to put in an overwhelming force and depend upon weight of numbers and extremely small districts to ensure success. The possibilities of this system are soon reached, owing to the prohibitive expense. The other system is to adopt specialization, to use fewer but more highly trained men, to co-ordinate their activities by organization and discipline and to assist them with every form of mechanical appliance that will multiply their individual effectiveness. Among these appliances modern means of intercommunication are of basic importance, and in no respect is this more evident than in specialized means of Detection.

The function of Detection in a specialized staff is performed by units entirely distinct from the rest of the force. The nature of their duties is such that they can rarely perform any other duties even as a secondary function, and only in a very imperfect way can other units perform the function of Detection on a secondary basis. These units, charged specifically with the duty of detecting and locating fires, are known as "lookout men" and hundreds of them are employed in specialized forest protection forces in the United States. They are a most picturesque unit, performing a little-known but valuable service under most unusual and often trying conditions.

Placing Lookout Towers.

For the most part lookout stations are established on the tops of prominent mountain peaks; mount Hood in the Cascades, mount Fairview in the Rockies, even the active volcano, Lassen peak, in northern California, and scores of other mountains throughout the Western States are used for lookout purposes. Several have also been established in British Columbia by both the Dominion and provincial forest services. In the Eastern States, notably in New England, a very extensive development of the lookout system has taken place. Practically the entire timbered area of these states, and large parts of many others as far west as Minnesota, are watched by permanent lookout men throughout the fire season. The location and character of the lookout stations is determined by the nature of the topography. If suitable sharp-topped peaks are not available, towers must be erected. Lookout towers as high as 150 ft. have been built but ordinarily the standard steel towers which run from 30 to 80 ft. high are satisfactory.

Satisfactory lookout service in a specialized organization demands the continuous presence of the lookout man at his station throughout the daylight hours seven days in the week. This can be accomplished only by making the lookout station and dwelling-house one and the same. Accordingly a type of building has been especially designed for this work which is so arranged that no matter where the lookout may be while in the station he can always have a clear and unobstructed view of the entire area for which he is responsible. His duty, therefore, is easily defined. It is to remain at his station continuously throughout the day and maintain a constant watch over the area within his range of vision, noting all indications of fire, determining their location, and reporting immediately to the proper unit of the control force. For the purpose of aiding him to fulfil his function he is provided with certain mechanical devices. These

include tinted glasses to protect his eyes and aid him to distinguish faint smoke at long range, field-glasses with which to examine suspicious-looking smudges, a special form of lookout map correctly oriented, a fire locator (or alidade) for determining the bearing of a smoke, and finally a telephone or other means of communication by which he may report without delay. Rapid means of communication are fundamental to successful lookout service. For this purpose the forest telephone is universally preferred, but other means are sometimes used for reasons of expediency and are nearly always maintained in order to guard against temporary isolation of the station should the telephone line be broken.

Wherever a region is fully covered by lookout stations, the precise location of a fire within a distance of a fraction of a mile may be quickly secured by the simple process of intersecting from two or more stations. Where the fire is visible from only one station, other methods of location, slightly less exact, have been devised. Many difficulties in the establishment and maintenance of dwellings on the high peaks of the western mountains have been encountered and many ingenious devices resorted to in overcoming them which it is beyond the scope of this article to discuss. Also, it is impossible to discuss the human factor in lookout service which is in itself an element of much importance.

The Work of Suppression.

A fire having been discovered and reported by the lookout man, the third element of the specialized staff is brought into action. This is the unit whose main function is Suppression. The title "smoke chaser" applied to this unit adequately indicates the nature of the service. The "smoke chaser" corresponds to the fireman of a city fire brigade. His duty is to remain within call of his telephone bell or other communicating apparatus and upon being advised of the location of a fire to proceed to it by the shortest route in the least possible time and to extinguish it. Here again, minutes count and every possible measure is taken to see that none are lost. If he travels on foot, his pack is ready to be instantly shouldered. After careful study and experiment a "smoke chaser's" pack, containing all essentials for three days and the tools needed for fighting a fire, has been devised to weigh only 21 pounds. If he can use a horse, it stands ready saddled and bridled; if he travels by power boat, it floats at his dock fully equipped. His only duty is to leave instantly, get to the fire in the least possible time, and do everything in his power to put it under control.

Supervision of Forces.

The "smoke chaser," however, is only the first or skirmish line of defence. Back of him stands the whole organized control force, the entire man-power of the community where this system has been most highly developed. This brings up the fourth function, that of Supervision. For the successful operation of a specialized protective force it is essential that the function of Supervision be performed by a permanent staff. In order to provide year-long employment economically, this staff must necessarily be incorporated in the organization which is concerned with the woods operations. Private owners can incorporate it in their logging crews; governments in the scaling or inspection staff. This is a particularly easy problem in Canada where logging is confined almost exclusively to the winter season and fire-ranging almost wholly to the season when logging ceases.

Keeping in mind the military analogy already alluded to, it will be evident that the supervising staff is nothing more or less than a skeleton organization composed wholly of officers, which organization can be rounded into a complete defensive unit by calling upon a large body of assistants of various degrees of training, according to the necessities of the season. In a region where anything in the nature of permanent settlement is found, this training may, indeed, be carried to considerable lengths and the efficiency of the force greatly enhanced.

It will be realized, however, in studying the details of forest protection work that it divides rather distinctly into two general classes. There is on the one hand, the more strictly administrative duties which fall to the various supervising officers. These include the day-by-day supervision of the work of prevention and detection forces; the inspection of field conditions; study of fire conditions and labour supply; preparation and revision of mobilization schemes; the supply of provisions to field forces; direction of construction on improvement projects and various other activities not concerned with the actual process of fighting fires, but either preventive in character or in the nature of preparation for fighting fires that are anticipated.

On the other hand, there is the actual forest fire-fighting, mostly on a small scale in a smoothly running organization but sometimes on a very large scale and with crews of considerable size. This, too, will as a rule be under the direction of the same supervisory officer, although in some cases the actual executive work on the fire-line is placed in the hands of a fire-line foreman, while the supervisory officers devote their attention to co-ordinating the various auxiliary services and determining the general strategy of the fire control operations. Here is seen a distinct development of staff and line functions as will be hereinafter explained.

(*To be continued*)

Pack, Packing and Pack Saddles

(*Concluded from page 717*)

loads or special kinds of packing equipment. To be a thoroughly competent packer one must know at least one good single man Diamond and a good double or two-man Diamond. These will be the hitches used for the usual run of pack work.

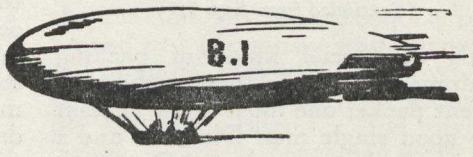
In addition one should be able to tie such hitches as are best adapted to packing on a riding saddle, on a bare horse and without a cinch hook. This will enable one to meet practically any packing emergency. Such other hitches as are particularly useful for special loads may be learned but will not be remembered unless used from time to time. The best guide for packers in print is 'Camp and Trail' by Stewart Edward White.

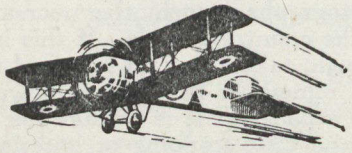
Looking after the Horse.

Finally there is to be considered the care of the pack horse himself. It is here that the real test of the packer's skill is met. To make up good well balanced packs, to place them properly, to tie one's hitches quickly and firmly are all necessary for good packing. But all these may be acquired without gaining the first knowledge of how to keep pack horses from getting sore backs and without this last knowledge a packer is useless for any long distance travel. Many factors enter into the care of pack horses and few can be acquired except by experience. For one thing, it is much easier to prevent sores than heal any that have formed. Therefore, avoid, if possible, all horses which have on their backs or behind the fore legs signs of previous back or cinch galls. A sore that may be weeks in healing can easily develop in a few hours. Therefore, it is well when starting out with new horses to unpack at noon during the first couple of days and, of course, to make only short runs. Watch all packs and under the cinches carefully and at the first sign of wear treat at once with Bickmores Gall Cure. Cinch galls can often be healed while continuing to use the horse by crossing the two cinches of a double cinch saddle. The comparative rest secured by transferring a riding saddle to a pack horse threatened with a sore back will often effect a cure. But at the basis of the whole question are good clean blankets, well fitted saddles, proper packing and eternal vigilance.

Finally there is the question of feed. Pack trains almost always depend simply on grass. No matter what its quality this is insufficient to keep a horse in good flesh if he is doing work throughout the day. On long hard trips it must be anticipated that some falling off in weight will occur therefore horses should be in the best possible condition on starting. In order to secure the maximum of feeding time, the entire day's journey should be completed without unpacking or even stopping for lunch. If a lunch is required it should be eaten in the saddle. In the morning do not tie horses up until ready to saddle and pack immediately. Don't loiter on the trail. Push through to the next camp and unpack without delay. In other words, arrange the day's routine so as to have the horses under packs the least possible length of time. The usual maximum day's travel in mountain country with fair trails, grass feed for stock and packs of 100 to 150 pounds is 15 miles. This should take from 5 to 6 hours giving ample time in the late afternoon for work about camp, piling, taking of photographs or such other recreations as the country affords. If this is not enough, take a day off now and then. But remember that the only way to rest a pack horse is to take his pack off and that stopping or loitering on the trail is simply inviting trouble on a long trip.

AERONAUTICAL SECTION





A department devoted particularly to the application of aerial methods in forest conservation and generally to the promotion of sane civil aviation in Canada.

Scouting for Fires and Fighting Them by Aeroplanes

Record of Twelve Days Operations in Crow's Nest Forest Reserve Furnishes Remarkable Figures on Regularity and Reliability of Aerial Patrols and Reports.

By Captain F. C. Higgins

THE effective manner in which aircraft may be employed in the detection and suppression of forest fires was very well illustrated in the late summer of 1921, when on August 25th, one of the biggest forest fires in recent years broke out in Alexander Creek Valley on the British Columbia side of the Rockies, and raged continuously for twelve days, eventually spreading eastward across the provincial boundary to Allison Creek in the Crow's Nest Forest Reserves of Alberta. The fire when it first started was outside the area patrolled by aeroplanes from the High River Air Station on the Alberta side of the Rockies, and was in consequence, not detected from the air until it had spread over a wide area and had assumed large proportions.

Subsequent to its detection, however, daily patrols were at once organized from the High River Air Station to cover the threatened area, and by bringing in daily reports of the progress of the fire, the extent of timber burned, and new areas likely to be threatened, these patrols enabled the Officials of the Forestry Branch, Department of Interior, to establish at once an efficient fire fighting organization, and to direct from day to day the work of the fire fighting crews at the most threatening points.

The excellent record maintained by these machines in rendering such valuable assistance during this period of twelve consecutive days of fire fighting is all the more gratifying since it is believed to constitute the first occasion in Canada when aircraft have been extensively employed in this manner as an integral part of a fire fighting organization engaged in combating a fire of such unusually large proportions, and raging continuously for so many days.

In reporting upon several tests conducted in the Crow's Nest Forest Reserve, when test fires were purposely set in inaccessible areas in order to test the ability of aircraft to quickly detect and accurately locate a fire, Mr. J. L. Van Camp, Liaison Officer of the Forestry Branch, Department of the Interior, makes the following comparison between the aerial method of observation and the usual ground methods:—

"The distance at which the smoke from this fire was first seen demonstrates the way in which fires are ordinarily visible to the aerial observer. A ranger, even in his own district, might have seen a fire this size and similarly located it, depending on the chance arrangement of intervening ridges, but he could scarcely have reached the location in as short a time unless it were right at hand. Having reached the fire, and found it beyond his control as might well happen, he is then under the disability of having to ride miles to the nearest telephone to secure help and direct men to come and assist him in fighting the fire. An immediate location and report by aeroplane saves hours in getting to the scene of the fire."

Regular and Reliable.

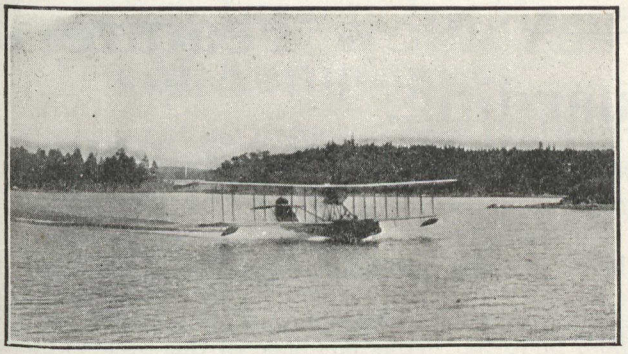
As evidence of the regularity and reliability which can be expected from aircraft in undertaking daily patrols over forest areas, the following interesting figures compiled from a "Report of Flying" for the month in question received from the High River Air Station, are given below. These figures cover a period during which daily patrols averaging over three hours duration and 300 miles distance were carried out over both the Bow River and Crow's Nest Forest Reserves. The total time in the air amounted to 168 hours, during which time a total distance of approximately 16,800 miles was covered.

Total number of daily patrols scheduled (two per day)	62
Number of patrols missed owing to mechanical trouble	2
Number of patrols missed owing to adverse weather	6

Total Resultant Efficiency.—

Number of patrols missed due to both weather and mechanical trouble	8
Efficiency percentage based on patrols possible to patrols missed due to all causes	87%

In practically all cases when weather conditions prevented flying they also made the fire risk in the forest negligible.



Manitoba Fire Patrol starting out from Victoria Beach, Lake Winnipeg.

Air Board Statistics

The Air Board, Ottawa, announces the following statistics for the period ending February 28, 1922.

Private Air Pilots' Certificates.

Lapsed—M. F. Peiler, Montreal; F. G. Pinder, Ottawa.

Renewed—H. S. Quigley, Toronto; R. A. Logan, Middle Musquodoboit; L. S. Breadner, Ottawa.

Commercial Air Pilots' Certificates.

Issued—G. F. Collinson, Winnipeg; K. F. Saunders, Victoria, B.C.; J. B. Home-Hay, Wadena, Sask.; C. C. Caldwell, Winnipeg; J. A. Ruggles, Bridgetown, N. S.; S. W. Holt, Medicine Hat, Alta.; T. W. L. Burke, Yorkton, Sask.; W. S. Lighthall, Westmount; C. H. Dickens, Edmonton; D. Carruthers, Kingston; H. J. Palmer, Vancouver.

Lapsed—N. R. Anderson, Hanover; A. Carter, Calgary; C. H. Fitzherbert, Vancouver; W. R. Maxwell, Hamilton; G. R. Howson, High River; H. R. Hillick, Geneva, N.Y.; P. M. Wallace, Yorkton, Sask.; S. S. Moore, Toronto; J. A. Mondor, Montreal; C. F. Bennett, Saskatoon; A. H. Sandwell, Invermere, B.C.; D. S. Macdonald, Wallaceburg; A. S. Highstone, Sault Ste. Marie; J. S. Scott, Quebec; D. A. Harding, Sarnia; H. A. Wilson, Westmount; F. M. Bradfield, Montreal; A. L. Cuffe, Winnipeg; O. A. C. Gibbons, Edmonton;

Renewed—R. A. Logan, Middle Musquodoboit, N.S.; G. E. Brookes, Winnipeg; H. S. Quigley, Toronto; A. Carter, Calgary; A. E. Godfrey, Vancouver; R. S. Grandy, Fort William; G. E. Brookes, Winnipeg.

Air Engineer's Certificates.

Issued—D. Ceifets, Toronto; A. D. Dowell, Winnipeg; W. G. Thompson, High River; G. E. Hervey, Calgary; G. R. Howsam, High River; J. A. Ruggles, Bridgetown, N.S.; W. S. Lighthall, Westmount; S. W. Holt, Medicine Hat; T. W. L. Burke, Yorkton, Sask.; R. F. Burnett, Montreal; F. H. Ryder, St. Stephen, N.B.; Joseph Laxdal, Winnipeg; A. E. Hutt, Oakville; F. D. Lapierre, Charlottetown, P.E.I.; D. Carruthers, Kingston.

Aircraft Registration.

Issued—Vancouver Island Aerial Transport Co., Victoria, B.C.

Fire Weather Forecasts—A New Feature in Timber Guarding.

By E. T. ALLEN, Forest Economist, Western Forestry and Conservation Association, Portland, Oregon.

IN 1913 the Western Forestry and Conservation Association began trying to systematize co-operation between Pacific Coast agencies in developing forecasts of weather conditions affecting forest fires. In two or three years the system had become very useful and promised high technical development. This promise has not been wholly kept, but those interested should know the reason why. It is not any flaw in the theory or lack of interest in those involved, but wholly economy in Government expenditure requisite to provide for the work.

The situation we sought to meet is not everywhere paralleled. Our Pacific coast forest protective systems are adequate in ordinary seasons, or reasonably so at least. But some years we have dry interior winds in the fire season which are hard for any system to cope with. They result from clearly-known phenomena—namely high-pressure areas in Western Canada co-incident with low-pressure areas over the Pacific Ocean, usually well southward. Air from which all moisture has been condensed in its passage from the sea eastward over the British Columbia mountains thus returns with great velocity down the Columbia River Valley, flowing usually south or southwest at first but spilling seaward over the Cascades as it advances. Local conditions affect this. But it usually affects our forest areas as a very dry and violent east or north wind. If between May 1st and October 1st it quickly becomes very dangerous, especially if following protracted dry or hot weather. Fires in hand break loose; smouldering unknown ones are fanned to serious proportions; all activities like clearing, logging or camping are full of hazard. The issuing of burning permits should be stopped and protection forces increased in size and alertness.

The plan then was to improve the reporting facilities in Western Canada where they were meager, have meteorologists make prompt forecasts, and distribute these quickly to forest agencies through our territory. To this end it was necessary to enlist the co-ordinated help of the Canadian and American meteorological officials, forest protective officials, and private protective organizations. Also, as you will see later, the post office authorities.

Much Money Involved.

Everything worked out as hoped; even better. We soon found the value of such service was not confined to cases of abnormal wind. In more ordinary fire weather it was extremely useful to have better reports on change and no change than the ordinary public service afforded. For example if a fire is under control after the employment of a large expensive force, the man in charge wants to know whether to discharge or hold its force, or a part of it. Many hundred dollars a day are involved. Numerous like situations will suggest themselves to any fire officer. It was also found possible to get much of this information to the public itself. Besides the telegraph and telephone service to forest officers, it was arranged to have a special mail service on special cards. An effective way of publishing this was by having these displayed in country post offices. The cards bore stock fire maxims, a blank being left for the forecast material, specially written to bear on the handling of fire at the time.

On the whole the service was accurate. Mistakes were made, but not enough to discredit the project as had been somewhat feared. Local pressure areas would sometimes upset the general forecasts as far as local nearby forests were concerned, but the likelihood of this became more or less known by the local forest officers. Over most of our territory the forecasts held good and were early enough to be used. We became quite ambitious as to refinements of the project, such as perfecting the report service, making amateur meteorologists of forest officers, research into evaporation and like atmospheric influences on fire conditions, etc.

But at the stage to which it was developed the project had never found firm footing in the Weather Bureau and its appropriations from Congress. The work has to be done by enthusiastic local weather officials in connection with their other duties. Nobody can be spared to devote his whole time to it. Changes in duties and assignments are interrupting, usually being made without reference to the fire work. Came the war, and further exactions of economy. The system has by no means been abandoned, but has remained somewhat crippled and stationary instead of progressing to the perfection it might have reached by this time and which its promise certainly warranted effort to attain. We expect, however, that it will eventually be one of the highly organized features of forest protection.

Fighting Insects by Means of Aeroplanes

An Account of the Successful Use of the Flying-Machine in Dusting Tall Trees Infested with Leaf-Eating Caterpillars.

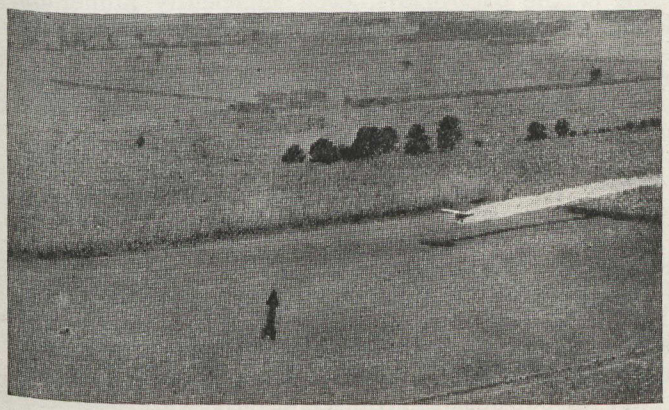
By C. R. NEILLIE AND J. R. HOUSER

Reproduced from National Geographic Magazine

IN THESE very modern times one should be prepared to expect the unusual, but to be told upon inquiry for a man at his office that "He is up in the air; I don't know when he will come down" is so ultra modern that the average person would be taken somewhat aback.

Such, however, was the experience of the writers one day last summer during the course of the work herewith reported. And after a short time, the one for whom inquiry was made did safely "come down." This was Lieutenant J. A. Macready, Acting Chief of the Flying Section of the Government's Aviation Experimental Station at McCook Field, Dayton, Ohio,—the man who piloted the machine which was an epoch maker in the annals of insect warfare.

Heretofore the usual method of controlling leaf-eating insects affecting tall trees has been by the use of liquid



LAYING DOWN A POISON POWDER BARRAGE AGAINST CATERPILLARS

Flying at the rate of 80 miles an hour, at an altitude of from 20 to 35 feet and on a line parallel with and 53 yards to the windward of a catalpa grove. A wind, varying from 8 to 11 miles an hour, was blowing in the direction indicated by the arrow. The grove lies directly ahead of the point of the arrow, and is surrounded on the two sides by fields of growing corn. This, as well as the following pictures of the machine in action, was taken from an accompanying plane.

poisons sprayed on the trees by means of engine-driven pumps, these outfits having reached their present development in the New England States in combating the gypsy and brown-tail moths and elm-leaf beetle.

However, the difficulties encountered in spraying very tall trees with liquids are legion, particularly when the trees are situated on ground so uneven that the spraying machine cannot be operated in their immediate vicinity. In such instances it is no uncommon thing to use several thousand feet of hose, and since this must be dragged about over the area under treatment, the labor cost of operating under such conditions is enormous.

Moreover, progress is so slow that it is not always possible to cover the infested area at the time when the application would be most effective from the standpoint of insect control. Dusting by aeroplane at least gives promise under some conditions of overcoming a few of these difficulties.

Early in the spring of 1921 the authors began seeking an opportunity to conduct a practical test of the aeroplane as a distributor of insecticides. In a few instances the plan was received with favor; in others it was considered a theoretical, impracticable and foolish undertaking and from many sources much good-natured chaffing was endured. Finally, however, a co-operative project was arranged with the officials of the Federal Aviation Experimental Station at McCook Field, Dayton, Ohio.

These officials entered into the spirit of the undertaking in a whole-hearted manner giving it priority over everything in the Field for one entire day. Those chiefly concerned were: Major T. H. Bane, Director of McCook Field; Major H. S. Martin, Chief Engineer and his assistant Mr. E. Darmoy, who designed the hopper to carry and distribute the poison and who operated the

mechanism during the flights; Lieutenant J. A. Macready, Acting Chief of the Flying Section, who piloted the plane, and Captain A. W. Stevens, photographer, who made a remarkable series of photographs of the dusting plane in action.

War on a Night-Flying Moth.

Originally it was planned to conduct the test in the spring of 1922 against the canker worm in the vicinity of Cleveland, Ohio, but almost simultaneously with the completion of plans for co-operative work with McCook Field, a much better opportunity for the test presented itself in the shape of an outbreak of the Catalpa Sphinx (*Ceratomia catalpae Bvd.*) at Troy, Ohio, some twenty miles distant from Dayton.

The Catalpa Sphinx is, in the adult stage, a large night-flying moth which lays its eggs in pearly white masses on the leaves of the catalpa tree. These eggs within a few days give issue to tiny larvæ which feed upon the foliage and upon reaching maturity are as much as three inches long. They then pass to the ground, burrow down about three inches and transform to the pupal stage.

From these pupæ emerge the adult moths, which proceed to lay their eggs for another brood of destructive caterpillars. Only about a month is required to pass through the stages from egg to moth.

Last year there occurred in Ohio three full broods or crops of the caterpillars, each sufficiently numerous to defoliate completely the grove in which they appeared. Some groves put on three full crops of foliage and each in its turn was wholly consumed by the ravenous worms.

Our work was directed against the second brood of caterpillars working on the second crop of foliage.

Poison Powder in a Dense Cloud.

The plane used was a Curtis J N 6 equipped with a hopper for carrying and liberating the poison powder. This hopper was secured to the fuselage of the plane by the side of the observer's seat. It consisted of an irregularly shaped flat metal box with a capacity for holding a little more than 100 pounds of dry arsenate of lead powder.

At the bottom was arranged a sliding gate, operated by a handle accessible to the observer in the plane. At the top of the hopper was a crank, connected by a sprocket chain to a revolving mechanism in the bottom, which when placed in motion dropped the poison powder through the previously opened sliding gate.

Immediately upon leaving the hopper the dust dropped into the "slip stream"—the violent air current set up by the revolving propeller—and was thrown into violent agitation in a dense white cloud which trailed out behind the moving plane as if the machine were on fire and belching large volumes of white smoke.

The catalpa grove in which the dusting was done was situated on level ground and had been planted for the growing of post and pole timber. It was a rectangular plot 800 feet long and 325 feet wide and contained approximately six acres. The trees, 4,815 in number, were from 25 to 30 feet tall.

The poison was applied between 3 and 4 o'clock on the afternoon of August 3, 1921, under almost ideal weather conditions. The atmosphere and sunlight were excellent for photographing and there was a steady wind varying from eight to eleven miles an hour. The direction of the wind is indicated by the arrows on the photographs.

Every Tree Sprinkled with Poison.

The plane flew at a speed of eighty miles an hour at an altitude of from 20 to 35 feet and in a line 53 yards to the windward and parallel to the grove. The dense cloud of

poison dust thrown out behind the moving plane was grasped by the wind and floated through and over the grove, covering the foliage in its passage.

We feared that the dust might all settle on the trees in the immediate foreground, but to our surprise we observed that little currents of air which we termed "booster currents" were rising in the grove and these had a tendency to toss the settling dust cloud upward, whereupon it would be grasped by the wind blowing parallel to the earth's surface and thus carried onward, even to and beyond the far side of the grove.

Not a tree could be found, and many were climbed and examined, whose leaves did not bear particles of the deadly poison, easily detected by the unaided eye.

In all, the dusting plane passed the grove six times and distributed about 175 pounds of the poison. Since each passage required but nine seconds, the total time consumed in the actual work of dusting was 54 seconds, thus establishing a world's record for speed in applying insecticides to forest areas.

With a dust-liberating apparatus of greater capacity it would be possible to decrease the number of passages by the grove and thus lower still more the time requirement, and with experience in manipulating the plane in the application of the insectide the amount of poison used could be reduced considerably.

Poison Wrought Havoc Among Caterpillars.

The outstanding feature of the application was the remarkable precision with which the poison could be placed at the point intended, thus dispelling the idea expressed by many before the test was made that the poison dust would be tossed willy-nilly by the air currents—wholly beyond control.

On the morning following the application of the dust some of the caterpillars were dead and many were ailing. Forty-six hours after the fog of dust had polluted their food, the evidences of the wholesale destruction of the insects were everywhere apparent.

Hanging on the branches and remnants of foliage, on fence posts and weeds; lying on the forest floor, and secreted beneath its refuge were literally millions of the insects. Not a step could be taken without crushing numbers of them, some of which already had begun to putrefy.

Large sheets had been spread beneath the trees to record the dead caterpillars as they fell, but here again the photographic record is inadequate, for the dying insects had a tendency to use what strength remained to crawl off the sheet to die in seclusion. Nevertheless, on five square feet of one of the sheets 100 dead insects were counted.

The effect on the insects had far exceeded our fondest expectations. We had confidently believed that the smaller caterpillars would be killed, but had scarcely dared to hope that we would be able to kill the large larvæ, since it is a well known fact that the full-grown caterpillars are difficult to poison.

A careful investigation revealed the astonishing fact that not over one per cent of the caterpillars remained alive on the trees, and the minute observations and notes by the experts who witnessed the text preclude the idea that the destruction of the insects could be attributed to any other agency than the poison.

Adapted to Fighting Cotton Pests.

When one considers the success which attended the test, conducted as it was with crude apparatus and without the aid of a guiding experience in the manipulation of the machine, it seems certain that the aeroplane will be used successfully in the future to control forest insects.

Whether it will be possible to employ this method for the treatment of cotton or other low growing crops, or even in large fruit orchards which permit the economical use of terrestrial machines, remains to be seen. In the treatment of tall trees in park and forest areas the tremendous saving in time and labor in which its use results would seem to indicate that the method is wholly practicable.

Canadian Air Force Activities

DURING 1921 the Government expended $2,135,697.86 in connection with the Canadian Air Board. This amount was made up as follows: Air Board appropriations, $1,790,715.44; from demobilization, $297,648.32; Civil Service bonus $42,037.01; Civil Service re-classification, $5,297.09. The Canadian Air Board officials and employees numbered 353, and their salaries during 1921 amounted to $426,356.12.

The total strength of the Canadian Air Force was 2,622 officers and men, and the total expenditure in connection with the force during 1921 was $958,551.55. During the year the total flying hours of both military and civil branches was 5,187 hours and 16 minutes, or approximately 424,000 miles.

The Air Board estimates are cut down from $1,625,000 last year to $1,000,000 in the estimates for the present year. Contingencies are reduced by $7,500, and Canadian Air Force and civil aviation by $617,500.

A VERY LARGE number of officers have completed a tour of duty at Camp Borden during the past several months. The complete list alphabetically arranged, of those who have completed the tour of duty in the period from January 24th, 1921 to March 1, 1922, is herewith presented:—

A. O. Adams, Bowmanville; E. A. Alton, Winnipeg; E. Anthony, Maitland, N.S.; H. R. Aikens, Montreal; A. M. Anderson, Toronto; N. R. Anderson, Toronto; H. A. Argles, Toronto; A. J. Ashton, Mt. Vernon, B.C.; M. E. Ashton, London; D. S. E. Atkinson, Toronto.

W. T. Bailey, St. Marys; J. R. Baisley, Winnipeg; F. X. E. Bastien, Montreal; A. G. Beattie, Toronto; E. J. Bell, Saskatoon; C. S. Bellany, Winnipeg; C. F. Bennett, A. H. Bill, Saskatoon; T. J. Birmingham, Toronto; G. Bolstad, Meyronne, Sask.; N. A. Bolton, Brompton; J. J. L. Boney, Vancouver; E. F. Boultbee, Montreal; W. H. Boyd, Renfrew; G. A. Boyer, Hartland, N.B.; C. H. Browne, Toronto; D. T. Brown, Yorkton, Sask.; H. E. Bryant, Winnipeg; V. M. Burns, Regina, Sask.; J. J. Buritt, Victoria; K. G. Boyd, Toronto; B. M. Boyer-Smith, Okanagan Mission, B. C.; L. R. Brereton, Winnipeg; L. Brown, Edmonton; O. Berry, Thornton Heath, England; J. P. Bernigaud, Montreal; C. S. Booth, Winnipeg; H. F. Balmen, Toronto; R. F. Burnett, Montreal; T. W. L. Burke, Yorkton, Sask.; W. T. Broome, Bedford, N.S.

Wm. L. Calvert, Toronto; W. C. Campain, Portage La Prairie; F. Campbell, Windsor; G. H. Campbell, Regina; G. H. S. Campbell, Verona, Ont.; E. H. Carlisle, Toronto; J. A. Carswell, Red Deer; A. Carter, Calgary; J. M. Catto, York Mills; R. D. Chalmers, Montreal; G. E. Champ, Regina; R. S. Chisholm, Denzil, Sask.; W. G. Claxton, Morley, Alta.; O. H. Clearwater, Saskatoon; J. H. Code, Pinkham, Sask.; S. McK. Connolly, Welland; C. M. Cook, North Vancouver; J. B. Cooper, Calgary; R. W. Corner, Kelowna, G. H. Corsan, Toronto; W. H. Corsan, Toronto; W. B. Crealock, Portage La Prairie; C. H. Crossley, King, Ont.; W. N. Cunningham, Montreal; R. V. Curtis, Toronto; G. C. Carr-Harriss, Toronto; A. J. de L. Chopin, Montreal; G. T. Collinson, Winnipeg; A. B. Corey, Port Williams, N. S.; J. G. P. Cleland, Montreal; A. K. Charlesworth, Harriston, Ont.; P. B. Calder, Edmonton South; J. M. Calnek, Moose Jaw.

W. E. Daley, Summerside, P.E.I.; W. C. Daniel, Toronto; T. G. Davidson, Halifax; G. M. Dean, Vancouver; H. E. Dempsey, Vancouver; E. B. Denison, Toronto; J. L. DesLaurier, Ottawa; E. DesLaurier, Ottawa; E. Dionne, Montreal; L. B. Dixon, Squamish, B.C.; T. St. C. Douglas, Moose Jaw; N. Duncan, Vancouver; W. J. A. Duncan, Vancouver; E. De L'Orme, Saskatoon; R. A. Delhaye, Regina; E. K. Davidson, Ottawa; C. L. Derick, Montreal; P. R. Dunn, Bayard, Sask.; F. W. Dogherty, Montreal.

H. L. Erb, Kitchener; G. S. Eby, Winnipeg.

C. F. Falkenberg, Quebec; P. J. A. Fleming, Crossfield, Alta.; R. D. Forbes, Hespeler; D. B. Foss, Sherbrooke; S. T. Franks, Regina; W. F. Forrest, North Battleford; L. J. Farley, Dundee, P.Q.; H. E. Foster, Toronto.

S. L. Garvin, Barrie; P. A. Gemmill, Sault Ste. Marie; W. C. T. Geraghty, Montreal; W. C. Gibbard, Richmond, Sask.; A. Gibson, Wiseton, Sask.; W. E. Gilbert, Cardinal; D. C. Girardot, Sandwich; A. N. Goodwin, Montreal; F. McE. Gorman, Vancouver; J. D. Grant, Westville, N.S.; R. McK. Grant, Toronto; A. G. Greene, Halifax; C. J. Greene, Ottawa; J. D. Guild, Kemnay, Man.; P. F. Gyles, Virden; D. M. B. Galbraith, Almonte (deceased); H. C. Graham, Elmvale; J. W. Grant, Bintley, Alta.; J. O. Groves, Fallis, Alta.; G. R. Gwynne-Timothy, Canning, N.S.; F. A. Green, Montreal; C. St. C. Guild, Musquodoboit Harbour, N.S.; J. J. Goldston, Regina.

A. R. Harris, Eastbourne, England; L. R. Haskill, Edmonton; W. Hay, Lockport, Man.; W. B. Henderson, Toronto; M. J. Hendrickson, Vancouver; T. Henderson, St. Catharines; E. Hill, Kitchener; L. M. Hill, Indian Head, Sask.; H. R. Hillick, Geneva, N.Y.; C. R. Hoare, St. Thomas; H. S. Holcombe, Havelock; W. G. Holder, Indian Head; J. C. Huggard, Winnipeg; H. N. Hyslop,; Smiths Falls; D. A. Harding, Sarnia A. St. J. Highstone, Soo; J. R. H. Hall, Sawridge, Alta.; C. Hancock, Regina; J. B. Home-Hay, Wadena, Sask.; J. R. Hopkins, Regina; E. O. Houghton, Ingersoll; H. H. Heal, Liverpool, N.S.; F. H. Helmuth, Toronto; S. W. Holst, Medicine Hat.

J. J. Ince, Vancouver; T. K. Irtuganoff, Toronto; R. T. Irvine, Toronto; H. J. Irvine, Sarnia.

S. A. Jefford, Vancouver; D. G. Joy, York Mills; E. G. Jones, Toronto; A. C. C. Johnston, Calgary; L. H. Jackson, Vancouver; W. E. James, Windsor; M. R. Jordan, Saskatoon.

C. F. Kearns, Vancouver; T. B. Kelly, Carillon, Que.; A. G. Kettles, Bruce Mines, Ont.; C. W. King, Woodstock; G. A. King, Oakville; C. W. Kirkpatrick, Victoria; F. R. Knight, Moose Jaw.

H. A. Laurie, Quebec; J. W. Lavoie, Montreal; M. L. Lawrence, Milton, Ont.; T. A. Lawrence, Cookstown; G. W. Laenby, Bell Court, Ont.; W. R. Leach, Oakville; M. Lewis, Montreal; W. S. Lighthall, Montreal; J. A. Longley, Vancouver; C. W. Loucke, Morrisburg; J. A. LeRoyer, Ottawa (deceased); G. A. A. Lemoine, Matane Que.; G. E. Lillico, Toronto; G. C. Loger, Peterboro; Joseph Lardal, Winnipeg.

W. R. Maxwell, Hamilton; W. R. May, Edmonton; J. A. Monder, Montreal; R. W. Moody, Vegreville, Alta.; P. D. Morency, Que.; G. M. Morrison, Amherst, N.S.; K.T. Munroe, Fort William; J. E. McArthur, Montmarte, Sask.; J. M. M. Maclennan, White Horse, Yukon; T. W. McClure, Hamilton; W. R. McCluskey, Vernon; S. H. McCrudden, Toronto; D. St. C. MacDonald, Wallaceburg; L. C. MacGlashan, Montreal; H. T. McKinnie, Revelstoke; A. D. McLean, Innisfall; T. M. McLellan, Springhill, N.S.; R. L. MacLeod, N. Vancouver; A. G. McLerie, Toronto; G. V. McNaughton, Sudbury; O. Matthews, Portage La Prairie; J. T. Menzies, Toronto; D. C. MacDonell, Vernon; W. McKay, Edmonton; P. R. Meredith, Toronto; L. S. Metford, Salmon Arm; D. B. Menzie, Burk's Falls; E. A. McKay, Donalda, Alta.; S. R. Mantle, Edmonton; J. M. Munroe, Benito, Man. A. H. McDonald, Vancouver; A. S. Maltby, Toronto; K. W. Mayhew, Windsor; P. J. Maloney, Dartmouth, N.S.; J. I. Morgan, Toronto; H. S. McClelland, Saskatoon.

G. A. Nagle, Winnipeg; B. A. Noble, Vancouver; O. J. Noonan, Christy's Lake, Ont.; R. E. Norman, Toronto.

D. A. O'Leary, Toronto; E. R. Owen, Ottawa.

W. F. Parke, Winnipeg; J. R. Pack, Victoria; P. J. R. Payne, Calgary, M. E. Patterson, Medicine Hat; E. F. Peacock, Montreal; C. R. Peters, Toronto; Geo. H. R. Phillips, Laural, Ont.; G. R. Pigeon, Toronto; G. R. Pinkard, Fort William; E. Pooley, Toronto; A. J. Potter, Mather, Man.; F. A. Pritchard, Surrey, Eng.; F. J. Prevost, Montreal; W. F. Purvis, Toronto; W. Partridge, Winnipeg; R. Pyper, Stettler, Alta.; J. A. Peterson, Regina; A. B. Porter, Bolduc, Man.

R. I. Quigg, Red Deer; A. S. Quick, Belleville; H. S. Quigley, Chicoutimi.

G. H. Ray, Vancouver; T. H. Reid, Pike Lake, Sask.; C. E. Revell, Calgary; H. P. Richard, Toronto; L. A. Richardson, Toronto; M. W. Richardson, Windsor; W. Riley, Sault Ste. Marie; R. A. Ritchie, Prince Rupert; F. Robb, Portage La Prairie; J. R. Robertson, Gravenhurst; I. C. Robinson, Moose Jaw; F. R. Ross, Edmonton; A. J. B. Roy, Vancouver; D. G. Russell, Brantford; S. L. Russell, Toronto; H. H. Reale, Cloverdale, B.C.; W. I. Riddell, Frobisher, Sask.; R. F. Redpath, Montreal; C. H. Reed, Central Butte, Sask.; H. S. Robinson, Winnipeg; R. W. Ryan, Regina; K. C. Rappell, Moose Jaw; M. M. S. Richardson, Winnipeg; S. Ross, Regina; F. H. Ryder, St. Stephen, N.B.; A. E. Roohouse, Ottawa; S. D. Robarts, Edmonton; F. G. Robins, Outremont.

P. M. Sangster, Brooks, Alta.; J. P. A. Savoie, Elvine, B.C.; W. B. Saunders, Tremont, N.S.; S. S. Scott, Farnham; J. G. Sharp, Toronto; J. A. Sherrett, Portage La Prairie; H. Shone, Toronto; A. C. Swedley, Farrquier, Que.; G. M. Smith, Deroche, B.C.; H. C. W. Smith, Kitchener; H. R. Smith, Medicine Hat; H. S. Smith, Winnipeg; H. W. Smith, Winnipeg; J. R. Smith, Ottawa; T. E. Snelgrove, Vancouver; G. V. Snell, Pakenham, Ont.; T. H. Spence, Regina; A. J. Snetsinger, Grimsby, F. J. Stevenson, Winnipeg; H. R. Stewart, Charlottetown; A. C. Stronge, Vancouver; G. P. Styles, Regina; J. H. St. Martin, Montreal; R. L. Scharff, Hartney; S. G. Smith, Toronto; G. M. Saunders, Toronto; K. M. Smith, Toronto; B. J. Svencheski, Vancouver; J. S. Sherren, Graspeand, P.E.I.; F. L. Southgate, Halifax; A. C. Symon, Craik, Sask.

J. Tate, Victoria; A. L. Taylor, Montreal; L. G. Taylor, Victoria; G. A. Thompson, Guelph; R. B. Thompson, Calgary; R. H. Thorne, Toronto; M. Thornton, Lachine; P. F. Townley, New Westminster; A. K. Tylee, Quincy, Mass.; K. Tailyour, Edmonton; H. L. Tamplin, Wolfeville, N.S.; J. H. Tudhope, Suenby, B. C;. W.F. Thorne, Hamilton; R. G. Trenholme, Coaticooke, P.Q.; A. Tapping, Revelstoke, B.C.; W. V. Tomlinson, Calgary.

G. H. Vasse, Vancouver; E. L. Vetter, Toronto; H. A. Vineberg, Montreal; R. I. Vander Byl, Victoria; Frank Vaillant, Ottawa.

N. W. Wade, Regina; T. Walker, Toronto; E. B. Waller, Toronto; F. R. Walpole, Montreal; W. G. Watson, Victoria; J. R. Wright, Regina; K. B. Wilkinson, Toronto; B. H. Windsor, Miscon Harbor, N. B.; H. O. Wyse, Moncton; H. Wensley, Birsay, Sask.

Congratulations!

From the President, American Forestry Association

Lakewood, N. J., U.S.A.,
February 20, 1922.

To Canadian Forestry Association:
I have just been looking over a copy of the "Illustrated Canadian Forestry Magazine" for January, 1922, and I have noticed, with real satisfaction, the many improvements that you have made, both in variety and form of treatment. Will you be so good as to accept my sincere congratulations.

CHARLES LATHROP PACK

HERE'S A HEARTY FRIEND.

Sandford Dene, Sask..
Feb. 27th, 1922.

Canadian Forestry Association: It is with great pleasure that I enclose five dollars as a contributing member; my chief regret is that I am unable to make it five thousand.

In connection with your educational work would it not be worth more publicity in the general press.

Yours for success,

CHARLES J. HERRIOT.

R. S. E. Walshe, Foam Lake, Sask.; J. L. M. White, Cape Breton; F. R. Winter, Westmount; C. D. Wright, Ottawa; F. H. Whiteman, Kitchener; D. S. Wylie, Calgary; H. R. Waugh, Charlottetown; P. Wickens, Brockville; S. J. Williams, Vancouver; F. J. Wolno, Hamilton: M. B. Walker, Hamilton,; F. J. Whigham, Selkirk, Man.

Trained at Dartmouth.

The undermentioned Officers have completed a Tour of Duty at the Halifax Manœuvres, Dartmouth, N.S.:—

Robert Leckie, Ottawa, Ont.; Ambrose Bernice Shearer, Morley, Alta.; Henry Cecil Fitzgerald, Halifax, N.S.; Joseph Leonard Marie White, Sydney Mines, Cape Breton, N.S.; Arthur Lester Allan Kane, Halifax, N.S.; Walter Robert Kenny, Ottawa, Ont.; Hugh Ronald Stewart, Charlottetown, P.E.I.; Edward Rosser Owen, Ottawa, Ont.; Leo Patrick Joseph Roy, St. Leonards, Madawaska Co., N.B.; Peter Joseph M. C. Maloney, Ennismore, Ontario.

Laurentide Air Service's Record

A DEVELOPMENT, of interest alike to Forestry and Aviation well-wishers is the formation of the Laurentide Air Service under the direction of Mr. W. R. Maxwell, former Chief Pilot for the Laurentide Company, Grand-Mère, Que. Mr. Maxwell has had a long and successful experience operating aircraft. Previous to his connection with the Laurentide Company he operated flying boats in Northern Ontario making several successful return trips to Hudson Bay. He has had considerable experience with aircraft operations applied to forestry which will be of great assistance to this Company in their new venture. With Mr. Maxwell is associated, as operating partner, Mr. H. D. Wilshire, who also possesses a long record as a successful commercial pilot. He is also operating Vice-President of the Canadian Aerial Services, Limited, Montreal. With the practical experience of these two men at the disposal of the Company, the successful operation of its equipment is assured.

Mr. Thomas Hall, of the Hall Engineering Company, Montreal Dry Docks, etc., who is a third partner, supplies the financial experience necessary to the successful operation of the Company. His business judgment and financial standing ensure its stability and permanency.

This Company, with headquarters and main air station at Lac La Tortue, Que., will specialize in the operation of aircraft on woods work, such as aerial photography, exploration, transportation, fire patrol, etc. The past record of the Company's personnel, a synopsis of which is included in this article, assures efficient operation, and the success or failure of the enterprise as a business venture depends entirely upon the support accorded it, by those forestry interests who will now have an opportunity of proving the practical value in woods operations of aircraft which are now generally recognized as a necessary adjunct to this work.

In connection with the announcement of Laurentide Air Service, which is in reality becoming the operating branch of Canadian Aerial Services, Ltd., Montreal, some facts concerning the major operations of Canadian Aerial Services, Limited, for the season 1921 are of more than passing interest.

The season opened March 27th. Six Curtis JN4's and one Avro 504K were operated. The officials of the Company are as follows:—

President, Thos. Hall; Vice-President, in charge of administration, R. B. J. Daville; Vice-President, in charge of operations, H. D. Wilshire; Managing Director and Secretary-Treasurer, A. E. Walford.

The operations carried on were advertising, aerial photography, exhibition flying, instruction, passenger joy rides and aerial transportation. The total number of hours flown were divided as follows:—

Cross country transport 90; advertising 40; photography 110; instruction 54; exhibitions 30; joy rides 66 total 390 hours.

There were 336 passengers carried, and the range of flights was: Ontario, as far west as Port Colborne and Niagara Falls; Quebec, north to Mount Laurier, east to Rivière du Loup; New Brunswick, Nova Scotia, Maine, New York and Vermont.

Among the outstanding trips were: —Montreal to Niagara Falls, Ont. This was an advertising trip and photographic advertising work was carried out for Brandram-Henderson, Limited of Montreal, and Tobacco Products Corporation, also of Montreal, over all towns and cities on the G. T. R, between Montreal and Toronto and over Toronto, Hamilton, Niagara Falls, Welland, St. Catharines and Port Colborne. The total mileage on this trip was 2,100 miles, without breakdown of any description. Later in September a machine left Montreal, flew to Chatham, N.B., from Chatham to Moncton, to Prince Edward Island, to Fredericton, to Edmundston, from Edmunston via Rivière du Loup up the St. Lawrence to Montreal—a total mileage of 3,700 miles without mechanical breakdown of any description. The return trip was made from New Brunswick in 5½ hours.

The one great difficulty on these trips was the selection of suitable landing fields. Quebec and the Maritime Provinces, it was found, lend themselves to seaplane or flying boat activities, to a much greater extent than to land or aeroplane activities, due to the large number of rivers and lakes scattered over their entire area. The country is settled and farmed along waterways, but in most sections the interior is all wooded. These farms along waterways are the only landing grounds for aircraft other than water machines.

The fact that the rather extensive operations above outlined were carried out without injury to personnel or serious damage to equipment is a tribute both to the efficiency of the Company's operating staff and to the practicability of aircraft as a safe and rapid means of transport over long distances.

Hedges to Improve Canadian Homes

(*Continued from page 727*)

come out very early, are of an attractive shade of green. As it makes practically all its growth early in the season one pruning each year is sufficient. This shrub-like tree will reach a height of eighteen feet if desired. The Siberian Pea Tree should be in full sunlight for best results, as if shaded the bottom will become too open. This plant has attractive yellow pea-shaped flowers when not pruned.

Common Buckthorn (*Rhamnus catharticus*)—The Common Buckthorn makes a good tall hedge though the foliage is not so attractive as the Siberian Pea Tree. It is, however, a firmer hedge than the Caragana and where one is desired that will stand rather adverse conditions this is a good one. It stands pruning well. It will grow to any height desired for a hedge.

Honey Locust (*Gleditschia triacanthos*)—Where a hedge is desired that will hold small animals to a great extent the Honey Locust is one of the most satisfactory. It is very thorny and the thorns are long and sharp. It requires more pruning, however, than either of the two previously mentioned hedges and is not hardy enough for the coldest sections, though it has done very well at Ottawa.

Josika Lilac (*Syringa Josikaea*)—Many persons like to have a lilac hedge, mainly as a matter of sentiment, for the common lilac is not a very satisfactory hedge plant, not being stiff enough nor having attractive enough foliage for a hedge which is to be looked at all the season. The foliage often becomes badly mildewed which makes it still less attractive and, when grown as a clipped hedge, there will be no flowers. The Josika Lilac, however, makes a much better hedge plant that the common. The leaves are deep green in colour and glossy, and the bush is firmer than the other. It is one of the most attractive tall hedges at Ottawa.

Tall Evergreen Hedges—The two most satisfactory tall ever green hedges are the Douglas Fir and Norway Spruce, although the White Pine (*Pinus Strobus*) has made an excellent hedge at Ottawa and is still in good condition though planted in 1890, over thirty years ago. The Arbor-vita, or White Cedar, might be included with the tall hedges, as it will grow as tall as required, but it has been put with those of medium height.

Douglas Fir (*Pseudotsuya taxifolia*)—This has proved to be the best tall evergreen hedge at Ottawa. Planted in 1894 this sample hedge is still in excellent condition, as is also another hedge of it planted before that time, and has living branches to the ground. The foliage is attractive and the hedge looks well.

Norway Spruce (*Picea excelsa*)—This is a very fast growing spruce, but is only fairly satisfactory as a hedge plant where one is looking for a hedge that will stay in good condition for a long time. For the first ten or fifteen years it may do well, but later on the lower branches are likely to die unless it is under very favourable conditions. It is such a strong grower also that it needs much

Hedges to Improve Canadian Homes

(*Concluded from page 747*)

pruning to keep it within bounds. This spruce should be in the open where it will get bright light to do its best. The native White Spruce (*Picea canadensis*) makes a beautiful hedge but is so often disfigured by the spruce gall worm that it is not recommended for general planting on this account.

Deciduous Hedges of Medium Height—A few satisfactory hedges of medium to tall-growing shrubs have been found among the many that have been tested. Two of the best are the Alder Buckthorn and Wayfaring Tree. The Shrubby or Woody Caragana (*Caragana frutescens*) makes an attractive looking hedge, but is rather soft and sometimes gets out of shape with the weight of snow. It also suckers to some extent. The Tamarack and European Larch have both made good hedges.

Alder Buckthorn (*Rhamnus Frangula*)—This is a more attractive looking hedge than the Common Buckthorn. The leaves are rather small, are glossy and of an attractive shade of green. It stands pruning well and will succeed in partial shade better than some others. While put among hedges of medium height, if allowed to grow, it will reach any height a hedge is likely to be needed, but can be kept down with little trouble. It is not thorny like the Common Buckthorn and on this account is not so desirable where anything is liable to run up against it much.

Wayfaring Tree (*Viburnum Lantana*).—The Wayfaring Tree, or shrub, as it really is, was planted as a hedge in 1890 and after thirty years is still in good condition. While the foliage is rather large to make the most attractive kind of hedge, it is of a lively green colour which offsets that to a large extent. It has done well under pruning and is still clothed with branches to the ground. While the hedge at Ottawa is in bright light, this shrub would probably succeed better in partial shade than some others.

Evergreen Hedges Medium to Low in Height—The best evergreen hedges of medium height are those made by the various forms of the American Arbor-vitæ, but the ordinary one found growing wild in many places in Eastern Canada is very satisfactory. The Japanese Yew (*Taxus cuspidata*) is promising and the Swiss Stone Pine (*Pinus Cembra*) is still a good hedge after twenty-six years' growth.

American Arbor-vitae (*Thuya occidentalis*).—This is the best evergreen hedge which can be readily kept at a medium height, or let grow tall as desired. It stands clipping well, will endure shade better than most plants, is only a moderately strong grower, lessening the amount of pruning which would otherwise be necessary, and can readily be kept looking well trimmed for most of the year. It is also very hardy. The hardiest variety of this would seem to be the Siberian Arbor-vitæ *Thuya occidentalis Wareana*), which, however, has a little coarser look than the ordinary form. Other varieties are dwarfer and they are very suitable where a low-growing evergreen hedge is desired. Among these may be mentioned the Globose Arbor-vitæ (*Thuya occidentalis globosa*) and Compact Arbor-vitæ (*Thuya occidentalis compacta*).

Low-growing Deciduous Hedges.—Three of the best low-growing hardy deciduous hedges are the Japanese Barberry (*Berberis Thunbergii*), the Dwarf Caragana (*Caragana pygmæa*) and the Alpine Currant (*Ribes alpinum*). The only privet that has proved at all suitable for hedge purposes at Ottawa is the Amur Privet (*Liaustrum amurense*), but from time to time even this kills to near the ground and the hedge becomes unsightly for a time, hence no privet is recommended for the colder parts of Ontario nor for Quebec.

Japanese Barberry (*Berberis Thunbergii*).—This is the most satisfactory and most popular low-growing hedge. It will reach a height of four feet if desired. It has the good hedge qualities of being of compact habit with small attractive foliage and sufficiently firm to keep its shape well. The leaves become highly coloured in autumn and after they fall the scarlet berries give this hedge a pleasing appearance until it is covered with snow. So far the disease which causes the rust of wheat has not been found on this species, so that it can be planted without fear of its doing harm. There is a dwarf form of this called Box Barberry, which should prove very useful where a very small hedge is desired.

Dwarf Caragana (*Caragana pygmæa*).—Dwarf caragana, because of its great hardiness and attractive flowers, is a desirable shrub, but on account of its small foliage and neat habit it makes a very good low hedge. The colour of the foliage, however, is rather dull, which detracts from it where a bright-looking hedge is desired.

Alpine Currant (*Ribes alpinum*).—The Alpine Currant has not been tested long at Ottawa as a hedge plant, but it has done well elsewhere and it promises to make a good low hedge here. The foliage is comparatively small and is of an attractive shade of green, and the habit of the bush is compact.

Classified Advertising

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WANTED—Qualified Forestry Engineer to act as assistant to Woods Superintendent of large Pulp Company. Applicants must give full business and personal history. Reply Box A, Canadian Illustrated Forestry Magazine, Jackson Building, Ottawa.

FIRST CLASS REPRESENTATIVES WANTED.—The Canadian Forestry Association is open to employ in all communities, except Ottawa, membership agents on a liberal commission basis. Applicants must have reference. Apply 224 Jackson Building, Ottawa.

ADVERTISING REPRESENTATIVES in Quebec, the Maritime Provinces and West of the Great Lakes for the Illustrated Canadian Forestry Magazine. Apply Publication Manager.

New Zealand's Progress

NEW Zealand Forest Service, Annual Report for Year ending March 31, 1921 by L. M. Ellis, is partly as follows:—Forestry agitation in New Zealand dates back to 1874, but with comparatively small actual progress until the recent establishment of the State Forest Service. There is now a definite forest policy, an administrative organization, and the dedication to technical management of forest and woodlands totalling 6,800,000 acres, or 10.3 per cent of the total area of the Dominion. A district organization has been made effective, and experts employed for the several lines of work. There are still at least 4,000,000 acres of undedicated Crown and Native forest land which should be added to the State Forests, in the interests of hydro-electric development, irrigation, municipal water-supply, regulation of stream-flow, and stabilization of the climatic balance on the lower fertile plains. Unregulated logging and forest fires have already caused enormous damage. The total forest revenue for the year was 45,162 pounds, of which 19,697 pounds is credited to State Forest Revenue, and 25,465 to Crown Land Timber Revenue. The State Forest expenditure was 79,551 pounds. Of this expenditure, 80 per cent was for afforestation. There are large areas of forest land under the control of interests other than those whose objective is conservation and rational use. During the past generation, 2,500,000 acres of virgin forest has been rendered a barren waste by fires; over 50,000 acres were burned over during the fiscal year. During the year, 2,877,954 trees were planted on 1,381 acres, bringing the total area reforested from 1896 to 1921 up to 38,462 acres. Over 456,000 seedling trees and 240 pounds of tree seeds were disposed of during the year to farmers and soldier settlers. A forest products laboratory is needed, to study the qualities of the native woods. Silvical research has been inaugurated, to form a basis for future forest management. The establishment of a school of forestry is strongly recommended. The New Zealand Forest Service has made an excellent start toward the adoption of a rational forest policy, and it is to be hoped and expected that its future progress will be both steady and consistent.—Clyde Leavitt.

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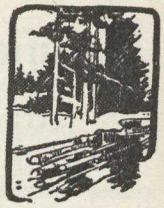

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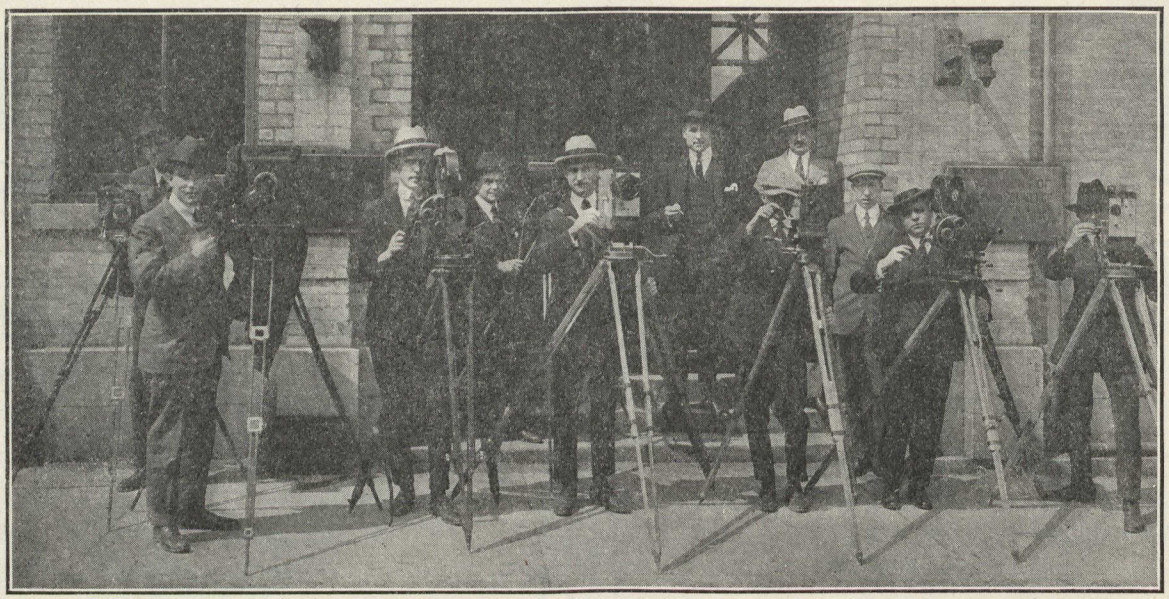

A Battery of Motion Picture Shap-Shooters. Staff of Exhibits and Publicity Bureau, Ottawa, Canada.

BY MEANS of the motion picture, the Dominion is spreading broadcast throughout the world the story of Canada and doing splendid and far-reaching work in developing a spirit of nationalism The now-famous **"Seeing Canada"** series of films which are produced in their entirety by the Exhibits and Publicity Bureau of the Department of Trade and Commerce, are enjoying a tremendous world-wide popularity in the best theatres in Canada and foreign countries. The distribution of the **"Seeing Canada"** series of government films has been so great that it has out-grown the laboratory equipment in Ottawa, and plans are now being made to take care of the ever-increasing circulation.

One of the most popular **"Seeing Canada"** releases and one which has been used with telling effect by the Canadian Forestry Association is **"The Enemy of the Forest."** This film shows in a most vivid manner the ravages of forest fires and how carelessness may play havoc with natural resources. Many copies of **"The Enemy of the Forest"** have been made and distributed, not only in Canada, but throughout the world. The cordial reception of the **"Seeing Canada"** films, especially in the United Kingdom and in France, Belgium, and Switzerland, has been most pronounced.

AS OTHERS SEE US

Fighting to Save the Forests

Editorial from: The Pulp and Paper Magazine, March 9th

UNDOUBTEDLY the most active agency in Canada in this matter of arousing public opinion to a definite and useful stand in the matter of forest management and forest protection, is the Canadian Forestry Association. This organization has for its sole object, the perpetuation of Canada's forest wealth, an enormous mass of capital which will perpetually pay regular and increasing dividends to the Canadian people if properly protected.

"The Association includes thousands of members who are lovers of the forest; this number naturally includes many who derive their livelihood from the cutting and manufacturing of timber into useful products. These realize that the passing of the forest means the losing of jobs. They realize that the great majority of Canada's timbered areas are unfit for agriculture and that as these areas become devastated through the carelessness of men and the ravages of nature, there is just that much less opportunity for work and development for the Canadian population. Those who work in the woods realize that human carelessness is by far the most destructive agency in the world, and it is the realization of this fact which has moved the association to direct its efforts chiefly to the education of the public towards the vast inheritance with which nature has endowed them and to educate them to the necessity and means for maintaining the forest in a productive condition.

"There is no organization in Canada working more constantly nor more effectively in the interests of public good than is the Canadian Forestry Association."

Protégeons nos Forêts

(*La Presse, Montreal*)

L'ASSOCIATION forestière du Canada, qui compte aujourd'hui plus de 13,000 membres, est la principale organisation indépendante qui mène avec activité des campagnes d'éducation, dans la province de Québec, en faveur de la protection des forêts. Cette organisation est, de l'avis des experts forestiers, l'une des divisions les plus importantes de l'œuvre de la protection des ressources forestières du pays contre ces incendies.

Il est donc juste et équitable qu'une telle organisation reçoive un subside du gouvernement de la province de Québec, et la demande d'une subvention annuelle de $5,000 faite actuellement par l'Association forestière du Canada mérite l'appui de nos législateurs et de tous ceux qui s'intéressent à la protection de nos forêts.

Favors a Grant

Editorial from the Montreal Gazette

THE Canadian Forestry Association, being independent of governments and commercial interests, is excellently equipped to carry on forest protection propaganda. It has used all of its methods to the maximum extent in Quebec province, reaching into scores of districts at a cost of thousands of dollars for field lecturers, motion pictures, the operation of its lecture cars and forest exhibits car and the general maintenance of its educational propaganda. To give a substantial grant to such an association would seem to be only a common-sense method of applying first-class insurance to the timber resources of Quebec."