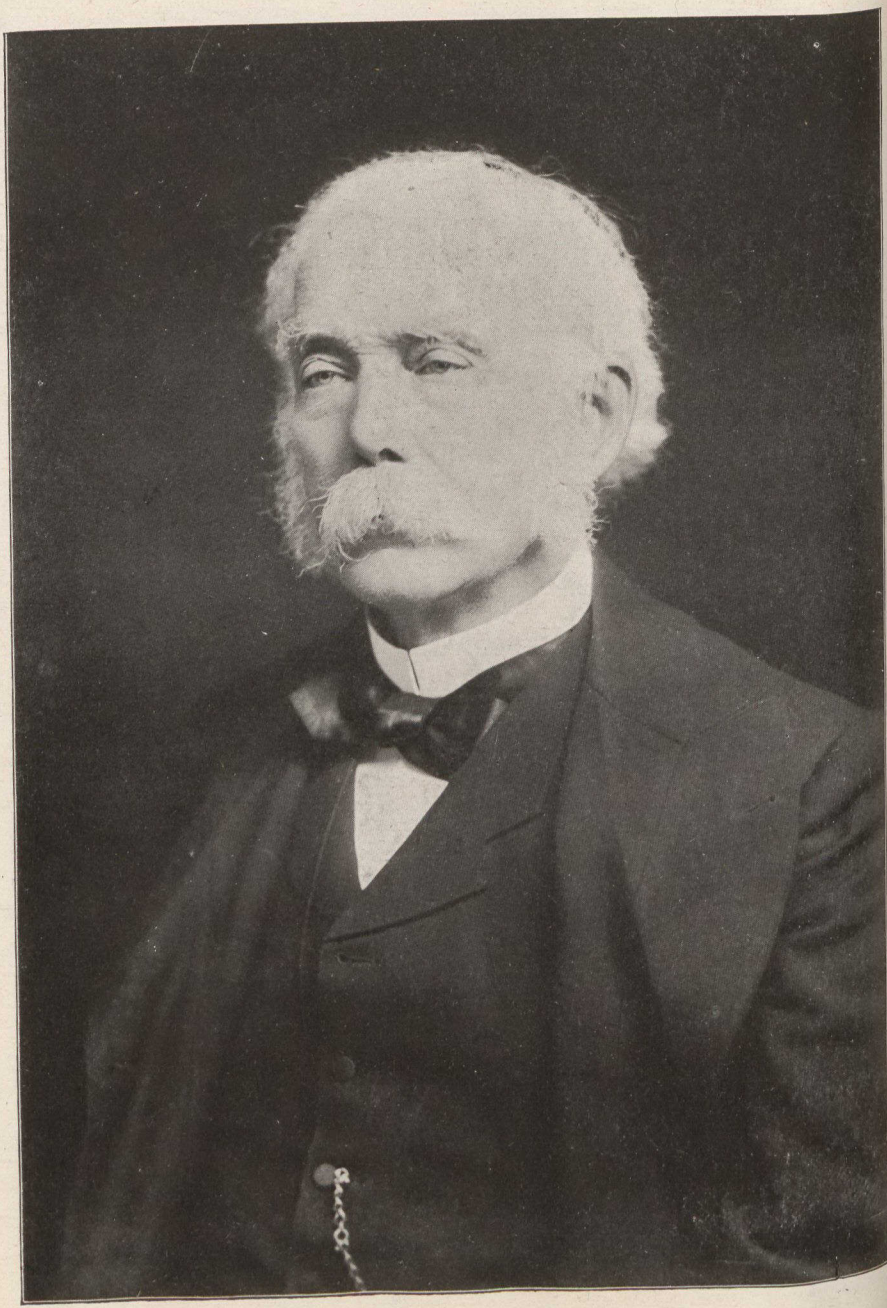


The late Sir Henri Joly de Lotbiniere, K.C.M.G.

Canadian Forestry Journal.

VOL. IV. DECEMBER, 1908. NO. 4

SIR HENRI JOLY DE LOTBINIERE.

Since the last issue of the JOURNAL, the Canadian Forestry Association has sustained a severe loss in the death of its first President, Sir Henri Joly de Lotbiniere.

For many years Sir Henri held a prominent position among the public men of the Dominion. Entering the Legislative Assembly of Canada several years prior to Confederation, as member for the County of Lotbiniere, he took an active part in the discussions leading to the union. For seven years subsequent to Confederation he represented his country in both the Dominion House of Commons and the Legislative Assemby of the Province of Quebec. Then, when dual representation was abolished, he chose to retain his seat in the Provincial Assembly, and from 1874 to 1878 led the Opposition in that chamber. In 1878 he became Premier of the province, but resigned that position in 1879, and for four years longer was head of the provincial Opposition. He retained his seat in the Assembly until 1885, when he resigned owing to his disapproval of the attitude of his party in regard to the Riel agitation.

Elected to the House of Commons in 1896 as member for Portneuf, he became Controller of Inland Revenue, and afterwards Minister of the same department. In 1900 he was appointed Lieutenant-Governor of British Columbia, an office which he held for the full term.

He was created a Knight Commander of the Order of St. Michael and St. George in 1895; and, in recognition of his services in accompanying Li Hung Chang in his tour of the Dominion in 1896, he was also appointed a member of the Imperial (Chinese) Order of the Double Dragon. He was an honorary D.C.L. of Bishop's College, Lennoxville, Que.. and an LL.D. of Queen's College, Kingston, Ont.

Among the pioneers of the forestry movement in Canada Sir Henri held a unique position. Long before the necessity for forest preservation and protection was generally recognized, Sir Henri labored in many ways to arouse the public to the

necessity for greater care of their forest wealth. His speeches and labors in the Quebec Legislature did much to advance the cause of forest protection in that province.

At the time of the meeting of the American Forest Congress in Montreal in August, 1882, Sir Henri was Vice-President, and gave an important address, in which he pointed out the rapid rate at which Canada's forests were being depleted, and from his personal experience in the management of the forests on his own large estate gave hints of measures which should be laid down for proper forest management.

During the decade of his retirement from public life in the later eighties and early nineties, Sir Henri gave much attention to the practice and propagation of forestry, and a few years later, when the Canadian Forestry Association was formed, became its first President and held that office for the first two years of the Association's existence.

Even more noteworthy than the part Sir Henri has taken in the propaganda work of forestry has been his practice of his principles on his own large estate. Twenty-six years ago, at the time of the 1882 Forest Congress, he was able to point to a "diameter limit" of twelve inches imposed in the cutting of spruce in his own forests. His work in planting up large tracts on his own estate—particularly in the case of his black walnut plantations—is well-known. In his method of enforcing on purchasers of timberlands on his seigniory of Lotbiniere (described in the paper read at the 1908 Annual Meeting of the Canadian Forestry Association by his son, Mr. E. G. Joly de Lotbiniere, himself a past President of the Association) is exhibited a fresh evidence of the far-seeing efforts made by him to prevent the denudation of the forest lands and to secure a permanent timber supply for the country.

The following brief account of his experiments in tree-planting is from the pen of Mr. E. G. Joly de Lotbiniere:—

"His experiments consisted chiefly in trying to grow in the East the most valuable products of the West, and in the West our best Eastern forest trees.

"At one time it was thought impossible to grow Western Black Walnut in the Province of Quebec, and particularly in the vicinity of the city of Quebec. My father took this experiment seriously in hand. He purchased nuts from seed dealers in Toronto, planted them at Platon late in the autumn and found that about sixty per cent. of these nuts gave seedlings next spring. The following year about twenty per cent. more made their appearance, and about twenty per cent. gave no result.

"This result was satisfactory and the young trees grew vigorously wherever they were situated in well protected sites. When these trees were about twelve years old they began to

give nuts. These nuts were planted, but very few gave any results the next spring. The trouble was that, when they fell from the trees, late in October, they were immature and in a milky condition and quite unfit to be planted in the damp soil, where they soon rotted. We soon discovered this fact, and found that, by gathering the nuts, drying them thoroughly and planting them late in November, we got nearly as good results as with the Western nuts.

"My father's experiments showed conclusively that black walnut could be successfully grown near Quebec and that, if properly treated, the Eastern nuts could reproduce equally as well as those imported from the West. The growth of the tree is exceedingly rapid, too rapid, almost, for our climate (I have measured growths of five feet) for the later growth of the season, being soft and immature, often freezes back to a considerable extent. The tree can be grown and with fair success near Quebec, but I would advise, as my father would have done, all tree growers in the East to grow the best indigenous trees of the province, and particularly White Pine, with which we have had great success.

"Sir Henri was most successful at Platon in growing Catalpa speciosa, though the winter always cuts back a certain portion of the too rapid growth.

"Deodar, the Himalaya pine, was not a success, but naturally Norway spruce flourished.

"So far for the East. At Victoria my father grew black walnut, butternut, maple (Acer saccharum), ash-leaved maple, beech and eucalyptus with wonderful success, the rate of growth being in excess of that in their natural habitat."

In this connection a rather striking coincidence may be noted. At the Forestry Convention at Ottawa in 1906, samples of eucalyptus wood, grown by Sir Henri at Victoria and by him sent to the Convention, were exhibited before the meeting by Dr. Fletcher, whose death preceded Sir Henri's by only a few days.

At a recent meeting of the Board of Directors of the Association the regret felt by the members of the Association at his loss and their sympathy with the bereaved relatives was embodied in the following resolution:—

Moved by H. M. Price, seconded by F. W. H. Jacombe, and resolved that

We, the Directors of the Canadian Forestry Association, have learned with the deepest regret of the death of our late honored colleague, Sir Henri Joly de Lotbiniere.

From the time of the inception of our Association Sir Henri has taken the deepest interest in its work. The two years of his Presidency were years of the greatest importance in the

history of the Association, and to his interest and enthusiasm was due much of the success of the Association in its earliest years.

Outside the immediate sphere of the Association's work, Sir Henri's interest in forestry questions was well-known and has undoubtedly contributed in a very large degree to the spread of the movement for the adoption of a more rational forestry policy by the Canadian Governments, both federal and provincial. His deep interest in these questions was well shown by his practical demonstrations in tree growing, both in the Provinces of Quebec and British Columbia, and by his work in promoting the protection of the public forest wealth from fire and its other enemies. For his work in these respects we feel that the thanks of the country are due him.

In other spheres his great public services have earned for him a permanent place among the greatest benefactors of his country.

To the bereaved relatives we would extend our deepest sympathy, and we trust the blessing of the Almighty may rest upon them and afford them solace in their severe affliction.

DR. JAMES FLETCHER.

In the death of Dr. Jas. Fletcher, Entomologist and Botanist of the Dominion Experimental Farms, the Canadian Forestry Association has lost one of its most eminent members.

Forestry had no warmer friend than Dr. Fletcher, though his many other interests prevented his taking a prominent part in the movement. He was a life member of the Association, and more than once his name appears in the reports of its meetings—in 1901 as the writer of a paper on "Forest Insects," and also as a speaker at the Convention of 1906.

His eminence as a botanist was attested by his being granted the title of Fellow of the Linnæan Society, an honor which he received in 1886. His work, in collaboration with Mr. G. H. Clark, Seed Commissioner, on the volume "Farm Weeds in Canada" has produced a book which is unique and of the highest value. For a number of years Dr. Fletcher was in charge of the Arboretum at the Central Experimental Farm.

His work as an entomologist is especially widely known, and he filled many offices in societies devoted to the study of this science.

In the work of the Royal Society of Canada he was very prominent. In 1885 he was elected a fellow of the Society, and in 1895 President of Section IV (Biological and Physical Sciences). He also filled for years the position of Honorary Treasurer, and for the past two years had held office as Honorary Secretary.

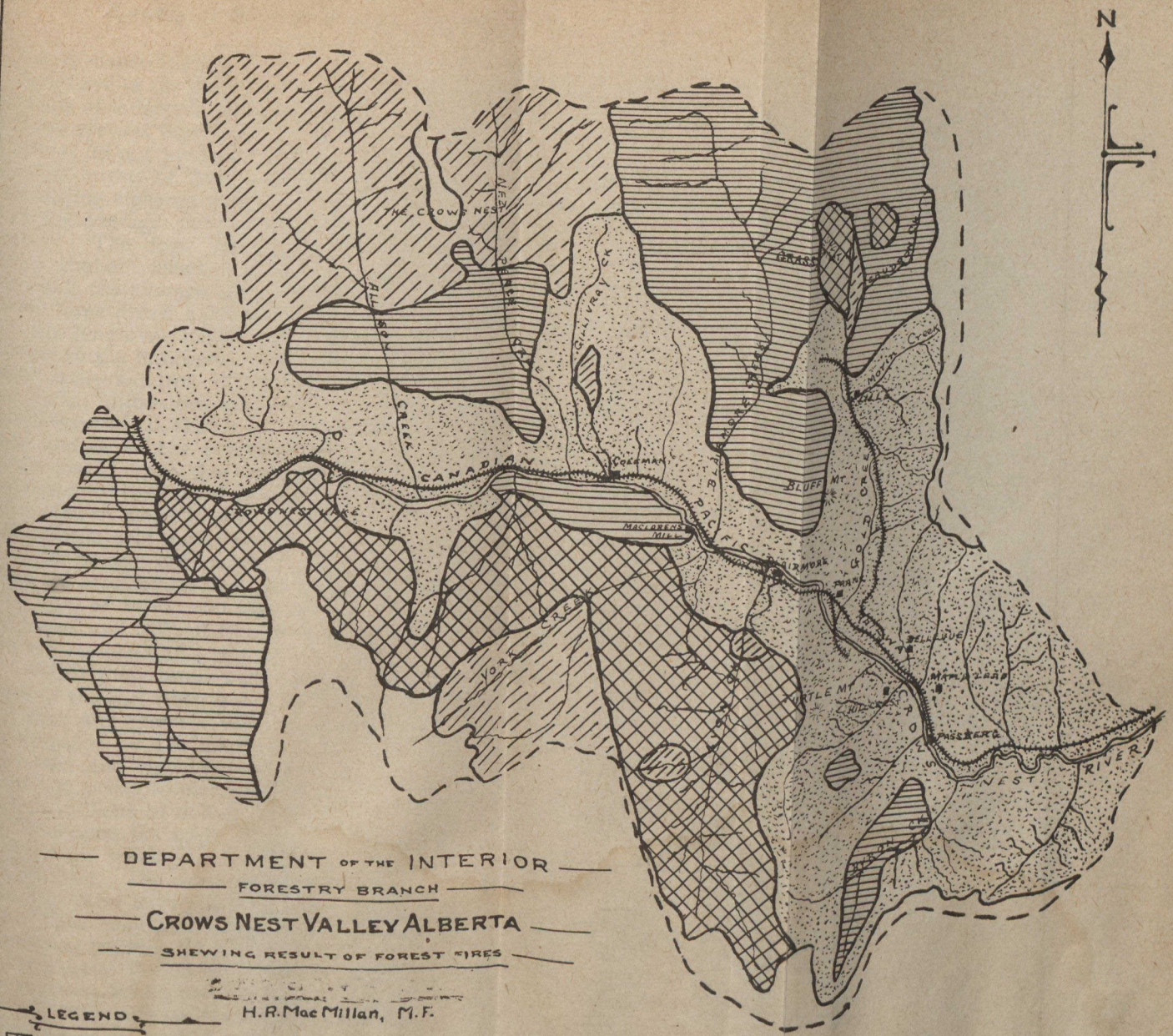
Few men possessed in as great a degree as Dr. Fletcher the power of arousing and holding the attention of an audience and in inspiring a lasting enthusiasm for the subjects he treated. He possessed to a degree the gift of personal magnetism; and, apart altogether from his reputation as a savant, his loss will be mourned by many as that of a personal friend. The entire membership of the Canadian Forestry Association will join the Directors of the Association in their resolution of sympathy and condolence with Mrs. Fletcher and the other bereaved relatives.

FORESTRY ON THE EASTERN SLOPE OF THE ROCKIES.

By H. R. MacMillan.

Various organizations at their annual meetings and in their official organs, have, especially during the past few years, called the attention of the Government to the destruction of the forests on the eastern slope of the Rocky Mountains, have pointed out the disastrous results which must follow and have put forth widely varying schemes of relief. Some of these have asked that the Government build storage reservoirs on the larger tributaries of the rivers and thus artificially hold back the flood waters. Others, understanding the waterholding powers of a timber cover, have declared that no logging operations should be permitted on the eastern slope of the Rockies. The practical intermediate suggestion has been that the interests of the lumberman, the miner, the rancher, and of the whole prairie population should be respected, and that the Government should, after a thorough study of local conditions, devise regulations governing fire protection, lumbering, and the opening of land for homesteading, such as would permit the full use of all resources, the cutting of the timber and the settling of the agricultural and ranch land, but which would prevent its devastation and subsequent waste. The first step toward such a policy was taken this summer when a detailed investigation was started, which will embrace a study of the dependence of the different commercial interests on the forests, minerals and water of the eastern slope, and which it is hoped will show how, by the co-operation of those interests and the Government, the resources, may, while being used, be best conserved for the benefit of the country. This investigation has not yet covered a large proportion of the country, nor are all the results available, but enough has been done to show the great value to all western citizens of a forest cover on the east slope of the Rocky Mountains and to give an idea of how the timber may be best protected.

The timberland of the eastern slope of the Rockies differs in character and situation from any other in Canada. From the International Boundary 140 miles north to the main line of the Canadian Pacific Railway the forest area consists of a strip fifteen to forty miles wide between the elevations of 3,500 and 6,500 feet. The whole of this mountainous belt is not under timber; a large proportion of it, that which comprises the very steep mountains, the summits of the ridges and the higher peaks, is, because of its very rocky nature or extreme altitude, incapable of producing commercial timber. The remainder of the area, the valleys of the main rivers and their tributaries, the



DEPARTMENT OF THE INTERIOR

FORESTRY BRANCH

CROWS NEST VALLEY ALBERTA

SHEWING RESULT OF FOREST FIRES

H.R. MacMillan, M.F.

LEGEND

- Unburnt Forest
- Timber burned still standing sound
- Everything destroyed dense stand of young trees coming on
- Forest destroyed by repeated fires now prairie
- Mountains above timber line

S.W. 27/11/19

gentler slopes leading to them and the lower ridges separating them have in the early days been completely covered with dense stands of lodgepole pine, Engelmann's spruce and Douglas fir. These species, especially east of the summit of the continental divide, do not produce as much lumber per acre as is common in the forests of British Columbia; the trees are small, rarely exceeding eighteen inches on the stump, and seldom producing on the average, more than three and a half 16-foot logs per tree. The logs run 16 to 24 to the thousand feet, and the timber usually grows in very dense stands. As a result the average cut per acre in the best Alberta timber, is, over large areas, 5,000 to 7,000 feet, and a high average yield is anything over 10,000 feet. The great value of the east slope forest to the lumberman lies in the fact that the timber is small and easily handled, that the formation of the country presents no great difficulties to render logging expensive, and, most important of all, that it is a short distance and down grade from the timber to the prairie market. Its natural situation has thus placed upon this pine and spruce a high value, which is attested by the fact that nearly every square mile of timber on the eastern slope of the Rockies, accessible or inaccessible, is at present held under license.

At present only a few of the limits are being worked. The sawmill capacity on the east slope is not large; the present cut per year of 31,651,000 feet has not yet cleared any large area of forest, and will not soon at its present rate of growth consume all the merchantable timber.

That these limits only represent a small proportion of the area of the east slope is due to the incalculable damage wrought by fire; and that the value of the limits is less than should be represented by the amount of timber involved is due to the constant and well founded fear amongst limit holders that a fire may occur to-morrow and reduce to ashes what is to-day worth millions of dollars. The extent of the damage inflicted by fires upon the trade of the country at large, as well as upon the private holdings of lumbermen on the east slope, can hardly be realized. The example of the valley of the Middle Fork of the Old Man River, known as the Alberta side of the Crow's Nest Pass, may be considered representative of the conditions governing between the main line of the Canadian Pacific and the International Boundary. The area of this valley between the Livingstone Range and the summit is approximately 204 square miles. The earliest reports of explorers and geologists state that the whole valley was timbered excepting that comparatively small proportion, not exceeding 20 square miles, which is above timber line. Undoubtedly, the general appearance of the country at present would bear out their reports. But so numerous and so disastrous have been the fires following in

the wake of travellers, settlers and railroads that at present of the original 184 square miles of forest only 39 square miles remain. Nor is this the worst of it. The timber which does escape the fire, is that at higher elevations, in the heads of valleys and draws where conditions are not so favorable to the production of heavy stands. The best timber grows in the lower valleys, on the wide exposed benches and terraces, and in the case of fire is always the first destroyed. Anyone with a little patience and a leaning towards statistics would have no difficulty in producing authentic and dazzling figures to show that the destruction in this one valley of the 145 square miles of forest with their 400,000,000 feet of timber has meant a direct loss of millions of dollars in trade and industries.

The damage inflicted upon Western Canada by the burning off of the present forest crop cannot be measured in terms of value of the timber alone. The first fire may destroy only the timber. After it a few trees which are left or seed which escaped the fire may suffice to start a new forest, or "second growth," which represents another crop from the land. There are 48 square miles of young timber of this nature coming up in the Crow's Nest Valley; indeed, a survey of the forest of the eastern slope would show a greater area of this young timber than of mature stuff. A second or third fire rarely fails to kill all the forest reproduction, to destroy the remaining seed trees, to burn off the upper layer of soil and leave a desolate waste which must for a long period remain unproductive and be absolutely lost to the country. There is such an area in the Crow's Nest Valley, which before the days of railway construction and travel was a heavy fir forest but which is now a poor gravelly prairie, unfit for agriculture, of very little value for grazing and which is in no way producing a crop. There are 68 square miles of this worthless land in the Crow's Nest Valley alone. Except a few small areas adapted to ranching it can only produce a revenue by growing timber.

Other interests and industries besides lumbering already feel keenly the results of these fires of five and fifteen years ago. The Crow's Nest Valley is the home of the Alberta coal fields. The Crow's Nest and Lethbridge mines, now in their first stage of development, already consume annually 3,000,000 feet of props, or the eighty years' growth on one and a half square miles of land. The present mines will, with the development of the country, greatly increase their output. On coal seams already discovered and known to be profitable, new mines will develop until within twenty years the valley of the Old Man River from Burmis to the summit will be one hustling mining camp. The demand for mining props and timbers will be enormous and it will be important for the cheap and economical production of coal that they be grown as close at hand as possible. To see

[Photo H. R. MacMillan

This timber was killed by fire five years ago. It is now the main source of supply for mining props in the Crow's Nest Valley. It took 80 years to produce this stand of timber and every day 3½ acres must be cut to supply the current demand for mining timbers alone.

that this is done, especially upon land belonging to the Government, is the function of the Government. The land in this valley, except for narrow strips along the rivers and creeks, is fit only for the growing of timber, and would naturally produce dense stands of the finest mining props were it not for constantly recurring fires. The slow growth of the timber and their absolute dependence upon the promise of large supplies of it have driven the mining companies to ask that the Government take some steps promising relief.

In the other valleys of the east slope where timber will not be required for mining purposes, it will always become more and more necessary for use on the prairies below. With the settlement of the plains there is a growing increase in the use of lumber which is being accompanied by a yearly decrease in the supply. While such is the condition, it needs no argument to prove that in the interests of everyone in the West the Government must do all in its power to protect the standing merchantable timber and the young reproduction from fire, and to encourage lumbering in such a manner as will insure that on all cut-over land a new crop of timber will speedily follow that just removed. This will be forestry.

One great reason for the conservative handling of the forest on the east slope of the Rocky Mountains is its undoubted influence on the run-off of the water from the ice, snow and rain of the region. There have been several bad floods in the North and South Saskatchewan Rivers and their tributaries which have resulted in great loss to lumbermen, through the breaking of booms; to municipal and provincial governments and to railway companies, through the destruction of roads, bridges and permanent improvements, and to farmers and to the residents of towns situated on the different streams, by reason of the destruction of bridges and buildings and the flooding of property. The lumbermen of Edmonton saw several million feet of their logs go down the North Saskatchewan toward Cedar Lake on the high water this spring; two provincial bridges were washed out on the St. Mary's River in June of this year; several residents of the town of Cardston who built too near Lee's Creek were forced to abandon their property when the snow water came down from the mountains.

With high water come great quantities of gravel and sand, which are deposited in bars and islands, forming impediments to navigation. A superfluity of water at one season may be taken as guarantee of its scarcity later. This in itself is often as great a hardship as the flood, particularly in the southern and middle prairies where water is required for irrigation purposes. The extent of the irrigation works already constructed and the certain great development of irrigation with increase in western population require that every possible provision be

taken to regulate the flow of the rivers so that the largest possible amount of water may be available in the driest seasons.

Western floods have been ascribed, and in part rightly so, to the denuding of the forests at the mountain headwaters of the streams. There is no doubt that the removal of the forest from the slopes draining to the tributaries of streams permits the drying and disintegration of the soil, and the rapid run-off of water after snow, rain or spring thaw. But those who say that lumbering should be prevented on that account are wrong. Fires, not logging, have removed the forest. Fires take everything; they burn the trees, the shrubs, the moss and, in many cases, the soil, so that there is absolutely nothing left to soak up the moisture and gradually give it out after the rain or snow has ceased. There is no equalizing of conditions, there is no ground cover to hold the moisture, so that periods of flood are followed by equally disastrous periods of drought. A fire, in addition to completely cleaning the ground where it travels, usually magnifies its disastrous effects by burning out a whole river valley in one season. On the other hand a logging operation, especially such a one as are those on the east slope, covers only a small area each year, while over the remainder of the valley the conditions are unchanged so that the influence it exerts on the stream flow is not so great. Moreover, on the area actually cut over many trees are left, the shrubs, the tops and debris prevent the sun from completely drying the soil, and the grass, moss and duff remain unharmed to act as a sponge retaining the moisture.

The worst floods in the Western Rivers have their origin in the rapid melting of the snow at high altitudes during an exceptionally hot season in the summer. Preserving a forest cover cannot altogether prevent these periods of high water, but undoubtedly the presence of timber and of the ground cover found only under timber, on all the steep slopes up to timber line and in all the gorges, modifies the run-off to a great extent, and at least distributes it over such a period as to prevent its reaching dangerous proportions.

It has been shown above that the resources of the eastern slope, as measured in timber, have been reduced at least 75% by fire; that the loss of this timber has not only deprived the region of much trade, decreasing the volume and jeopardizing the permanence of the lumber industry, but that timber has been destroyed which is even now needed for the development of the coal mines; that land is now unproductive, fit neither for agriculture, grazing nor mining, land which should yearly be producing a timber supply; that the property of private citizens, corporations and governments is being periodically damaged or destroyed by floods originating in this burned over area; that the navigability of the large inland rivers is becoming year by

year more difficult owing to extremes of high and low water and great shifting deposits of silt, and the supply of the two dearest possessions of the prairie farmer, wood and water, is becoming yearly more uncertain.

The cure for these disorders is forestry. The first and largest dose must be fire protection. The sources of fire in that country are (a) railroads; (b) campers (including prospectors, fishermen and hunters); (c) settlers clearing the land; (d) lightning. The railroads have received the larger share of the blame and have probably earned it. From survey and construction through every day of their history they carry fire through prairie and wooded country. The greater part of the Crow's Nest Valley was burned by fires set from the railroad before 1904; since then they have done no damage. The railroads are now governed by a very complete set of regulations issued by the Canadian Board of Railway Commissioners. Railroad fire protection will consist of holding the companies to the letter and spirit of these regulations and patrolling the line through the timber during the danger season.

Fires accidentally started by campers throughout the mountain valleys will be the most difficult to detect. To prevent these there must be a patrol of the most travelled trails, especially where these lead through timber or to game and fish country or other regions of popular resort. The difficulty of such a patrol lies in the fact, that without a close supervision, which is at present impossible, the rangers cannot be kept where they are most needed, or cannot be depended upon to act to the best of their ability.

Mr. Margach, Chief Forest Ranger at Calgary, has worked out a scheme which should prove satisfactory. His idea is to utilize the continuous system of trails running north and south in the mountains, across or along which all travel must proceed. Mounted rangers will be stationed on certain beats, radiating from central camps; they will cover their territory every day, meeting at each boundary their neighbors, and carrying from one to the other a signed trip sheet which will be regularly sent to headquarters at the end of the chain as a proof that the patrol has been constant. As the work goes on the rangers will be able to improve their trails, and in cases alter their route so that it will be over the points giving them the best view of the surrounding country. In a mountainous country such as this the great essential is to be able to see over the timber and catch the first sign of smoke, not to be in the timber where a fire any distance away cannot be detected until it is beyond control. This patrol, constantly getting a better idea of the country over which it is travelling, keeping a close eye on travellers and systematically securing the co-operation of residents and

settlers, will be the best thing in fire insurance that has yet appeared in Western Canada.

After fire protection forestry will consist in securing the best possible use of the land and timber. Before homestead entries are granted for land in the mountain watershed it should first be determined by careful examination by competent authority that such land is not being homesteaded for its timber and that the land is capable of producing crops or supporting stock. The high prices of produce and feed in the mountains (hay $15 to $20 per ton, green feed $9 to $10 per ton, potatoes 90c. per bushel), will always make it necessary to utilize land of an inferior quality, but will never make possible the utilization of anything but the stream bottoms and best benches in any other way than for the growing of timber.

The spirit of a policy which would protect young timber from fire would require that mature timber be cut when needed. The only qualification would be that it be cut under such regulations as would provide for another crop of the most valuable species in the region on the same ground. A detailed study of the growth-habits of the timber is necessary before any judicious regulations can be devised. Lumbering methods commonly practised must also be taken into consideration; whatever schemes are put forward to provide for the conservative lumbering of the forest must be practical and must impose no hardships on the lumbermen.

Having provided for fire protection and the conservative handling of the timberland, forestry can yet extend its usefulness by encouraging a closer utilization of timber. On most operations a comparatively small proportion of the wood-content of the limit reaches the lumber pile. Beginning with high stumps and long tops, wood is wasted all the way from the skidway to the mill yards.

The greatest service that can be rendered by forestry in the way of closer utilization on the Eastern slope will be in proving that the large quantities of perfectly sound fire-killed pine and spruce can be, by preservative treatment, rendered more valuable, more durable than the green timber now used for ties and posts. Where this timber cannot be used for mining props it is going to waste in spite of the fact that experiments with the same quality and species of timber in the United States have proven that it exceeds the green timber in strength, that treated with chemical preservatives its life of service is at least four times that of green timber, and that it is therefore better adapted to every use.

MAP
showing
YELLOWHEAD PASS ROUTE
from

FROM EDMONTON TO THE YELLOWHEAD PASS.

By A. E. Rau.

During a period covering the fall months of the present year I was engaged in looking up forest resources of the great basins at the head of the McCleod and Athabaska Rivers with a view to ascertaining the amount of available merchantable timber in these basins, and on the eastern slope of the Rocky Mountains.

Owing to the fact that there are no roads of any kind through this country the trip had to be made entirely with pack ponies on the available pack trails. These pack trails generally lie on high ridges and benches and allow of a very extensive view over the surrounding country.

The country from Edmonton for a distance of sixty to seventy miles west (to the Pembina River) is rolling and sandy. Between rolling sand hills there are low-lying muskegs and swamps. The country is only partially wooded, the tree-growth consisting of poplar and cottonwood, interspersed in the low-lying areas with groupings of spruce and in some cases tamarack. The forests grow denser as one proceeds west, and the high banks of the Pembina River are fairly well wooded with pine and poplar groves and in some places with an excellent growth of spruce.

The character of the country does not change materially as one goes west from the Pembina. There are perhaps more marshes and a larger extent of the country is covered with muskegs. There is certainly more spruce, and considerably more tamarack is found throughout the low-lying areas. There are two or three small areas thickly wooded with merchantable timber. One of these areas lies directly south of Lobstick Lake, consisting mostly of spruce. Another area, containing considerably more timber, lies just west of the Government cache. There is another area containing considerable excellent spruce on what is known as January Creek, which is one of the tributaries of Lobstick Creek. As a rule the river valleys are open and grassy.

Between Lobstick Creek and the McCleod River the country is very wet and marshy, containing practically no timber except on the sand ridges, which are covered with a young growth of pine. West of the McCleod there is very little timber of available size except along the southern banks of the river and along the southern bank of Sun Dance Creek. The rest of the country is covered by large muskegs on the north, and the ridge between the muskegs and the river is covered with a light growth of poplar and pine. To the south of the river,

behind the fringe of timber lying directly in the basin, the country is entirely burnt. Proceeding south along the McCleod to its headwaters, one finds that, except where the fires have traveled into the basin proper, the low valley of the river contains excellent spruce timber, mostly Engelmann's. As one penetrates farther south and comes nearer the head waters, more and more pine is met with, until, at a point lying about where the thirteenth base line crosses the river, there would be, by actual count, sixty pine to forty spruce. The benches back of the river-bed on both sides of the stream have been burnt clear of all timber and present a very desolate appearance. The burnt area recedes from the river, however, on the east side until near the base line the timber covers a stretch of country three miles wide. The thirteenth base line marks the end of the available timber. South of this there is a good growth of spruce and a great deal of pine, but the trees are too small to be of any use at present.

The estimates which I have prepared cover a distance of thirty-five miles on the river from the point where it turns east. These estimates are conservative and give as a total for the thirty-five miles of river slightly less than a hundred million feet of available timber.

Proceeding along the trail from the McCleod to the Athabaska there is only a small area of timber lying north-west of the point known as the Leavings. The balance of the country has all been burnt.

There is a small area of good timber along what is known as Brulé Lake on the Athabaska, and another at the height of land between the head of Prairie Creek and the foot of Jasper Lake.

Up to the head of Prairie Creek the country is, generally speaking, gently rolling in character, but at this point the first high rugged mountain appears.

There is probably no more picturesque spot to be found in the Canadian North-west than the basin in which Jasper Lake lies, surrounded on all sides by high rugged mountains precipitously steep towards the summit. The basin itself is lined with a thin fringe of trees which extend only part of the way up into the draws between the mountains. At the foot of the first high peak, that of Roche Miette, there is a good plantation of young Douglas fir, and this most valuable wood is found in scattered clumps throughout the valley and well up towards the summit of the Rocky Mountains. All the slopes have been burnt over and the timber found is quite young. The valleys of the Miette River, the Whirlpool River, the Maligne River and the head waters of the Athabaska itself are all fringed with timber, but the timber is too young to be

available. Large areas like that at the foot of the Henry House Mountain have been burnt over so frequently that they are now of a prairie character.

My impression is that the entire country covered in this exploration from the crossing of the McCleod River west was at one time rich in Douglas fir, but owing to repeated fires the fir has entirely disappeared except for the four hundred thousand feet which are found in the Athabaska Valley. There is no question that the eastern slope of the Rocky Mountains will never be available for anything but forestry purposes. There is no agricultural land and very little grazing land. But there is only one possible way of making the country valuable for forestry purposes, and that is to check, by some system to be determined, the sweep of the fires that have denuded this country, and, by giving protection to the young trees to build up in time a valuable industry. It sounds rather derogatory to the present forestry system, and is certainly not in keeping with the general reports circulated throughout the country, to state that not ten per cent. of the so-called forested areas on the eastern slope are in timber to-day. My belief is that this figure may be put at four per cent. and then be excessive.

The best idea of the amount of timber available through this north-western country can be gained by a glance at the map prepared by the Interior Department showing the berths which have been granted. These berths cover all the available timber and considerable country, besides, which is to-day not covered by merchantable timber.

As far as systems for patrolling this district are concerned, they may be dismissed in a few words. There are none. The question, therefore, is how best to cover this country with a system of patrols that will be adequate to protect the young timber. The country is so huge and the money available for this service so ridiculously small in comparison with the area to be covered that an adequate system seems almost impossible to devise. The system I suggest, if it could be carried into effect, would be purely one of prevention.

Fires in the western country are not set by the travelling bands of Indians and of half-breeds. They are due almost entirely to the white man. One of the greatest offenders in this respect is the Government land surveyor, who, although he does not directly set the fires, cuts lines east and west and north and south through the bush, felling the trees in such a way that the tops will not interfere with his sights, and thus preparing a first class fire trap for the next passerby to kindle. This practice should be stopped, and, while it will be necessary, of course, to cut lines through the bush, it is still more necessary that the debris be disposed of.

Besides the above precautionary measure a system of patrols should be installed under a centrally situated head. Men should be given a range of, say, not more than a day's travel between stipulated points and their beat should be laid out along the higher ridges in such a way that they can watch an extended strip of country. For example, a force of twenty men under a central head at the Leavings could adequately patrol the country included between the thirteenth and fourteenth base lines from Edmonton to the summit of the mountains. Young and active men should be picked for this service and their beats changed often enough to make their work interesting. As the fires in this country travel slowly in the heavy timber, owing to the thick growth of wet moss, it would be a comparatively easy matter to check them as soon as they are noted. The men should be supplied with ponies and a good camp outfit and with suitable houses on their beats. If the men were required to report regularly to headquarters in regard to everything that occurred in their territory, a thorough knowledge of the country could thus be gained, and I believe that a check could be put to the tremendous destruction of public property now going on.

The present method of patrolling consists of putting out a few men during the summer months. The country is not patrolled in the spring and fall, the dangerous months of the year. From June 1st until well on in September there are heavy rains as far west as the Athabaska Valley, and the dangers from fire are small. I would suggest that, if a system of patrol is to be put into this country, the men should be employed for all the year. They can study the conditions of growth, etc., when not employed on their beats and during the winter months can be kept busy to advantage cutting trails and building shacks.

With further and thorough explorations it will not be long before the myth of the great forest resources of the eastern slope is dispelled; and, as soon as the people of Canada open their eyes to the present condition of affairs, the forestry department will assume its proper position in the administration of the remaining fraction of the public wealth. It is, therefore, important that this country be covered by explorations and that the result of these explorations be presented to the people in such a manner that they will be able to grasp the fact of the importance of such a proper administration.

The trees observed during the trip were as follows:—

Poplar and cottonwood throughout the territory; birch near Fiddle Creek on the Athabaska and in occasional clumps through the mountains; black, white and Englemann's spruce throughout the entire territory; tamarack as far west as the head of the McCleod River; black pine from east of the Pembina to the mountains in increasing quantities; Douglas fir from Jasper Lake south and west.

HEIGHT MEASURING INSTRUMENTS.

By A. H. D. Ross, M.A., M.F., Faculty of Forestry, University of Toronto.

Between thirty and forty different kinds of hypsometers, or height measuring instruments, have been devised for the purpose of finding the heights of standing trees. The principle underlying the construction of most of them is known as that of "similar triangles"—one scale of the instrument representing the distance of the observer from the tree and the other representing its vertical height. In other words, the two scales represent in miniature two sides of the triangle outlined by the tree itself and the lines drawn from its top and bottom to the eye of the observer. With such instruments as those devised by Klaussner, Weise, Winkler, Faustmann, Tieman, etc., one of the graduated scales is set to correspond with the distance of the observer from the tree, and the other enables him to take a direct reading of its height. For this reason they are known as "direct reading" instruments.

Christen, Stotzer, Reuprecht, Sanlaville, Heyer, Lorey, Fricke, Hossfeld, Wimmenaur, Truembach, Friedrich, Havlick and Peltzmann have also invented height measuring instruments based upon the geometric principle of similar triangles. A full discussion of each of them may be found in Professor Udo Mueller's *Lehrbuch der Holzmesskunde*, pp. 117-148. Other hypsometers, as those devised by Brandis, Goulier, Abney, Pressler, Matthe, Bose, Mayer, Bohn, Pfister, Brehmann, Guttenberg, Starke, etc., (see Mueller's Holzmesskunde, pp. 149-189) are based upon trigonometric ratios, and for this reason are not so well adapted for rapid work.

In using a hypsometer of any kind, the observer should select a station where both the top and the base of the tree may be seen distinctly, and at a distance approximately equal to its height. If this is impracticable, it is advisable to choose a greater rather than a lesser distance. On a slope it is advisable to stand above rather than below the base of the tree. If the tree leans, choose a position in a line perpendicular to its vertical plane. Otherwise, the distance obtained by measuring from the observer to the tree will be incorrect, which, in the great majority of hypsometers, means that the height obtained will not be correct.

In Klaussner's instrument a graduated metal rule is sighted to the base of the tree and a plain brass rule is sighted to its top by means of a high-pitch thumb-screw. Each rule has a hair-line sight at its further end, and at the point where they join there is a revolvable peep-sight which can be directed, by means of a

milled disc, to either of the two hair-lines. Attached to the base rule there is a closely fitting slide, carrying a thin metal strip which is graduated in the same units as the base rule, and is kept in a vertical position by means of a weight attached to its lower end. By moving the slide which carries the vertical rule along the base rule to a point representing the distance of the observer from the tree, the height of the tree is indicated by the point at which the vertical rule is crossed by the rule sighted to the top of the tree. Theoretically, this is the simplest and most accurate of hypsometers. Unfortunately, however, to get accurate reading it is necessary to have it mounted on a tripod. This requires too much time for each set-up, and the tripod is a troublesome affair to carry about in the bush.

In the hypsometer designed by Weiss, there is a metal telescope barrel about nine inches long fitted at one end with a peep-sight and at the other with stout cross-wires. Attached to the outer side of the barrel, and parallel with its axis, there is a strip of metal with 47 notches on the "left-hand" scale, and 10 on the "right-hand" scale. At the zero point between these two scales there is a groove in which a square graduated vertical bar can be held in any desired position by means of a retaining spring. From the upper end of this vertical bar there is suspended a triangular-shaped rod, weighted at the lower end to keep it in a vertical position. By setting the vertical bar at the mark representing the horizontal distance of the observer from the tree, sighting the telescope to the top of the tree and carefully rotating the barrel until the triangular "pendulum" rod catches in one of the nicks of the left-hand scale we obtain the height of the part of the tree which is above the level of the eye. Similarly, by sighting to the base of the tree we learn how much of the tree is below the eye—the sum of our readings being the total height. When the observer is below the base of the tree its height is found by taking the *difference* of the readings, both of which will be on the left-hand scale. By constructing a diagram it will readily be seen why this is. Another case that may occur is that of measuring a tree so far down the slope that its top is below the observer's eye, in which case the difference of the readings on the right-hand scale would give its height. Weiss' hypsometer is very compact and strong and gives fairly accurate readings. When not in use, the sliding bar and pendulum may be detached and packed inside the barrel.

In Winkler's instrument a flat pendulum rod with a bevelled edge swings across the vertical face of a box about an inch wide, six inches long and three inches high. This vertical face is ruled off into small squares by vertical and horizontal lines—the vertical representing the observer's distance from the tree and the horizontal the height of the part of the tree above

(or below) his eye. Each horizontal line has a right and left-hand scale, meeting at the zero point, and the vertical line passing through this point is graduated as a distance scale, corresponding to distances of 20, 40, 60, 80 and 100 feet. A peep sight and cross-hairs attached to the upper edge of the instrument are used to sight to the top of the tree. The part of the tree above the observer's eye is indicated by the point at which the left-hand scale, on the horizontal line representing the observer's distance from the tree, is crossed by the bevelled edge of the pendulum rod. Similarly, the part below his eye is obtained by sighting to the base of the tree—the sum of the two readings being its height.

In Faustmann's instrument the pendulum consists of a small plumb-bob suspended by a thread passing through a hole near one end of a reversible brass slide which fits into undercut grooves in the frame of the instrument and can be held in any desired position by a spring pressing against its inner face. On one side of this slide the graduations run from zero to 100, and on the other side from 100 to 175. For example, if the observer is 70 feet from the tree he sets the cross-line of the slide marked I opposite the 70 mark, but if 160 feet from it he reverses the slide and sets the cross-line marked II opposite the 160 graduation. Peep-sights on the upper edge of the framework enable the observer to sight to the top of the tree, and a long narrow mirror hinged to the framework enables him to see where the vertically hanging thread intersects the scale engraved upon the lower edge and ends of the rectangular framework. The left-hand scale runs up to 225 and the right-hand scale to 75. The advantages of this instrument over Winkler's are that the observer may stand any distance he chooses from the tree and at once see in the mirror the height of the part of the tree which is above or below his eye. With a little practice, trees not exceeding 100 feet in height should be measured to within a foot of their true height.

Tieman's hypsometer resembles Klaussner's in some respects, but possesses the double advantage of not requiring the use of a tripod and of giving the height of a tree by sighting to its base only. It consists of a rectangular metal framework, or telescope, about 8 inches long, 2½ inches wide and 1½ inches deep, provided with a sliding arm which enables the observer to set the graduated vertical swinging-scale rod at the point representing his distance from the tree. Inside the telescope there is a small mirror which can be rotated by means of a thumb-screw on the back of the frame. Opposite the mirror there is an opening in the side of the telescope so that light reflected from the top of the tree may fall upon the mirror. The parts are so arranged that the mirror can be seen side by side with the

"hind sight" when the instrument is sighted to the base of the tree. By rotating the mirror until the reflection of the top of the tree is seen in juxtaposition with its base, the height of the tree is known immediately by observing the reading on the vertical scale. The simplicity of the instrument is due to the use of the rotary mirror, which makes it possible to simultaneously view the top and the base of the tree in proper parallax with a single sighting. Furthermore, the sight being towards the base of the tree the strain upon the eyes and the muscles of the arms and back is greatly lessened, as will readily be understood by any one who has used a hypsometer requiring upward sighting. The instrument has not yet come into general use and is the invention of Mr. H. D. Tieman, M.E., M.F., of the Yale Forest School.

Three of the best known height measuring instruments depending upon trigonometric ratios are those of Brandis, Abney and Goulier, each of which may also be used as a clinometer. In the case of the Brandis instrument there is a weighted wheel which keeps a horizontal position as the telescope alongside it is sighted upwards or downwards, and a retaining spring to hold it in position until the angle of elevation or depression can be read. The graduations on the rim of this wheel run in both directions and are magnified by a small lens placed over a slit in the case enclosing it. If e and d represent the angles of elevation and depression, and D the slant distance of the observer's eye from the base of the tree it may easily be shown that the height of the tree is equal to D times $\frac{\text{Sine (e + d)}}{\text{Cosine e}}$. If, however, D is the *horizontal* distance from the observer's eye to the tree, then the height is D times (Tangent of e + tangent of d).

The Abney Hand Level and Clinometer is a telescoping surveyor's hand level of ordinary construction except that its spirit level is placed above instead of in its main tube, which, however, contains the usual inclined mirror and sighting cross-wires. This mirror is placed so as to reflect the bubble in the level, but is so narrow and so close to the edge of the telescope that both the cross-wires and the reflection in the mirror of the spirit bubble can be seen at the same time. Attached to the axis upon which the spirit level turns there is a graduated arc of a circle, with the graduations reading in both directions from the zero mark. With this instrument the angle of elevation is found by sighting through the telescope to the top of the tree and slowly rotating the graduated arc until the reflected image of the bubble shows that the spirit tube is level. Similarly, the angle of depression is found by sighting to the base of the tree—the height of the tree being D times (Tan e + tan d), as in the case of the Brandis instrument.

To overcome the necessity of using a table of tangents, Goulier graduated his circle tangentially, or in "percentages" instead of in degrees. A pendulum-ball, the lower half of which is bevelled to an edge and is provided with an index mark, sweeps over a right-hand and left-hand scale running outward in opposite directions from the lowest or zero point to 100. The top of the tree is sighted along the upper edge of the square case in which the pendulum and graduated arc are enclosed, and a retaining spring holds the pendulum in position when it comes to rest. The so-called percentages engraved upon the circular arc are in reality the tangents of the angles of elevation and depression, and for a horizontal distance of 100 feet give a direct reading of the portions above and below the eye—their sum being the height of the tree.

Following out the principle of Goulier's instrument, Keuffel & Esser, of New York, have produced a special form of the Abney Hand Level, in which the graduations on the arc attached to the level are made in "percentages" instead of degrees. In cases where the top and bottom of the tree cannot be seen at a distance of 100 feet, all that is necessary to do is to find a point where they can be seen simultaneously and measure its difference from the tree with a tape or chain. This distance multiplied by the sum of the percentage readings found by sighting to the top and base of the tree gives us its height. For example—Angle to top of tree gives a percentage, or tangent, reading of 84 and to its base of 6, and observer is 80 feet from the tree. Then the height of the tree will be (84% + 6%), or 90% of 80 feet, i.e. 72 feet.

Last May, at Burnt Lake, in Algonquin Park,I had my class in Forest Mensuration make a thorough test of the comparative merits of most of the height-measuring instruments above described. By felling the trees upon which the tests were made and measuring them with a steel tape, it was found that the better class of instruments gave their heights to within one per cent of their true value. The general conclusion arrived at was that the Abney Hand Level and Clinometer with percentage graduations is the most satisfactory of all. It is simple in construction, compact, light and strong, can be used at any distance from the tree and gives accurate readings. Besides, it has no cumbersome tripod to impede progress; no swinging pendulum, folding sights or mirrors to get out of order, and may also be used either as a level or as a clinometer.

TRAINING FOREST STUDENTS.

G. C. Piché, M.F.

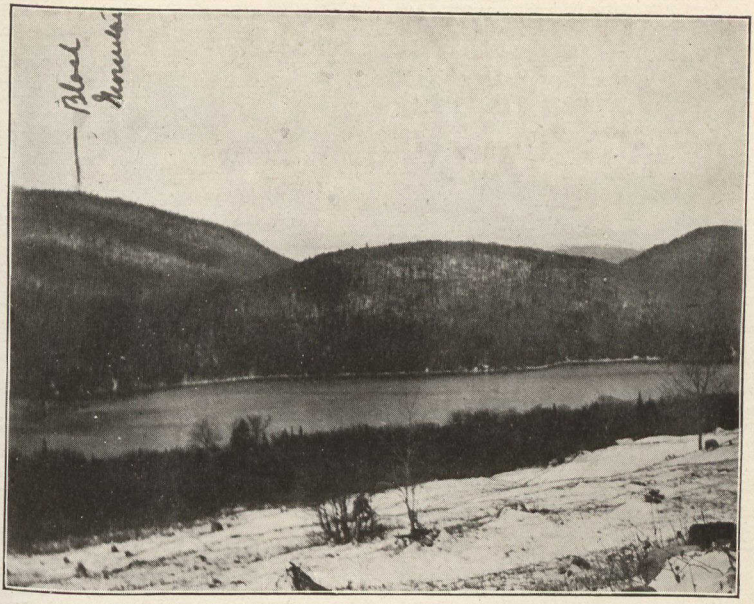
Twenty-four miles east of Ste. Agathe—so justly famed for the picturesqueness of its situation and the suitability of its climate for those suffering from weak lungs—we find the village of St. Donat. It is the last parish in that direction; beyond is the forest.

The first settlers arrived here some thirty-four years ago, but the population now numbers only six hundred,as the absence of communications has prevented its development. The scenery in the vicinity is unequalled for grandeur; the lofty hills that encircle the village are covered with timber, and numerous lakes of all sizes, well stocked with trout, form a series of blue spots in the dark green cloak of the region. The two lakes, Archambault and Ouareau, would be enough to give renown to any place, and it is expected that, as soon as the railway passes here, this corner of the Laurentian will become as famous as the Saranac region.

When the St. Maurice forest reserve was created, all the land that was not taken at the time was withdrawn from sale. This naturally caused the population of St. Donat to protest, and it so happened that I came here on the 1st of October last to examine the soils of the townships of Lussier and Archambault, in which this interesting place is located.

The main point to be noted in regard to our party was that it included three students of the future Quebec school of forestry, whom I was supposed to "break" into the life of the woods and initiate to the mysterious rites peculiar to forestry. Two of these students are graduates of the Ecole polytechnique of Montreal, and the third comes from Laval University, Quebec.

It is needless to describe here the great reception we were given on reaching our destination, nor to mention all the good advice we received. To cut short all this, we started immediately for the woods and pitched our tents near Lake Pembina. I had expected to hire a cook at St. Donat, but as they had all gone to the shanties, we had to take turns in doing the cooking, which meant a good meal not too often. However, we managed the thing fairly well, and at the end of six weeks everyone could make excellent pea soup, good baked beans, etc. This was not in our program of studies, but we had to go through this experience, and it proved valuable.



According to geologists, Montagne Noire is said to be 2100 feet above sea level, it is a lofty mass covering 16 square miles, so rugged that the surveyor refused to run lines there.

Unable to cross the lake we had to portage our baggage around 6¼ miles.

The first nights were a little bit frosty, and our students who did not have an excellent sleeping bag like mine found their blankets uncomfortable. The next morning I had to write to Guelph to order "three sleeping bags sent on by express". During October, the weather was not too cold, but when November stepped in clothed with snow all the little creeks started immediately to take their winter sleep. To return from Riviere Michel, we had to break the ice (1¼ inches thick) for nearly a quarter of a mile.

It was the best time of the year to go into the woods; the underbrush was no more a nuisance and in taking sights with the compass we could prolong our lines for quite a distance.

Every morning at 6.00 a.m. the echoes would repeat the melodious "ROLL OUT" that I would serve to wake up the party. It meant quite a change to dress in the cold air of the morning, and one had to be anything but slow in his movements. Everyone would help to put up the breakfast, which was eaten rapidly; then at 7.00 we would find ourselves on the road, for a good day's work.

It has been the habit of some land inspectors in the past to hire guides; but as some of these guides were more or less interested in the classification of lots, the Government man, should he lack care, would be taken around the same group of lots, travelling all day within a mile of his camp, visiting the best or the poorest soils according to the fancy of his guide. The inspector's report was worth a good deal for the lots he had crossed; but in respect to the rest of the township its worth was nil.

To avoid the repetition of such a game, we started to pick up the old range lines, quite visible yet, pacing the distances in order to know where we were; then, after running a couple of miles, we would come down the range about the half of its length and would retrace our steps in a line parallel to our first direction. It meant a preliminary instruction on the use of the compass and a practice of pacing for our students. So we would go as in a forest survey, one man at the compass to keep the direction and pace the distance, while his companions were noting the trees, their average size and form, the amount of rocks and their occurrence, the soils, etc. Once in a while we would dig a hole to study the different layers and collect samples of different types of soils. Naturally I had to keep a check over all, questioning the boys on the name of such a tree, etc., so that we were doing soil classification along with a little dendrology and surveying.

We had to move our camp quite a number of times, as each township has ten ranges of one mile in length each. I must say here that the surveying of Quebec differs somewhat from that

of Ontario and other provinces. In only a few instances will the sides of the township be north, south, east or west; usually they are running in all directions but that; in our section, they were directed at 45° from the cardinal points. The reason of this is obscure. Another anomaly of our system is that the range lines may have different directions, not only from those of other townships, but even in the same township, the township of Provost is the best example of the excellence(?) of this system. Here we were lucky; the range lines of township Archambault had their trend perpendicular to those of Lussier, though the topography is the same; I have been unable to find out why. The sides of the lots are perpendicular to the range lines, the only difference is that our lots are one mile long by about one-sixth of a mile wide; so that when a settler has located his buildings near the range line, where the roads are usually passed, he has to walk only one mile to go to the end of his farm!

Each moving gave us further experience, especially the day when we returned from Lac Croche. We had to cross also Lac Ouareau, a sheet of water five miles wide; but the gale was so strong and the waves so rough that we were forced to run for the shore and portage our baggage around the lake, a distance of eight miles. As illustrated in the cut, the shore is a trifle rocky and but little obstructed with logs and other litter. Besides these small inconveniences, the snow was melting. So we started off in good humour. However, we were not at the end of our troubles, as when we reached the spot where the Archambault river, a stream about fifty feet in width, empties into this lake, we had to face another problem; the boat expected was gone. We had to go across; so we built a sort of raft with two cedar logs, tied together with twine, and paddled to the other shore in turn—not all in safety either, as the farmer who accompanied us that day to represent the settlers' interests, managed to drop off the rolling logs.

The logging operations having already begun, our party visited several camps and lumber jobs. In all instances, we found a great lack of care on the part of the jobbers and a great amount of timber wasted, so we had to impress them with the notions of economy. We intend to drive these notions down to their purse as by the new regulations just issued, the Government will charge stumpage not only on the logs measured on the banks of streams, but also on all timber wasted in the woods, and our students, particularly, who are passing this winter in the shanties, will take note of all the high stumps, tops, logs used for skids, etc.

Naturally the jobbers are making objection to this, but as we have the approval of the lumbering concerns and we represent the Government, it will have to go.

We thus spent six weeks, devoting our time to the soil classification and a few days to logging operations, to enable our students to discharge their functions, for this winter, as well as possible.

They have now entered their second term—if we can call this a term—of practical studies. Next spring, they are expected at our nursery at Berthierville, where they will learn how to use the spade and the mattock, together with the first notions of reforestation.

Without boasting, I believe our students have started their studies of forestry at the right end, i.e., by beginning to face the various problems of their future work. They know now what the life of the woods is, that the forestry profession is not a sinecure, and that those who look for an easy life will have to enquire somewhere else than in the Forest Service of Quebec.

The traffic in young spruce and balsam saplings for use as Christmas trees is reported to be again active in New Brunswick. From one town in this province some one hundred carloads are said to have been shipped to Philadelphia.

American capitalists are reported to have made a $2,500,000 purchase of timber limits in New Brunswick from the Alexander Gibson Railway and Manufacturing Co.

Some very candid statements are being made by various speakers at the tariff revision consideration before the Ways and Means Committee of the United States Congress. Representative Clark, of Missouri, expressed the opinion that free trade in lumber would tend to prevent the devastation of American forests and it did not matter if Canada did devastate her forests.

WILL STUDY IN EUROPE. Mr. G. C. Piché, M.F., of the Department of Lands and Forests of the Province of Quebec, left this month for Europe, where he will spend the winter, returning about the end of March next. He will visit France, Germany, Norway and Sweden. In the spring he will superintend the work of the nursery at Berthier, where the forestry students—referred to in another part of this issue—will be employed.

NOTES ON CANADIAN FORESTRY.

By Stanislas Gagné, A.M. Can. Soc. C.E.

During the last few years the attention of Canada has been brought to the problem of Forestry, and the results of a campaign against the wasteful use of the forests are already visible in the interest taken in it by the Federal and several Provincial governments; but while new laws have been passed, areas of forest lands reserved, and nuclei of Forest Engineering staffs formed, much more is necessary before this problem can be considered solved.

The aim of this paper is to give a general description of the question of forestry so that all the members of the Canadian Society of Civil Engineers may understand its importance, take a deeper interest in it, and help to form the public opinion necessary to cause the Canadian parliament and provincial legislatures to treat it in a scientific and practical manner.

The engineering profession is specially interested in the preservation of the forest and in the continuity of its yield of the timber which enters into practically all classes of construction. In regard to the value of forest as such, engineers are familiar with the fact that rivers with an even flow have been transformed into torrents in the spring and rivulets in the summer by the destruction of the forests at their sources; the Grand River in southern Ontario is an example often cited in this respect. They are also familiar with tracts of land that have been, by the clearing of their forest and thin soil protection, transformed into rocky wastes, or into sand deserts which menace the adjacent country. This is why the value of the forest as a soil cover is considered of greater importance than as a timber producer. The imagination need not be stretched to conceive that the destruction of the forests of the Great Lakes' watershed would have a greater effect on the flow of Niagara Falls than several hundred-thousand-horse-power hydraulic plants, and on the inland navigation system than another Chicago drainage canal.

Although it is not proved that forests directly influence climate and rainfall, it is generally admitted that they have a beneficial effect in acting as wind-break, in cooling the air, and in influencing rain-storms. Their action as a regulator of the flow of water is well known, and need not be explained here.

The Forest.

Forests are composed of an aggregation of trees of many species and many conditions of life and growth; this aggregation is the result of ages of evolution and of elimination of the unfit as in all other plant life.

The factors which influence the forest are: First, temperature; second, rainfall; third, soil composition, which is a result as well as a primary condition; fourth, winds, etc. Thus, growth is most luxuriant in the tropics, and varieties and numbers vary either with increasing elevation, as in mountains, or with the latitude north or south towards cold regions.

Canada's forests are composed of trees ranging from the walnut and the chestnut, which are only found in the southern fringe of Ontario, to the scrubby spruces growing in the north from the shores of Hudson Bay to the Yukon Territory. Between these extremes the following most prominent deciduous or broad-leaved trees occur: Hickory, oaks, elms, ashes, poplars, and birches. Coniferous trees, such as the pines, firs, and cedars have a wider range, while spruces and larches compose the most northerly forests.

These forests are producing lumber by the process of yearly growth, and the aim of forestry is to direct this growth in the same sense as that of grain crops. Thus, the life and habits of all species are studied and their growth fostered with a view to obtaining the best results.

Present statistics show that Canada has about 800,000,000 acres of forest land, but this includes all the northern forests, some of which are of little value, and the parts lumbered over and burned. Estimates of the productive area vary between 200,000,000 and 300,000,000 acres, and it is probable that only about one-quarter of this has a growth of merchantable timber. The Department of the Interior is at present preparing statistics giving a more accurate and clearer view of the situation. These forests are mostly composed of coniferous trees, and of these spruces and firs are the most prominent, the pines having been nearly all lumbered; the hardwood forests are now practically exhausted, and most of the ground they covered has been converted into agricultural lands, so that forestry here is mainly concerned with the coniferous forests.

It is a matter of common knowledge that the handling of the Canadian forests has been a wasteful process, and that the economic supply of timber from even these vast areas is fast disappearing and will be exhausted in the course of a few decades; in fact, forests have been treated as if they were mines, and in marketing what nature had placed there, no provision has been made for reproduction.

The application of scientific forestry principles will stop this waste and will make these forests produce a perpetual and largely increasing amount of material, thereby increasing the financial revenue.

Afforestation results in the reclamation by planting of denuded river sources for the regulation of the flow of water for

power and domestic purposes, of sand wastes to check the blowing of the sand over the adjoining agricultural lands, of denuded slopes which are liable to be washed down over fertile valleys, and of parts of the western prairies to form wind-breaks and fuel reserves.

The Federal and Ontario Governments have already begun this reclamation work in the prairies and in Ontario. They are offering young trees free of cost to the individual owners of land, and are themselves planting the most dangerous waste areas. Trees of the kind best adapted for the various lands are used, and these plantations will become valuable forests from which revenues may be derived.

The cost of planting an acre of white pine varies from $5.00 to $15.00, according to the character of the soil; this is exclusive of seedlings, of which it takes about 2,000 per acre. On account of this cost, and of the 80 or more years necessary for such seedlings to grow to merchantable size, forest planting is not a profitable investment for private capital, and in view of the fact that vast areas under advanced growth are easily available, afforestation is a work to be carried out by the State.

This does not apply to farms where a few acres of soil unfit for yearly crops can be made profitable by planting seedling trees to constitute a future fuel reserve and wind-break, and where the use of the coppice system referred to later can reduce the time element.

It is interesting to note in this connection that some European cities have found it more economical to afforest certain areas than construct reservoirs for the regulation of their water supply.

Forest economy ensures a maximum production from existing forests consistent with the conditions necessary for a perpetually increasing yield.

For purposes of management, forests are generally divided into two groups:—

1. *Protection Forests*, whose value as soil cover is such that they should not be cleared. This includes all forests covering the main sources of rivers, regardless of whether their soils are fit for agriculture or not, also forests on side hills and light soils liable to erosion, and those acting as wind-breaks, especially at the sea coasts.

2. *Supply Forests*, including all those not covered by the above group, and whose principal value lies in their capacity for producing marketable wood material.

The distinction is elastic since most protection forests may be valuable wood producers, and some supply forests may have little value as such, but the distinction is necessary as a basis of economic policy.

See article by H. R. MacMillan]

A prairie produced by successive fires. After several fires the steep slopes are bare to the rock, the gentle slopes are covered with a dry impervious sod which neither absorbs the rain, holds the snow, nor prevents evaporation, and because of the rapid run-off, extremes of high and low water are induced.

[Photo H. R. M.

For maximum efficiency both require to be protected against fire, insects, winds, etc., and to be scientifically managed as regards reproduction and cutting.

PROTECTION.

It is admitted that fire is responsible for more destruction in the forests than all other agents combined, and that the present laws and systems for its prevention are inadequate. This danger and lack of protection justifies many owners of Canadian forests in their policy of realizing on their actual timber in as short a time as possible lest the fire rob them of it. The last Fernie conflagration also points out the destructive danger from bush fires to property other than forest. It is, therefore, of primary importance that an effective system of fire protection be devised and applied, and without it practical forestry is valueless.

The causes of forest fires are mainly the following: First in importance are the sparks from railway locomotives, which have transformed wooded areas into brulés for miles on both sides of Canadian railway tracks. The present regulations do not prevent sparks from even coal-burning locomotives from starting fires in the dry grass on the right-of-way, which in a few hours get beyond the control of rangers and sectionmen. The settler is probably the next in importance as a fire danger,where in order to clear a patch of land worth $100.00,he causes millions' worth of timber to be burned. This does not mean that settlers' clearing should be discouraged, but it should be done under control of Government officers, who would take necessary means to guard against conflagrations from this source. Carelessness on the part of lumbermen, prospectors, tourists and other travellers of the forest is the cause of many extensive fires. Lightning also causes fires but to a less extent than the above.

In the light of former experience it is reasonable to predict that in a few years the lands adjoining the National Transcontinental Railway will be depleted of their present valuable timber if more effective methods of protection than the present ones are not used.

That most forest fires can be prevented, even in the wild and extensive northland, has been proved by experience in Europe, and in large tracts in the United States, where laws and regulations such as now exist in Canada are more strictly enforced, and the careful disposal of the debris from lumbering operations and the construction of fire lines or rides have been found very effective in preventing and checking fires. These fire lines or rides consist of strips 200 to 300 feet wide, cleared of all inflammable material, which are constructed through the forest, preferably alongside small rivers and roads; they will quickly be covered by a deciduous-leaved growth, which will form a barrier to the flames and a base from which they can be fought. Their cost is generally between $15 and $25 per mile.

They are patrolled at times of danger by men carrying light tools necessary for extinguishing small fires. In some valuable limits in the States, telephone systems are erected, whereby patrolmen summon help in case of large fires. In one instance the complete system of fire lines, patrol, and telephone costs less than two cents per protected acre per year. Fire lines for protection alongside railway tracks can be patrolled for many miles by one man with a gasoline car; they should also be effective around lumber camps and mills, and even villages.

Strict police regulations, education of the forest traveller and intelligent ranging are also valuable in the fight against fire.

Damages from insects are generally of a local character, and usually remedied by the clearing of the infested areas.

Wind damage can be prevented to some extent by leaving in exposed places more trees standing after lumbering than would otherwise be necessary.

Forest Management.

Unaided nature produces trees of different species and kinds, some valuable in the arts and some useless, called tree weeds, and produces them in different quantities and qualities according to conditions of stand, soil, and climate. It is the duty of management to first become familiar with the conditions at hand and then foster the reproduction with a view to maximum result, whether in the direction of soil protection or of crops of merchantable timber.

Men specially educated and trained for this workhave lately formed in America the profession of forestry or forest engineering, and it may be of interest to this Society to know that a Canadian Society of Forest Engineers was established in March of this year.

The most important part of the forester's knowledge is that of sylviculture, or the science of growing wood crops. His task in this respect is rendered more difficult by the fact that he has to use many different and generally poor soils. Engineering knowledge is useful to him in making topographical surveys and maps, and also in the location and construction of dams, roads and mechanical devices for lumbering operations. He is also required to be familiar with these lumbering operations, and the timber values, since in case of supply forests his efficiency is determined by the financial results of his work.

Forestry Methods.

Assuming a timber limit or supply forest such as found in Northern Ontario to be managed as an investment, for producing lumber, the forester will first acquire a knowledge of the property. A compass survey with barometric levels will enable him to draw comprehensive maps showing rivers, creeks, valleys, swamps, hills, etc.; he will also note the nature of the soils, the directions of the prevailing winds, and the amount of rain and

snow fall, while his knowledge of trees will enable him to determine the different species, their rate of growth, and the nature of the stand in the different localities.

From this knowledge he determines the ages, sizes, amounts of available timber and the productive capacity of the limit, which will enable him to draw a plan of exploitation. This is where skill and experience are of paramount importance, since the policy adopted will probably be retained for a great number of years, and errors in judgment will be costly.

A given forested area can only produce so much timber, and, if the amount of cutting is to exceed that of reproduction, the continuous yearly crop principle must be abandoned. This yearly crop will be doubled and trebled, but only after many years of forestry practice, and a gradual increase of expenditure in protection, in removal of weeds and in thinning of dense stands. Any system will require expenditure, and future remuneration must be well assured before a system can be put into practice.

The working plans adopted so far in the privately-owned forests of the United States have been a compromise between the owner and the forester, and in many cases the forester has had to give up most of his measures conducive to perpetual yield, in order that the immediate cost of lumbering might not be increased beyond a certain point; in these latter cases he aimed specially at reducing the waste and at preventing the producing power from being unnecessarily destroyed.

The following working plans in whole or in part, or combinations of them, have been found practical, and have been adopted in Europe and, to a certain extent, in the United States.

Pure Selection.

This method consists in cutting the trees that mature or attain a certain size over the whole of the area every year On account of the expense of logging over such large areas, this plan is generally impracticable in supply forests, but may be workable in protection forests, especially if cutting is only done every few years.

A variation of this plan, called Improvement Cutting, is sometimes found good policy, and consists in removing the most mature and the saleable dry trees, also the tree weeds, to provide necessary space for the better development of the others. In any plan the cutting of tree weeds in the lumbering areas is encouraged.

The openings made by this system are quickly seeded by the adjoining trees, and natural reproduction is thus assured.

Localized Selection.

This system, the most generally adaptable to Canadian forests, consists in sub-dividing the area into a certain number

of parts forming the operation of one year's cutting, the number of parts determining the time which must elapse between two successive cuttings of the same area.

For example, it has been found in the Adirondack forests of the State of New York, that if all spruce over 12 inches in diameter is cut from certain portions, the young trees will grow up and replace the original timber in 20 years;* therefore if the limit is divided into 20 parts the lumberman will return to each part once in 20 years, and in the course of 100 years each portion will be cut over five times. This is only possible if the young trees are not destroyed, and if enough seed trees are left for the natural reproduction of the lumbered area.

Seed-bearing, especially in conifers, is irregular, and depends on the amount of stored food in the tree, which in turn depends on the quality of the soil, the quantity of moisture and the amount of sunlight available. Forest trees begin to bear good crops of seed at ages ranging from 25 to 80 years; in the open this may begin at from 5 to 10 years, but in the case of young spruce the fruit is generally barren because of imperfect pollination, the female flower being born earlier than the male.

In a general way, the system of Localized Selection is simple, elastic and easy of application, while if mistakes occur the consequences are not so serious as with other systems. Logging, being confined to a smaller territory, is comparatively cheap, and reproduction is provided for without large expense.

The Strip System.

If the trees are mostly of the same size, and so situated that it is difficult to preserve the young growth, then narrow strips are cut clear of all trees, seeding being provided for by the trees on either side. These strips will run at right angles to the direction of the prevailing winds, or, if the soil is dry, they may run east and west, so as to afford shade for the young growth. Another strip alongside will be cut the next year, and so on until the whole area has been lumbered.

It is evident that if entire new growth is depended upon for future operations the number of years between two successive cuttings of the same strip must be many times that necessary in the system of Localized Selection, but the areas cut over are smaller, and after a first rotation the whole forest is composed of regular even-aged strips.

Extensive European forests are managed in this way, and some have even reached the second cutting period. In Canada it is only applicable where the small wood has a market value, as in the case of pulp wood limits, where trees of much smaller size than for lumbering are required and the period of rotation is thus largely reduced.

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*This estimate is too low; it should be 30 years.—S.G.

Strip of good white spruce, average about 10 inches, on Ross River, Y. T. [Photo by J. Keele

The Group System.

If instead of strips, more or less circular portions are cut where suitable, the method is referred to as the Group System. These circles are enlarged year by year until they meet and the process is repeated. Seeds from trees around the opening are depended upon for reproduction, and the rotation is the same as in the case of the last-mentioned method.

This is specially applied in Europe to smaller forests, and in areas subject to high winds it is safer than the strip system.

Coppice System.

Many deciduous trees, such as chestnut, the oaks, the poplars, etc., will sprout from stumps or roots of cut trees, and on account of the large amount of stored food and collecting power of the roots, will grow much faster than seedlings to a size suitable for fence posts, railroad ties and cordwood; forests managed on this principle are referred to as Sprout or Coppice Forests. If the area cut over each year is completely denuded, the method is called Simple Coppice, and if some of the trees are left to attain larger size, such as suitable for high-priced quartered oak, it is called Stored Coppice.

Farmers' wood-lots are best adapted for such a system, which requires practically no management; all that is necessary is to cut the stumps low, to take care that the bark on them is not destroyed, and to see that there are enough seedlings to replace decayed stumps with vigorous young ones.

Logging.

Under present conditions logging forces are trained to sacrifice everything in order to produce logs as cheaply as possible, and the result is a large waste. To the forester the question of quantity for given area becomes most important provided the cost is not too much increased; thus trees that are comparatively difficult of access will cost more to log, but if their value is greater than their cost, the result will be an economy.

Waste in logging is generally in the following forms: Unnecessarily high stumps; the use of the axe instead of the saw; dead, lodged or fallen trees, and large tops containing valuable timber left in the woods, and merchantable logs used in the construction of skidways, roads and camps; in some instances this waste has been found to amount to 2% of the total cut, and its prevention has paid more than the cost of the forester and his inspectors.

The saving of young growth is also a difficult problem, but while it is impossible to prevent all damage, there are tricks in felling the trees and dragging out the logs that are very effective.

Rational lumbering is therefore an integral part of the art of practical forestry, and is necessary for the economic value of the several systems above mentioned.

Yield.

Owing to the wide variety of the conditions in Canadian forests, it is clear that each tract forms a problem which has to be treated on its own merits, but a glance at what has been done in Europe gives an idea of what may be accomplished.

Germany has practised forestry for about a century, and more zealously than any other country. The 430,000 acres of State forests of Saxony produced 93 cubic feet of wood per acre in 1904, 66% of which was saw timber, and yielded a net revenue of $5.30 per acre after deducting all expenses of management and protection, amounting to $3.00 per acre. A 115,000-acre forest, owned by the Duke of Saxony, yielded in 1905, 79.6 cubic feet of wood, 45% only being saw timber, with a gross revenue of $6.90, and management cost of $2.35, leaving a profit of $4.55. Prussian forests yielded about 70 cubic feet, with a net revenue of $2.50 in 1904, being ten times that of 1850. Fifteen and a half million acres of state, municipal, and private forests in Germany average a net profit of $2.40 per acre per year.

Swiss forests have also reached a high state of development, and owing to the greater age of forestry and the higher price of wood, the profits range from $3.00 to $9.00 an acre, represented by from 42 to 80 cubic feet per acre per year. The city forest of Zurich, famous as the Sihlwald, has been managed since 1680, and now yields an average profit of $12.00 per acre per year.

In France, State forests yield at best 40 cubic feet per acre per year, but the money spent on them is only 95c. compared with two or three times that amount in Germany, and a large proportion consists of newly-planted areas which have not yet reached the money-producing period.

Austria and Hungary are also practising Forestry after the German methods, and meet with the same success.

In short, the yield of managed European forests varies between 40 and 100 cubic feet per acre per year, and it is most interesting to note that those forests on which most has been expended in Forestry practice have yielded the largest profits.

From the above it is evident that 60 cubic feet per acre per year is not too much to expect from many Canadian forests, and this at 60% saw timber would yield 250 feet B.M. per acre per year.

Whether this can be considered a good return for private enterprise depends on the capital value placed on the forest in question. If the assumed capital is that represented by the price at which some timber limits are sold, it is clear that the yearly return will probably exceed the original cost, but if the total value of the standing wood plus the price of land covered by this wood be taken as the amount of the capital, the result will be different, and will depend entirely on existing conditions.

It is probable that on account of the difference in the policies and methods of selling limits by the several Canadian Governments, the great danger of fire, and the necessary increase in the immediate cost of the logs due to methods designed for a continuity of yield, most present owners of saw-timber forests are justified in realizing on their marketable material in the shortest time, and the cheapest way possible.

But in the case of the pulp and paper industry, where the capital invested in the mills is large, the question of continuity of supply becomes one of the utmost importance, and the disregard of forestry methods can only result in a financial waste of unnecessary large areas or in a suicidal process.

Therefore, if private management of forests is to be fostered along the lines of Forestry principles, the various Government laws and policies must be remodelled, by offering certain inducements to private owners and by establishing regulations which must be strictly enforced.

But while strict Forestry principles, especially as regards reproduction and sustained yield, may not be applied with financial profit to most privately-owned saw timber forests in Canada, many would be directly and immediately benefitted by the application of some of these principles, namely: Fire protection, topographical maps, accurate analysis of the available wood, less wasteful lumbering methods, and better care of the young growth.

State Management.

The importance of the protective properties of the forests being a matter which interests the whole nation, a state control of protection forests is essential; and on account of the long time element in natural reproduction, supply forests are also best managed by the state. Fortunately, most Canadian governments have retained the ownership of the forest lands, and sooner or later the areas over which cutting rights have been granted will revert to the crown.

The country is probably not prepared to go the whole length of European practice in the matter of laws and regulations, but many improvements are imperative if the remainder of the Canadian forests are to be saved before they are beyond recovery.

The most pressing need is that of more adequate protection from fire, which is yearly devastating hundreds of square miles. and in this the experience of Europe and the United States, as seen above, is most valuable and convincing. If lumbermen cannot be persuaded to protect their own limits it becomes the duty of the Government to regulate their operations and prevent them from at least increasing the danger of fire. In all cases some means of prevention, such as fire lines, more efficient patrol or ranging, and control over settlers' fires are urgent.

The next most imperative improvement is probably the revision of the present system of disposing of the timber on crown lands. The present bonus plus stumpage tax method in use by most Canadian governments is undesirable on account of the larger capital necessary for the bonus, which bars out many prospective lumbermen, and which results in lower public revenue and more waste than if sales were effected on stumpage tax only.

Contingent on this revision of method of timber sales, comes the necessity for regulations or specifications as to the disposal of the debris, the care of the young growth, the leaving of seed trees, etc.

In order to properly deal with the forested areas, complete and accurate knowledge of their condition, value, power of production, soil protective properties, etc., must be compiled in the same manner as an inventory of a private industry. This will enable a classification to be made of the divers purposes for which this forested land is adapted, and thus protection forests will be differentiated from supply forests, and the areas unfit for agriculture will not be disposed of to pretending settlers.

In this connection, it may be mentioned that even the sale of individual township lots that are over 50% unfit for growing yearly crops is unfair to a settler who can at best make only a scanty living on them, and also unfair to the municipality, since even a 100-acre forest reserve may prove of great value in the future.

The knowledge of the present value and producing capacity of the forests will also assist in determining upon systems and policies that will insure a perpetual supply and a maximum revenue.

Forest Reserves is the name given to many forested areas that have been set apart during the past few years, and on which no lumbering operations are allowed. For protection forests such a policy is in the direction of forestry principles, and it is also commendable in the case of supply forests on account of the destructive character of the present day lumbering, but when practical forestry methods are enforced, lumbering becomes an improvement of the forest, because by removing the mature timber it allows the remaining trees to develop more rapidly; then the necessity of putting certain areas out of the reach of the lumberman ceases to exist, and these forests, whether "protection" or "supply," instead of being sources of expense will produce revenues.

Settlers vs. Lumbermen.

The relation between the settlers and the lumbermen as to their respective rights has been the subject of much discussion. Some settlers by squatting on or buying certain township lots

and disposing of the timber on them, which timber had been bought and paid for, have been a frequent source of loss to the lumbermen; on the other hand, the removal of all valuable trees from lands fit for agriculture has deprived the settlers of material necessary for building and also of the means of earning their living until enough land is cleared to grow crops. A system of forestry will, therefore, be incomplete without a proper adjustment of these difficulties.

Financial Possibilities.

The following table, taken from Circular 140 of the United States Forest Service, issued January 24th, 1908, shows the results obtained from forest management by other countries:—

Country	Total net revenue from Government forests	Expenditure per acre	Net Revenue per acre
Wurtemberg	$ 3,098,428	$2.05	$6.60
Saxony	2,299,000	3.00	5.30
Baden	829,162	3.58	4.42
Hesse	744,209	1.25	4.29
Switzerland	237,663	1.32	2.55
Prussia	17,054,144	1.58	2.50
Bavaria	5,128,348	1.99	2.22
France	4,737,250	.95	1.75
Italy	.....	.....	.33
Hungary	.....	.34	.32
Austria	5,313,000	.56	.21
Roumania	482,600	.....	.18
Spain	.....	.....	.17
Sweden	1,677,672	.02	.09
Russia	21,500,000	.01	.032
United States (1905-6)	12,000(b)	.007	.0001
United States (1906-7)	128,659	.0093	.00086

The above figures represent yearly revenues of all the national forests of each country, and not of the specially productive ones. Results from Canada are not given because the revenue drawn from our forests represents the sale of wood capital, and not a yearly production based on a perpetual yield.

It is interesting to note that the countries spending most money on forestry practice derive the largest net revenues from their forested lands; and these are yearly increasing in capital value represented by the available wood.

The results for the United States are for 150 national forests, with a total area of 143,000,000 acres, situated principally in the Western States; most of them were cleared of their valuable wood some years ago, and nearly all have been under the control

(b) Deficit.

of the Forest Service less than three years; in view of these facts the results are considered remarkable, and a proof of the high efficiency of practical forestry.

The high revenue of German forests has only been reached after several decades of forestry practice, but there has been much time lost in experimenting and gathering data, and it is safe to assume that similar results are possible in much shorter time under proper conditions.

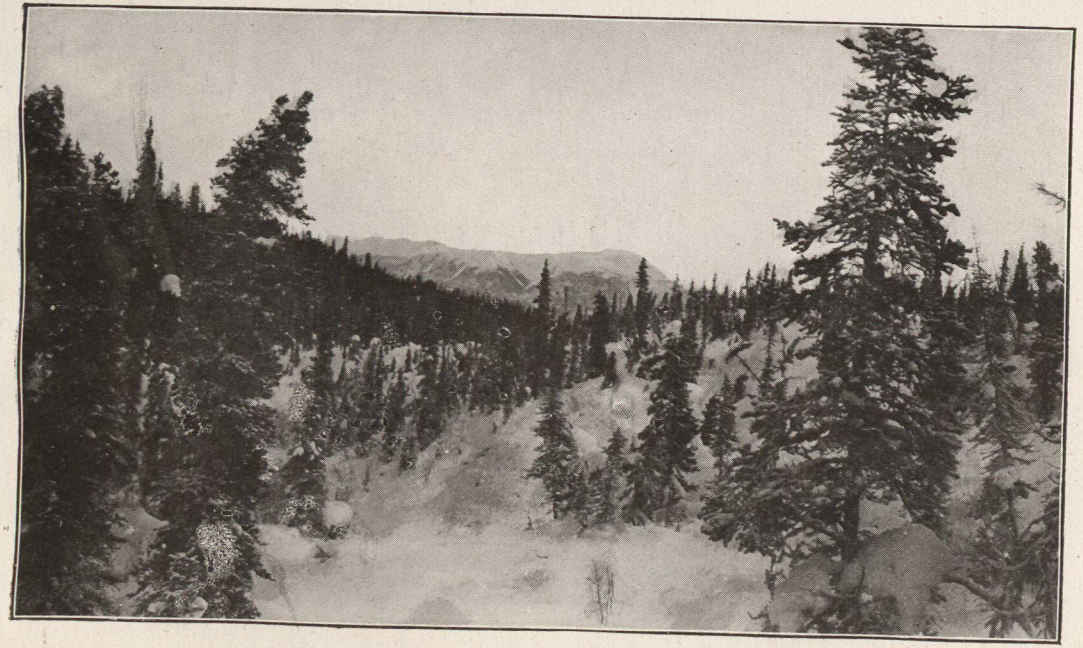
Hypothetically there is no reason why the 200,000,000 acres of productive forests in Canada could not be made to yield an average of 20 cubic feet of lumber per acre per year, which, at $6.00 per thousand board feet on the stump, would net a profit of 50c. per year, assuming expenses to be 50% of the gross revenue. This would mean a yearly production of 50,000,000 tons, or seven times the total present output, or five and a half times the total imports of Great Britain, or three times the total exports of the world.

There is clearly no demand for such production, but the present output can be largely increased, and it is reasonable to conclude that Canada has in its forests one of the most valuable assets, capable of producing large and perpetually increasing revenues.

NOTES ON TIMBER IN THE CHURCHILL AND YUKON REGIONS.

The amount and extent of the timber in the less-known parts of Canada, especially in the Far North, is a topic on which a good deal of speculation has been indulged in and on which information is urgently required. In many quarters it is believed that there is in these northern latitudes an immense supply of timber, especially spruce; but, as further knowledge of this country is gained, the facts do not always seem to warrant this view.

During the past summer the Geological Survey of Canada had two of the members of its staff exploring in northern Canada. Mr. Wm. McInnes travelled along the Churchill River, starting from Stanley and reaching as far as the north end of South Indian lake. Mr. J. Keele has lately returned from a two years trip in the north, having gone in during 1907 and wintered in the Yukon territory, coming out this summer.



View in Valley of Ross River, showing black spruce and white spruce of inferior quality and small size. Characteristic of most of the forest growth of the valley.

[Photo by J. Keele

Mr. McInnes reports having found very little timber of any size along his route. The only large trees he found were a few scattered white spruce left on islands where they had escaped the ravages of fires, and on some isolated points. The greater part of the country has been repeatedly burned over, the fires originating from the carelessness of travellers, white and Indian. It is now occupied by second growth, thirty to sixty years of age. This growth consists principally of poplar—aspen on the higher ground, balm along the immediate shores of the rivers—with some white birch and jack pine on some of the dry and sandy ridges, and black spruce and tamarack on the more swampy areas. There is not much white spruce growing up, Mr. McInnes thinks. The larger specimens of black spruce would not run more than eight to ten inches in diameter about three feet from the ground; and the general average would not be more than six inches—in fact, would be less than six inches.

There is little or no timber fit for sawing, and there is no great timbered area along the river. Near South Indian lake there are occasional points along the river where large white spruce are found up to 16 inches in diameter. Along the Churchill, too, the rate of growth is very slow.

On the neighboring rocky hills the timber is small and the forests are everywhere second-growth. About halfway up South Indian lake the northern limit of Banksian pine is reached, while the balsam does not go quite as far north. The timber at a distance from the river everywhere seems to be small, stunted stuff. In the swamps it is small black spruce and tamarack and on the ridges jack pine, aspen and white birch, nowhere exceeding five inches in diameter.

The larch in this region has not been attacked by the sawfly at all.

Mr. Keele started in from the west, going in the summer of 1907 to Dawson by way of Vancouver and Skagway. From Dawson he went up the Yukon as far as the Pelly river and ascended this river as far as the Ross river, one of its principal tributaries. In the spring he crossed the watershed to the Gravel river, a tributary of the Mackenzie and then came down this latter river to civilization again. The winter he spent in a winter camp on the Ross river.

Through all the country the white spruce was found to be the chief tree,and a tree of 18 inches diameter is a relatively large tree. The average diameter of the trees grown along the river, he estimates, would be about twelve inches. The timber is, of course, easily put into the water, and that growing along the Yukon can be rafted down to Dawson. In pretty nearly every case the good timber constitutes only a narrow fringe along the rivers; as one goes back from the river, the timber becomes very scattered

and of small size. This fringe of timber varies in width from a few yards to a mile or more, its width depending on the width of the flood plains formed by the river. On these plains the soil is kept open so that the tree can grow; above the line where the spring freshets come, the moss comes in and effectually checks tree growth.

On the Klondyke the timber is entirely stripped. On any of the streams of the region there is so little timber that, if there was any considerable travel and parties began to use the timber for building and repairing boats, erecting cabins and other uses, all the sizable timber would very soon be used up. The country through which the party passed, could never, in Mr. Keele's opinion, be depended on as a source of timber.

On the Pelly river Mr. Keele's party saw a very disastrous fire burning in the fringe of good timber along the river. This had probably arisen through the agency of Indians; at any rate it was burning as they passed up the river, and there was no white man in at the time. There is not much trace of forest fires in former years; as a general rule the country is pretty green. On the Gravel river, from the divide to the Mackenzie, there were no fresh fires seen.

Here, again, the rate of growth was found to be very slow. As regards the size of the timber, that on the river bottoms would average about ten inches and that on the hillside about seven inches in diameter.

Almost all the Athabaska and Slave river country is very poor; it has been repeatedly burned over, and there is much need for fire protection. An incident of the party's journey here, too, was a visit from one of the rangers employed by the Dominion Forestry Branch to patrol along this river.

ELK IN LAURENTIDES PARK.

Under direction of Hon. A. Turgeon, Minister of Lands and Forests of the Province of Quebec, an attempt is now being made to stock the Laurentides National Park with elk. Some years ago Messrs. Holt, Renfrew & Co., the well-known fur dealers of Quebec city, imported for their zoological garden at the Montmorency Falls, a couple of elk, which have since that time increased to quite a herd. Hon. Mr. Turgeon has succeeded in prevailing upon the owners of the herd to transfer it to the ownership of the Province, and about the middle of November the entire herd was transported from Quebec to Baie St. Paul and turned over to the wardens of the Laurentides National Park, who will have charge of the animals in future. Strict regulations will be made for their protection for the present.

CANADA'S TIMBER AREA: ANOTHER ESTIMATE.

Dr. Judson F. Clark, of Vancouver, B.C., formerly Forester to the Province of Ontario, delivered an address on the timber situation throughout the world before the Canadian Club of Guelph, Ont., on the evening of October 20th. Dr. Clark's address has been widely quoted (and misquoted) and commented upon in the press of the Dominion, and seems to have done its part in waking people up to a realization of the actual situation.

Dr. Clark drew attention to the fact that North America was the only continent whose exports in the timber line exceeded the imports; and in North America the United States and Canada were, of course, the only two countries which really contributed to the world's supply of timber. Speaking particularly of the United States, it was pointed out that while the exports were still maintained, and in late years even increased in volume, the imports had increased at a very much more rapid rate, and it was only a question of time, perhaps even of a decade, when the United States would pass from the ranks of the exporting nations and become an importing nation. It was also pointed out that the per capita consumption of timber in the United States increased from 150 ft. B. M. in 1850 to 450 ft. B. M. in 1900. The year 1907 saw the largest per capita consumption in the history of the trade. The gross consumption for 1907 was seven per cent. in excess of that of 1906.

Canada, the speaker thought, was greatly overestimated in regard to its forest resources. Various estimates of the forest area had been made from time to time, ranging from 200,000,000 acres to 1,657,000,000 acres. Doubtless this latter figure was intended to refer to the area on which trees occurred, rather than commercial timber areas, for without doubt it exceeded the total area in North America which could, in any commercial sense, be considered timbered. Dr. Clark gave it as his opinion that the actual cutting area, that is, the area on which are found forests of commercial value, as measured by present day logging standards, is probably not in excess of 100,000,000 acres. This would include the areas bearing timber suitable for pulpwood or saw-timber.

As regards the future of supply and demand for forest products, three things were to be emphasized: 1st, more efficient protection of the naturally grown forests; 2nd, decreased consumption of wood products; 3rd, increased production of timber by growth. The first and third would result in placing the administration of the forests in the hands of trained foresters.

The consumption of timber products, which had been on the increase in all countries for upwards of half a century, must presently reach its maximum and thereafter greatly decrease.

There was but one way in which a decrease of consumption could be brought about, and that was by an increase in prices until a point was reached when a forced decrease in consumption could result. The highest point yet reached in lumber prices had not been sufficiently high to cause a decrease in consumption, but that this point would soon be reached is generally believed by students of our forest resources.

FOREST FIRES IN OCTOBER.

Continued drought in some parts of the Dominion throughout the month of October had its result in a continuation of the forest fires which had been so disastrous during the months immediately preceding. New Brunswick, Quebec and Ontario all report forest fires during the month, though the most serious tales of disaster come from the state of Michigan.

In Ontario, the city of Brockville was, on the 22nd of the month, reported surrounded on three sides. About the same time serious fires were reported from the country north of Fenelon Falls and the vicinity of Haliburton. Shortly before, fires had been reported from the vicinities of Woodbridge, Huntsville and Orillia. Serious fires were also reported from the Bruce Peninsula and from the near-by township of Keppel, in Grey County. An estimate made of the area burned over in the townships of Dummer, Methuen and Belmont, Peterborough County, rated it at 130 square miles.

In Quebec, Beloeil Mountain was badly burned over. At Nantel, near St. Jerome, the whole population had to turn out to fight the fires. Around Lac L'Achigan a fierce fire was raging, while large fires were also reported in the mountains near Lake Chapleau. St. Michel de Wentworth was threatened by the flames, which were also doing great damage on Stoke Mountain.

Near the village of Metz, Michigan, a horrible disaster occurred. Fires which had been burning in the bush around the village for some time finally reached the place on October 15th, and a relief train was sent out to bring the inhabitants to a place of safety. When the train pulled out, with about a hundred persons on board, the flames were already consuming the village. After having proceeded a few miles the train reached a place where the ties had been burned out and where piles of ties were burning on each side of the road. Here the rails spread, the train was derailed and the cars caught fire. The greater number of the passengers and crew managed to fight their way through the flames to a place of safety, but sixteen lost their lives, chiefly women and children. Many other serious fires were reported from the northern peninsula of Michigan.

MR. A. T. DRUMMOND'S SUGGESTIONS.

Mr. A. T. Drummond, of Toronto, has lately sent to many of the prominent newspapers of the Dominion a letter, with memorandum appended, which has been widely published, and met with considerable favor. In view of the damage which the forests sustained during the past season, and the loss which is occasioned every season through fire, the memorandum is published herewith, and any further suggestions or criticisms from any of the readers of the JOURNAL will be welcomed.

Mr. Drummond's memorandum is as follows:—

The first point to consider is that forest fires are preventable. They occur chiefly in August and September, but the hot weather and lessened rain of these months do not furnish the cause of these fires, but merely supply conditions under which they spread more rapidly.

THE CAUSE.

The cause, with, possibly, but a rare exception in the case of lightning, is entirely traceable to sparks from locomotives or factories, to railways, railway contractors and settlers clearing land, to neglected camp fires, and to the unextinguished match. In this supposed age of intelligence, when men can foresee the consequence of their neglect, it is not right that the carelessness of some individuals or corporations should bring upon the country losses amounting constantly to hundreds of thousands of dollars, and, in recent cases to millions of dollars, and should go unpunished.

LEGISLATION SUGGESTED.

It may be difficult to prove the neglect, but the moral effect will be very marked in every railway or settler's clearing and around every camp fire, if a law is passed making it an offence punishable with imprisonment to neglect to maintain a guard over the burning stumps or brushwood, or to leave guarded camp fires, or to put them out entirely before departing.

The present Criminal Law relating to neglect only applies to such negligence as shows the party to be reckless or wantonly regardless of consequences in setting fire to any forest or tree, and is not of general application to all property—Crown domain or private. Under this law there can be practically no conviction. What is wanted is a prescribed course of action for the protection of all forests, and the penalty if it is not adopted.

A PATROL SYSTEM.

The protection which the Dominion and Provincial Governments can furnish is by establishing forest wardens in each given number of square miles, similarly to what is now being done in some parts of Ontario. Their duties, among others,

would be to protect the timber and the fish and game, to see that hunters, prospectors and other campers are made aware of and fulfil their obligations, and, in the case of fires, to secure assistance to prevent their spread. On properties under license to lumbermen, one-half of the cost of maintaining the forest wardens should by law be made payable by the holder of the license, and not left to his option, and it should be the right of the Government, and not of the licensee, to fix the number of such forest wardens. Where properties are owned by private individuals or corporations in the midst of the forest, they should pay for this protection in the same way, and the amount be made, like taxes, a first charge on their land.

Brush Burning.

Every lumberman by the terms of his license should be compelled, under a large penalty, to clear up and dispose of his brushwood before breaking up camp at the close of the winter.

The Punishment for Carelessness.

The Criminal Law of the Dominion should be so changed as to make punishable by imprisonment what is now too often, with little thought for consequences, regarded as being but a trifling neglect.

Thus it should be made punishable by imprisonment if campers do not keep constant guard over their fires and entirely extinguish them before breaking up camp.

Every settler, lumberman, railway contractor or railway company, when clearing land, should, under a similar penalty:—

(a) Be forbidden to set fire to any standing tree or to any stump over four feet high, or to any stump or brushwood nearer than twenty-five feet from any standing tree or trees.

(b) Be compelled to clear away all brush, grass and leaves to a distance of fifteen feet around any stump or collection of brushwood before setting fire to it.

(c) Be compelled, during August, September and October, if not always, to keep proper persons on watch day and night on the land being cleared until all fires on the clearing are extinguished.

All mills, factories and locomotives operating in wooded or forest country must, under a penalty, have on their smoke stacks, spark protectors of a mesh to be fixed by the Government.

Railway companies, mills and factories operating with steam power in wooded or forest country, should, under a penalty, be made responsible for the protection from fire of the woods or forests within a given distance of their respective tracks or buildings.

FORESTRY IN IRELAND.

The report of the special departmental committee on Irish Forestry, published in April last, contains much information about the state of the forests in the Emerald Isle and many recommendations for their improvement. The committee consisted of eight members, authorities on agriculture and forestry in Ireland, the best known among them to students of forestry being W. R. Fisher, M.A., one of the instructors in forestry at the University of Oxford. The report of the committee is a unanimous one.

The committee find that, through neglect, the proportion of woodland in Ireland is too low for the welfare of the country, and yet is being constantly diminished. The area of woods in 1907 was 306,661 acres, and was steadily shrinking from year to year. The quality of the woods was also deteriorating from harmful methods of cutting. In 1903 an exceptionally heavy storm threw a lot of trees; these had to be placed on the market, where prices were rising in sympathy with advances in the European market, and this made the situation even worse, through the over-cutting in sympathy with the very active demand.

The area of woodland necessary for the agricultural and industrial requirements of the country the committee places at 1,000,000 acres. In addition to the existing 300,000 acres of woodland, surveys made for the Department of Agriculture showed 200,000 acres of plantable land in large blocks and 500,000 acres of land in smaller blocks. State action, the committee believed, was necessary, and this action could be carried through by the Department of Agriculture and Technical Instruction, with a strengthened Forestry Section. Through the operation of the Land Purchase Acts, an exceptional opportunity is now afforded the state of acquiring more land.

The 200,000 acres of land in large blocks, above referred to, should be acquired, planted and managed by the central Forestry Authority; the smaller woods and blocks of plantable land should be acquired and planted by the County Councils, loans being made to them for this purpose, when necessary, by the central government; furthermore, encouragement should be given private owners to plant up part of their holdings. The net expense of the scheme recommended were estimated to be as follows: during the first decade, £44,525 per annum; during the second decade, £66,725; during the third decade, £74,600; during the fourth decade, £67,100; during the fifth decade, £32,600; after this period the scheme would provide a surplus, and would eventually yield a return of 4½ per cent. on the investment. A scheme for financing this expenditure has also been worked out by the committee.

The state of the export trade resembles Canadian export of pulpwood in one respect, namely, that practically all of the wood exported is taken from the country in the unmanufactured state, as trunks and logs. The total export of timber amounted to 72 per cent. of the timber cut.

The committee are satisfied that natural conditions in Ireland favor the re-forestation of the country, and cite the examples of Denmark and Belgium, both much smaller than Ireland, as having largely increased their forest areas during the past twenty-five years, the former by 175,000 acres, the latter by 70,000 acres. "If this policy be sound for these countries, it is not unreasonable, in all the circumstances, to suppose that it should be equally sound for Ireland; and, if she only has the land to spare for the purpose, the devotion of, say, five or six per cent. of her total area to securing a supply of home-grown timber would appear to be no more than a very modest aim for any policy of the kind."

The lack of organization in the Irish timber industry is specially noted; "not only is there no systematic business management applied to the woodlands by those who own them, but amongst those who buy and saw the timber, speaking broadly, there is an absence of the most elementary features of modern commercial organization."

The need of technical instruction in forestry is noted as "the chief indispensable requisite, without which no great scheme of forestry development can be successfully undertaken." The committee recommend that the provision for the training of working foresters and woodmen already made at the Forestry Station at Avondale and the higher technical training partially provided for at the Royal College of Science, Dublin, be extended.

Afforestation of waste lands in Great Britain is demanding increased attention, suggestions being made that it may serve to solve, in some measure, the problem of the unemployed in the Motherland.

By special legislation and proclamation of the Governor, the commencement of the hunting season in Vermont (where severe forest fires have raged this fall) was delayed until November 8th. This action has been taken because, in the words of the proclamation, "by reason of drouth the use of firearms in the forests of the State of Vermont is liable to cause forest fires."

See article by H. R. MacMillan] [Photo H. R. M.

The spruce forest at the Crow's Nest Valley, before fire ran through it.

JAPAN'S FORESTRY AND HER TIMBER NEEDS.

Japanese forestry and forest statistics, her timber requirements and the possibilities of Canadian trade with the countries of Eastern Asia generally are the subject of an interesting report written by Mr. W. T. R. Preston, Special Canadian Trade Commissioner to Japan, and recently published by the Department of Trade and Commerce. Extracts from this report follow:—

In discussing the lumber trade in Japan, it must not be forgotten that for centuries the governing authorities of the empire have had a clearly defined forestry policy. Large areas of the mountainous country have been regularly planted with the best known firs and pines, and timber cutting has been allowed only under very strict regulations. As a result of this wise policy, Japan is fairly well supplied with small timber.

Japan's Timber Area.

About 60 per cent. of Japan is occupied by carefully preserved forests. At present the forests that are immediately under government supervision aggregate 58,000,000 acres. Of this area about 30,000,000 belong to the state, 5,000,000 to the Imperial household, and 22,000,000 to municipalities, the Bhudist temples, Shinto shrines, and private individuals. But the timber on none of these holdings, except the portion that is the property of the Imperial family, can be cut without the explicit authority or permission of the government.

The following table shows in detail the ownership of forests and wild lands in Japan:—

	Forests.	Wild Lands.	Total.
State property—acres.....	29,449,534	1,074,327	30,523,861
The Imperial Household—acres.....	5,167,290	337,066	5,504,356
Municipalities, religious orders, temples and private individuals—acres.....	19,579,900	3,260,609	22,840,509

Japanese Lumber Exports.

Japan exports about Yen 13,000,000 ($6,500,000) worth of domestic lumber annually. The principal countries of export are shown in the following schedule:

TIMBER, LUMBER, BOARDS AND PLANKS.

	1905 Yen.	1906 Yen.	1907 Yen.
China	2,090,498	4,529,147	5,605,203
Korea	1,259,455	1,634,551	2,465,912
Strait Settlements	23	11,226	66,654
Asiatic Russia	4,492	61,240	34,236
Great Britain	125	30,050	201,954
Germany	556	.....	34,059
Belgium	.....	.....	105,644
United States	9,236	89,520	93,567
Australia	86	29,250	272,737

RAILWAY TIES.

China	1,036,963	1,622,498	2,439,689
Korea	81,525	7,002	215,185
Great Britain	.....	42,709	121,348
United States	75	.....	211,815
Canada	.....	.....	19,350
Mexico	.....	350,566	535,579

BOARDS FOR TEA BOXES.

China	1,933	913	13,133
Hong Kong	100,268	131,276	105,800
British India	352,759	495,960	407,816

SPECIAL USES OF JAPANESE WOODS.

The peculiar character of certain woods, having a singularly close grain and free from odour, has created this special demand for Japanese lumber for the purposes specified in the following schedule:

	1905 Yen.	1906 Yen.	1907 Yen.
Sleepers for railway	1,118,591	2,025,839	3,581,143
Boards for tea boxes	464,711	632,665	531,160
Match sticks or splints	118,411	132,285	169,282
Shavings for match box	57,174	73,205	86,142
Wood shavings	53,524	41,546	21,345
All other timbers, lumbers, boards and planks	3,384,819	6,423,769	8,945,739
Total	5,197,230	9,329,359	13,334,811

REVENUE FROM FORESTS.

The quantity of timber cut in the forests of Japan during the year ending March 31, 1907, was valued at 34,008,577 Yen, or $17,004,288 currency. As might be expected, the public treasury has considerable interest in the receipt of dues on all timber that is cut. Four years ago the receipts in the public treasury from this source amounted to 3,500,000 Yen ($1,750,000),

while last year no less than 12,000,000 Yen ($6,000,000) reached the treasury from this source. Each year, on account of the rapidly changing conditions in the life of the Japanese people and the erection of much better buildings than heretofore, the timber reserves are becoming more valuable. In fact the increase in the value of the local timber every year is almost incredible. This is recognized by the government to such an extent that last session important legislation was enacted by the Diet with a view of further protection to the forest reserves of the empire, as well as improving the regulations under which new forests are to be planted.

Private vs. Public Ownership.

The question is now being raised whether or not these forests can be more satisfactorily managed and operated by the state, or whether they should pass into the hands of private individuals. It is claimed from the economic point of view, that they would be better taken care of by private interested parties than by the state with its frequently changing personnel of government. The constantly increasing value of the peculiar timber that is grown in Japan, not only to the local market, but for a profitable export trade, will cause the authorities to move with great deliberation.

Rice Harvests Dependent on Forests.

But the preservation of timber areas means so much to Japan, in view of the necessity of great forests for the conservation of the waters so necessary in the irrigation of the rice fields, that it is scarcely within the range of possibility that the government will allow the control to pass into the hands of those who would have no other interest than to realise on their holdings at the earliest possible date. If by any means the mountains of Japan were stripped of the timber that grows so abundantly, and the possibility of a famine in the water supply thus brought within sight, the rice fields of Japan, from many of which two crops are now harvested every year, would seriously depreciate in value.

Why Foreign Lumber is in Demand.

The advancement, judging from a western standpoint, that is taking place in the customs and the habits of the people, and the changes that are being effected in the business and residential architecture in the centres of population, have created an enormous demand for timber and lumber, while the natural progress has also been followed by much more liberal regulations about the cutting of timber. This situation has naturally brought about comparatively large lumbering operations in the mountains of Japan; but, at the same time, it is right to say that the planting of new forests has been carried on with remarkable vigour.

Importation Necessary.

Japanese lumber has been unable to supply the current demand. The home product is naturally small and short, compared with foreign lumber, and more especially the lumber that is manufactured on the North American coast. The western lumber is long, and with its straight grain and light weight, in contrast to the short, though heavy weighted timber in Japan, is favoured by the Japanese for the many special purposes for which it is needed. The demand for large lumber, which only commenced a few years ago, was met by the enterprise of Oregon lumber merchants, and extensive and increasing importations have since been made to Japan.

Recent Imports of Lumber.

The following table gives the importations of western lumber in plank and timber to Japan during the last few years:

Oregon Pine, Fir and Cedar.

Year.	Boards. S. ft.	Value. $	Timber. C. ft.	Value. $
1902	902,490	23,645	134,526	70,572
1903	2,426,836	85,378	319,389	43,752
1904	1,355,120	40,197	301,839	137,798
1905	2,626,743	69,119	553,726	110,343
1906	787,549	27,844	473,400	151,265
1907	3,955,098	167,520	1,123,258	388,441

Last year the United States secured nearly 90 per cent. of this trade, amounting to Yen 948,000 ($474,000), while Canada's share was only 9 per cent., amounting to Yen 109,000 ($54,500).

The decline of the value of the importations between the years 1905 and 1906 was not caused by the demand being lessened, but the production in the sources of supply that year was said to be less than usual, in consequence of the weather conditions crippling lumbering operations on the western side of the Pacific Ocean.

Amount and Dimensions Required.

The marketable sizes of pine or fir are as follows:

For decking, 5 inches to 6 inches thick, 24 feet to 40 feet long.

For flooring, 1 inch to 6 inches thick, 12 feet to 24 feet long.

For tongue and groove, $\frac{3}{4}$ inch to 6 inches thick, 12 feet to 24 feet long.

The dimensions of the lumber that is required varies, but the following schedule gives the general standards that find the greatest favour among buyers: 12 inches by 12 inches, 14 inches by 14 inches, 16 inches by 16 inches, 18 inches by 18 inches, 20 inches by 20 inches, 22 inches by 22 inches, 24 inches by 24 inches square, and running from 25 feet to 60 feet in length.

The demand of lumber in these dimensions is large, and is certain to increase to an enormous extent. Canadian timber has an excellent reputation among dealers; it is believed to be better than that which is produced in any other part of the world.

The Imperial government through its public works, railways and naval yards, requires a very large quantity of the best qualities of pine and fir. The demand from this source is also likely to be very considerably increased from year to year. The Douglas fir from British Columbia will, beyond question, secure a market if proper facilities are available for placing the Canadian product in the East. The purchasing of lumber that is required for government buildings, railway work and naval constructions, is mostly done by tender.

The main purposes for which pine lumber is used in Japan are ship-building, car-building and in the erection of houses of foreign architecture. All these industries have developed with astonishing rapidity since the war with Russia, and the demand will undoubtedly be much greater in the future. A well-informed official of the Forestry Bureau of the Imperial government has expressed the opinion that the importation of foreign lumbers for ship-building alone will reach an annual value exceeding Yen 2,000,000 ($1,000,000) in the near future.

Of all the foreign timber which is intended for the special purposes indicated, the Douglas fir from British Columbia is by all odds the most desirable. In addition to the lumber that will be required for ship-building, an increased quantity will be needed for the government railways, not only in Japan, but in Formosa, Korea and Manchuria, all of which come within the sphere of influence of the officials connected with the Imperial administration at Tokio.

Needs of Exhibition of 1912.

Japan's great exhibition in 1912 will also give a tremendous impetus to the demand for foreign lumber. I have been informed by lumber dealers, that in the case of the great exhibition of 1912 alone, not less than 72,000,000 feet of various kinds of lumber will be necessary for the construction of the buildings. In addition to the particular requirements for the buildings that will be erected on the exhibition grounds, it is quite safe to say that the demand will be largely supplemented by the re-construction of buildings in Tokio, where Japanese architecture is giving place to foreign styles. In point of fact Tokio, a city of 2,000,000 inhabitants, is being practically rebuilt, great thoroughfares about one hundred feet wide, being opened the entire length and breadth of the municipality. The old-fashioned one-storey Japanese houses are being replaced by structures of two and three stories high, for which the Japanese lumber is quite un-

suitable. The larger lumber has, therefore, become an absolute necessity. The quantity that will be required for this purpose alone would keep all the mills in British Columbia in full operation for many months, if not for years.

Lumber Required for Ship-Building.

The forestry official referred to in a preceding paragraph has given the following figures as a conservative estimate of the quantity of lumber that will be required in the great ship-building operations now in progress, including the construction of docks, wharfs, and shipping facilities, approximately, 288,000,000 superficial feet. The different kinds of lumber that will be required are shown in the accompanying schedule:

"Sugi" (Cryptomeria)	136,944,000	48 p. c.
Pine ("Matsu")	29,808,000	10 p.c.
Oregon Pine or Douglas Fir	8,640,000	3 p .c.
"Hinoki"	25,488,000	9 p. c.
"Keyaki" (Zelkowa)	10,800,000	4 p. c.
"Kashi" (Oak)	70,560,000	24 p. c.
Teak	4,320,000	2 p. c.
Others	1,728,000	

Demands of the Asiatic Market.

The importation of lumber into Asia exceeds 125,000,000 feet annually. This totals at a rough valuation, c.i.f., about $3,500,000. More than 90 per cent. of this lumber comes to the East through foreign commission firms, every one of which adds to the f.o.b. price on the Pacific coast a much larger profit than the lumber manufacturers themselves are enabled to make.

Oregon pine finds a market all along the Asiatic coast from Hongkong to Newchwang, Dalny and Vladivostock. The whole of the vast territory, looking at the question both geographically and naturally, without the shadow of doubt, belongs to the Dominion of Canada.

During the next twelve months, China will require 125,000,000 feet of fir or pine. The railway will absorb about 35,000,000 feet, the house and general contractors will handle about 80,000,000 feet, and the dockyards and other special purposes will need about 10,000,000 feet.

And this will be only the beginning of trade. Within a very short time all the railways will be in the market for immense quantities of such materials as sleepers, and very long heavy lumber and timber for special sections of railway construction.

Competition from Australia and Western Asia.

On the question of railway sleepers for the railway in China, the Australian woods will be a factor in the market. The special characteristic of Jarrah, Karri and other hardwoods from beneath the Southern Cross are being pressed upon the attention of the railway officials. In addition there is also competition from the

hardwoods of Tonkin and Annam. But all of these are very expensive in comparison to the prices which can be quoted for Douglas fir. A trial of the specially treated creosote lumber from British Columbia may prove the adequacy of the treatment as a wood preservative. And if this should be successful, as it is claimed it will be, the demand for British Columbia lumber in the next decade or two will mount up into almost incredible calculations. In any event none of these competitive woods can compare with the Douglas fir for general purposes; the Canadian product has the length, the size, the strength of fibre and the freedom from blemishes.

GERMAN FOREST FINANCES.

Since 1900 Dr. Schwappach has annually compiled statistical returns of the German forests, which have increased from year to year until for the present year the figures cover an aggregate of 52.5 per cent. of the area of the German forests, as compared with 30 per cent. in 1900. The private and "corporation" forests are most scantily represented in the returns, only 9.1 per cent .of the former and 0.2 per cent. of the latter reporting.

Of the financial returns the highest per acre is that reported by the Murgschifferschaft, an association composed of twenty-five groups of private owners in Baden, whose forests are managed by the state administration. The return from these forests is $11.16 per acre, and the percentage of workwood 83. The area of the forests is over 12,000 acres.

Among private owners (several of whom have over 75,000 acres) the Prince of Furstenberg Donaueschingen is easily first with a return of $6.87 per acre.

Of the state forest, Wurtemberg leads with a net return of $6.00 per acre, Baden comes next with $5.18 and Saxony third with $4.96. Prussia gets $2.42 per acre and Bavaria $2.46.

Of the communal forests Kreuzberg, in Bavaria, gets the highest returns, with $8.12 per acre. Several of these forests are above or nearly up to the $6.00 per acre mark; such as Villingen, Baden, with $6.27 per acre, and Habelschwerdt, Silesia, with $6.01 per acre. Arnswalde, in Brandenburg, and Weissenburg, in Brandenburg, are just below the $6.00 line. One communal forest, however, produces but sixty-six cents per acre, and throughout there is the greatest variation shown. The largest of these forests, Goerlitz, in Silesia, produces $2.53 per acre on 70,000 acres.

SPRING COLORING OF LEAVES IN INDIA

At this season of the year, when the trees of more northern latitudes are glorying in their autumn tints, it is striking to read of trees of India whose glory of color is displayed in the spring-tide, when the new leaves are coming on to take the place of the old leaves of the preceding season. A contributor to the Indian Forester writes as follows:

"Nature, whilst denying the trees of the evergreen zone the gift of producing showy flowers, has amply compensated the loss by the wonderful variety of color which she allows them to display in their young leaves during the season of re-robing. In fact, the shades of scarlet, carmine, pink, magenta, copper, bronze, brown, yellow, green and purple are so various, and, lying against the dark green leaves of yester-year, are so conspicuous, that any additional show of gay flowers would be a superfluity. . . . .

"Of all the trees of the evergreen zone, the "Sagade" (Schleichera trijugera) is the most conspicuous and beautiful object in this vast expanse of "God's eternal green." When the young leaves appear, early in January, they are of a bright scarlet color; and, as if they would show themselves to the best advantage, they congregate in bunches at the ends of the branches. The leaves of the old flush are now very dark green and form an admirable background. As the days go by, the scarlet changes to carmine, pink, salmon, copper, bronze, brown, yellow, yellow-green and bright green; but the transition, which begins at the base and proceeds to the apex of the leaf, is so gradual and the shades of pink, copper, etc., appear so imperceptibly and in such beautiful order, as to bring about variegation. The Sagade then looks like a gigantic bouquet; and the crown being naturally somewhat rounded only intensifies the resemblance. If the tree was lovely in its simple dress of scarlet and dark green, it is superbly attractive in its "coat of many colors.". . . . .

"The very young leaves of the 'Hagain' (another giant of the evergreen zone) appear in magenta frocks, and, being large (a fully matured leaf measures nine inches by four inches), they are very conspicuous. . . . . .

"All leaves are not born in scarlet; those of the Mango make their debut in the color of royalty, a very rich purple, which changes to bronze, brown-green and green. In their young life the leaves of the Mango possess a degree of polish which the foliage of few other trees can boast of."

FORESTRY PERIODICALS.

Eaux et Forêts.

In the issue of the *Revue des Eaux et Forêts* of October 1st Canada is accorded a place in the publication of a review of "La Côte-Nord du Saint-Laurent et le Labrador canadien," a pamphlet issued by the Minister of Colonization, Mines and Fisheries of the Province of Quebec, and extracts from a letter written by Mr. G. A. Piché on forestry in Canada. The former, the author of which is M. Eugène Rouillard, is summarized and quoted from. Extracts from, and comments on, Mr. Piché's letter occupy a couple of pages, among the topics touched upon being the work of the forest nursery at Berthierville, the Convention of the Canadian Forestry Association in March last, the progress of forestry sentiment in Canada, the need of a school of forestry in Quebec and the proposed addition to the area of the province.

Indian Forester.

The September number of the *Indian Forester* treats editorially "The Danger of Formation of Pure Forests in India," discussing not only the dangers arising from their greater liability to insect and fungus damage, but also that of soil deterioration for the single species by the accumulation in the soil of material toxic to the species; the value of the study of mycology is also insisted upon. "Forest Research in India," by E. P. Stebbing, discusses the need of research work on forestry lines and the research work at Dehra Dun already initiated by the Government, urges the establishment of research work by the provinces and notes the fields for forestry research work in silviculture, soil chemistry, zoology, mycology and forest products. The aims of research work are outlined and the loss of much knowledge, through the fact of its not being recorded, deplored. A. W. Lushington makes "A Plea for So-called 'Worthless Species'," on the grounds that their leaves and debris form soil and that they increase the height growth of more valuable species, and on the possible ground that they consume the poisonous excreta of the more valuable trees.

The October number presents the fourth of the series of papers on "British Forestry;" this deals with the treatment of existing high forests, so as to bring them into a productive state. Clear cutting with subsequent planting and under-planting are the courses advised; for the latter, beech, among the

broad-leaved trees, and the giant arbor-vitae (Thuja plicata) and Lawson cypress (Chamaecyparis Lawsoniana)among the conifers are recommended; silver fir and Norway spruce are not rated so high, being more liable to insect attack. An abstract of M. Ducamp's article (see Revue des Eaux et Forêts, May 15th, 1908), "La Marche Retrograde de la Végétation" is given. M. Ducamp contends that the destruction of forests brings about diminution of the rain-fall. Rainfall is dependent on evaporation and subsequent condensation of the moisture; evaporation from leaf surface, area for area, is sixty times that from water surfaces; and for any given area the leaf surface on it may be at least ten times as great. In this assumption, he reasons that if one-quarter of the land surface of the globe were covered with forest, there would be from these forests over fifty times as much evaporation as from the entire water surface of the globe. From this it becomes evident how the destruction of the forest, involving the destruction of so much leaf-surface, must affect evaporation and consequent condensation and rainfall. M. Ducamp's paper is also discussed editorially. The use of the bark of Terminalia arjuna (Kohar) for tanning, is described at some length by D. O. Witt. The "Acquisition of a Herd of Bison by the Government of Canada" is also noted. An account is given of a complimentary dinner to Dr. and Mrs. Schlich. Many minor topics of interest are discussed in correspondence and notes.

Conservation.

In the October number of *Conservation* Henry Garnett outlines the work in progress under the direction of the National Conservation Commission. In a well-illustrated article G. E. Browne describes very optimistically "Irrigated Land Opportunities" in the raising of grain, fruit and stock, methods of irrigation and necessary precautions to be taken by the purchaser of such lands. Martin L. Davey writes on "Tree Surgery," describing the work of the "tree surgeon" in filling cavities in trees (much as a dentist would in a tooth), preventing splitting at crotches, etc. "Our Waning Coal Supply," by General A. Warner, sounds a note of warning in regard to waste of coal, and "Navigation Resources of American Waterways," by Dr. Emory R. Johnson, presents the position of the water transportation system of the United States, compares its mileage with that of the waterways of England, France and Germany, and shows why the canals will be more used in future.

The November number opens with an article on "The Fraudulent Homesteader," by Alford H. Thayer, describing

some actual instances of acquiring homesteads illegitimately, as practiced in western states. Dr. John Mickleborough describes "The Blight on Chestnut Trees" (*Diaporthe parasitica*) now prevalent in a number of the eastern states of the Union, under the headings of botanical relations, method of growth, geographical distribution, extent of damage (estimated at $10,000,000) and remedies. Brief accounts, with resolutions in full, of the National Irrigation Congress at Albuquerque, N.Mex., and the Lakes-to-Gulf Deep Waterway Association at Chicago are given. President Kavanaugh's address at the latter is given in full. Dr. W. J. McGee contributes a paper on "The Movement of Water in Semi-arid Regions", and Mr. J. B. Case, President of the Trans-Mississippi Commercial Congress describes the needs of the country west of the Mississippi and what is being done to meet them.

In the December issue M. O. Leighton, in his article "Water-Power," treats of the recent flood in Augusta, Georgia, and the amount of energy there wasted (amounting, by his calculation, to 9,500 horse-powers), worth in money, $665,000, by the breaking away of water that could have been stored, and makes a plea for increased use of water-power in order to conserve the coal supply. George Otis Smith outlines the work of the United States Geological Survey in exploration and investigations and the publication of the results of these, shows the importance of its work in regard to the campaign for conservation of the National resources, and treats particularly of the share of the State of Maine in the National conservation. Dr. W. J. McGee writes of the "Bearing of the Proposed Appalachian Forest Reserve on Navigation." The figures of the 1907 lumber cut compiled by the Forest Service and the Bureau of the Census, are reviewed at some length. The Conventions of the Atlantic Deeper Waterways Association, and the Mississippi-to-Atlantic Deep Waterways Association are noted with resolutions given in full, and an account of some of the work of the Appalachian National Forest Association is also given. The report of the Water Supply Commission of Pennsylvania is reviewed, and Thad. C. Pound writes of the "Origin of the Reservoir System in the United States," the work carried out on these lines on some of the sources of the Mississippi and urges its extension. "The Forest Holocaust" is a symposium of opinions from the newspaper press as to the fires of the past season and means of preventing them.

Pulp and Paper Magazine.

In its November issue the *Pulp and Paper Magazine* in "The Truth about our Forests" discusses sympathetically Dr. Fernow's recent speech before the Canadian Club of Toronto, and in "Combine Methods" proceeds to differ with the Toronto *Star's* condemnatory articles. The proposed use of cornstalks for the making of paper is discussed guardedly and not in a very optimistic strain. In "A Survey" the attitude of Canadian legislators and legislatures toward forest preservation and regeneration is reviewed, and an interesting interview with Lord Northcliffe is synopsized in "Lord Northcliffe in Canada." The rest of the magazine is devoted to discussions of paper-making problems and topics.

Quoting the statement alleged to have been made by a prominent Ontario official to the effect that the past summer's fires in the province have done very little harm to valuable timber, because confined to sections from which the best timber had been taken, the editor comments as follows: "This is satisfactory as far as it goes—but that is not very far. What about the small stuff which in time would become big stuff? and what about the soil burned over? Fertility is worth a great deal, and much of that is destroyed by these unfortunate burnings. We cannot afford for the idea to grow that any fire is a matter of small importance." This comment expresses the true forestry idea of it.

Directors' Meeting. A meeting of the Board of Directors of the Canadian Forestry Association was held at the office of the Superintendent of Forestry, Ottawa, on Friday afternoon, November 20th. Mr. T. Southworth, Vice-President of the Association, occupied the chair, and there were also present Messrs. H. M. Price, of Quebec; Hiram Robinson, R. H. Campbell, J. M. Macoun and F. W. H. Jacombe, of Ottawa, and the Secretary, A. H. D. Ross, of Toronto. Resolutions of condolence to the families of Sir Henri Joly de Lotbiniere, ex-President of the Association, and Dr. Jas. Fletcher were passed. A resolution was also passed commending the Canadian Northern Railway for the care exercised in the burning of ties in Saskatchewan. The approaching annual meeting of the Society in Toronto was also discussed. A considerable increase was reported in the membership, which now stands at about 1,600.

REVIEWS.

Peat and Lignite: their manufacture and uses in Europe. By E. Nystrom, M.E., Department of Mines, Ottawa.

"The growing value of the forests for other purposes (than fuel), such as for lumber, pulp and paper mills, adds another reason for the development of our peat resources, especially as peal for fuel purposes is fully comparable to, and even superior to, wood."

The words just quoted from this publication (page 3) indicate the relation of the peat question and its interest to the forester, i.e., the possibility of the use of peat partly or wholly as a substitute for wood as fuel. The writer estimates that the amount of wood used annually for fuel amounts to seven and a half million cords, which, at $2.00 per cord, would be worth $15,000,000.

A peat bog with an average depth of six feet after drainage will contain, of air-dried peat, 1,210 tons per acre, or 774,400 tons per square mile. The usual ratio of 1.8 tons of peat being equivalent to one ton of coal makes these 774,400 tons of peat equal, in heating value, to 430,244 tons of coal. As Canada possesses, according to the late Dr. Chalmers, of the Geological Survey, 37,000 square miles of peat, the value of its peat bogs is easily apparent.

In several European countries, namely, Sweden, Norway, Denmark, Finland, Russia, Germany, Austria, Holland and Ireland, the manufacture of peat fuel and other peat products has been carried on on an economical basis for some time and the fuel used both for domestic and industrial purposes. The writer visited these countries and investigated processes, machinery used and other questions. The processes and machinery used therein have been fully described, with many diagrams and illustrations. An account is also given of the Government aid given to experiments in peat utilization. Some of the processes used in Canada are also described. With some surprise we read, "Russia has the largest peat industry in the world, with some 1,300 machine peat plants in operation." The manufacture and uses of moss litter, peat mull and other peat products are also briefly treated.

As to the use of peat for heating and steam raising, the author concludes, "Peat can be used advantageously instead of wood in any suitable apparatus. In fuel value one ton of ordinary coal is equal to 1.8 tons air-dried peat, or 2.5 tons wood."

Gas producers erected right at the bogs, where power can be generated are pronounced, "the most rational method of utilizing the peat bogs on a larger scale."

Production of Lumber, Lath and Shingles, 1907. *Washington, D.C., Bureau of the Census, in co-operation with the Forest Service.*

The report consists of two tables, the first giving the number of mills and cut of lumber, lath and shingles in the United States for 1900, 1904, 1905, 1906 and 1907. The second gives the number of mills and production of lumber, lath and shingles by species and states for 1906 and 1907.

In the number of mills reporting there is an increase in the figures of 1907 over those of 1906, from 22,398 in the latter year to 28,850 in 1907, or almost 29 per cent. In 1900 (the last census year), however, the number of mills reporting was 31,883.

The 1907 cut of lumber was about forty and a quarter billion feet; that of 1906 was about thirty-seven and a half billion feet; the increase is thus about 7½ per cent. The number of lath, on the other hand shows a decrease from 3,812,807 to 3,663,602, or a little less than four per cent. In shingles, again, there is a trifling increase from 11,858,260 to 11,949,927.

The cut of lumber is larger than that of 1900 (a little over thirty-five billion feet) by 5,172,000,000 feet, an increase of almost thirteen per cent. The number of lath manufactured in 1907 is forty-five per cent. more than the manufacture of 1900, having increased during that time from 2,523,998 thousand pieces to 3,663,302 thousand. The number of shingles shows not much difference.

The different species are, in Table 2, arranged according to the size of the cut of each, the order being as follows: Yellow pine, Douglas fir, white pine, oak, hemlock, spruce, western pine, maple, poplar, cypress, red gum, chestnut, redwood, beech, birch, basswood, cottonwood, elm, ash, cedar, larch (western), hickory, white fir (A. concolor), sugar pine (P. lambertiana), tamarack, tupelo, sycamore and black walnut.

Of yellow pine the total cut for 1907 was 13,215,185,000 feet; that for 1906 was 11,661,077,000 feet; the increase was thus thirteen and a third per cent., or over one-eighth. The cut of yellow pine is now triple that of white pine.

The greatest proportional increases in the cut are in the cases of the following woods: Chestnut, increase sixty per cent.; beech, fifty-six per cent. increase; red gum, fifty-two per cent. increase; tupelo, increase, forty-three per cent.; white fir, forty per cent. increase; hickory, thirty-seven per cent. increase; poplar, twenty-eight per cent.; larch (western), twenty-seven per cent. increase; ash, seventeen and a half per cent. increase. Spruce shows an increase of five per cent., maple of six per cent., and western pine of ten per cent. Sycamore is shown separately for the first time.

The white pine cut declined from 4,583,727 thousand feet in 1906 to 4,193,787 thousand feet in 1907, a decrease of eight and a half per cent. A slight decrease was also shown by Douglas fir.

The largest decrease was shown by cedar, of which the cut declined thirty per cent. Redwood, black walnut and sugar pine each fell off by about fourteen per cent., and smaller decreases were shown by cypress (ten per cent.) and tamarack (eight per cent.)

In shingles, the state of Washington continues to lead, with the rest of the field nowhere. This state manufactures nearly 6,900,000,000 shingles, while no other state reaches a billion. California puts out 887,626,000 shingles, Michigan, 855,749,000 and Louisiana 812,587,000.

Minnesota put out most laths, with a total of nearly five hundred million. Washington manufactures four hundred and thirty million, and Wisconsin, three hundred and sixty-four million. The other prominent states in this branch are Maine, Louisiana, Pennsylvania and Oregon, in the order named.

Condition of Cut-over Longleaf Pine Lands in Mississippi. By J. S. Holmes and J. H. Foster. United States Forest Service, in Co-operation with the Geological Survey of the State of Mississippi.

Pure forests of longleaf pine originally covered the whole of the southern part of Mississippi, except in the river bottoms where hardwoods held sway.

Exploitation was somewhat tardy, but of late has been carried on on a gigantic scale. Some of the lumbering concerns now look forward to only a few years of operation, and only two claim to have enough timber to keep them going forty years.

To-day Mississippi is third among the States in yellow pine cut, and fifth of all the states in lumber production.

Cutting has been unusually severe and almost invariably followed by fire. "More than half the longleaf pine land of the State has been converted into a blackened and barren waste" with little or no reproduction. A small proportion of the cleared land (annually increasing, however), is being taken up for agriculture.

"The better land will, in all probability, yield a crop of poles in from twenty to thirty years, or good saw timber in forty years," and the report urges that the land be reforested rather than allowed to remain waste. Where fire is kept out, reproduction is good; the number of seedlings in some areas ran 12,000 to 15,000 per acre.

While fire is far and away the most powerful enemy to reproduction, other enemies to the young trees are droves of hogs

which are allowed to roam the woods and destroy the seed and root out the seedlings to eat the roots, while the growth of scrub oak which follows fire often retards or even altogether hinders reproduction.

Public opinion needs to be aroused to the need for action. The State forest fire law is ineffective, largely because of public indifference.

The authors urge the provision of a law for the prevention of fires which will include adequate measures for its enforcements. To this end they recommend the appointment of a state board of forestry, non-political, having the Governor as its chairman; the appointment of a state forester; a county fire warden in each county, with all the peace officers of the country ex-officio fire wardens, and the distribution and posting of fire notices. Punishment for setting fire, or for failure to equip with spark arresters all engines operating in the bush is also recommended, in addition to civil liability for damages, all fines to be paid into the county treasury.

Wood Paving in the United States. By C. L. Hill. United States Forest Service Circular No. 141. *Washington: Government Printing Office*, 1908.

This circular treats briefly the question of wood pavements in the United States. Only within ten years have these been laid with success. Longleaf pine has been practically the only wood used for the purpose, the only important exception being in Minneapolis, where Norway pine and tamarack have been successful. After a short account of the history of wood paving, statistics of its use in the United States are given; on December 31st, 1905, the cities using it to a large extent were the following: Indianapolis (404,800 square yards); New York (178,264 square yards); Minneapolis (148,465 square yards); Toledo (131,451 square yards); Boston (47,500 square yards). The success of the later wood pavements is ascribed to (1) careful selection of wood as to kind and quality; (2) accurate cutting of the blocks; (3) thorough seasoning, and (4) preservation with creosote. An enquiry was made by the Forest Service as to creosoted wood pavements, as compared with other pavements. Points were assigned to each as follows: Cheapness (first cost), 14; durability, 20; ease of maintenance, 10; ease of cleaning, 14; low traction resistance, 14; freedom from slipperiness, 7; favorableness to travel, 4; acceptability, 4; sanitary quality, 13; total, 100. The pavements compared were the following: granite, sandstone, asphalt (sheet), asphalt (block), brick, macadam and creosoted wood. Of these the wood came first, with 80 points; its average cost per square yard ($3.10) was lower than granite

and sandstone, but quite a little higher than any of the others. Wood ranked very high in the qualities designated, except in freedom from slipperiness, and, to a less extent, in durability. Little data was at hand as to durability, but several known instances are cited. Creosoted wood and the asphalts are equal in the matter of traction resistance. "Problems in Wood Paving" are taken up under the following heads: The Wood, Use of Laboratory Tests, Creosoting. Sapwood, under preservative treatment, is found to be as good as heartwood. Creosoting, especially under the vacuum-pressure system, is highly recommended. Laying the pavement and its maintenance are treated, the former under the heads of Foundation and Cushion, Blocks, Angles of Courses, Joints, Filler and Top Dressing. An account is given of an experimental pavement laid by the Forest Service in co-operation with the city of Minneapolis and two Minneapolis firms, the woods used being longleaf pine, Norway pine, tamarack, Douglas fir, Western larch, white birch and hemlock.

Thirteenth Annual Report of the Forestry Commissioner (formerly Chief Fire Warden) of Minnesota. St. Paul, Minn.

During the year 1907, of which this report treats, Minnesota was very fortunate in regard to forest fires, the damage reported from them amounting to only $16,145, while prairie fires did damage to the extent of $23,942. Of the fifty-five fires reported, eight were reported to have been caused by locomotives, the same number by hunters, three by clearing land. The causes of twenty-nine fires (over half the whole number) are reported as unknown.

The report briefly summarizes the provisions of the fire protection law as follows: "Town supervisors, mayors of cities and presidents of village councils are constituted fire wardens under the law; they are every year instructed in their duties under the law, and cautioned to use their efforts for the prevention and control of fires. They are paid for investigating and reporting fires; they are liable to a penalty for failing to report forest and prairie fires in their districts. In unorganized territory wardens are appointed by the Forestry Commissioner, where there is a suitable person whose services can be obtained."

The average damage from forest fires during the thirteen years during which this law has been in force has been only $29,819 annually.

A report is given of visits paid by the Commissioner, General Andrews, to various forested parts of the state. An interesting note on jack pine reproduction is here given: "Three miles east of Hinckley (the scene of the great forest fire in 1894) I saw a tract of several hundred acres of close standing

jack pine, about ten feet high, intermixed with Norway pine and with poplar, which has grown since 1894. . . . . Owing to the quality of the soil, some of the pine which I have mentioned will be large enough to cut in twenty-five years."

Regarding the same locality the report has another interesting note on wood distillation of red pine stumps. A plant for this industry, using a process of Russian invention, is located some miles east of Hinckley. "Only Norway pine stumps are used, and they must be old enough to have the sap-wood decayed. The company pays $4.00 for 3,000 pounds, reckoned a cord, of stump and roots; and the product from such quantity is 40 bushels of charcoal, 25 gallons of turpentine, 20 gallons of tar and some citric (*sic*) acid."

An attempt was made, by circularizing the manufacturers, to secure statistics regarding the cut of timber in Minnesota for 1907-1908, the first attempt of the kind ever made. The results, while estimated as 25 per cent. below the actual output, are interesting. They are as follows:—

Pine	800,000,000	feet
Mixed timber (including ash, balsam, birch, basswood, cedar, poplar, pine, spruce and tamarack	79,000,000	"
Poles	213,028	pieces
Ties	3,565,750	"
Posts	1,754,500	"
Pulpwood	151,890	cords
Wood for fuel	77,580	"
Mine timber	500,000	feet

The number of lumber camps in the state was 529; they employed 19,575 men at an average wage of $26 per month and board.

A prominent place in the report is given to General Andrew's plan of forest planting for the state. His aim seems to be to plant up some 37,500 acres per year. The cost of planting is estimated at $6.00 per acre, on the basis of two men planting an acre per day. The land is estimated to cost $2.50 per acre, except some school land for which $5.00 per acre at least would have to be paid. In addition to the ordinary revenue, the Commissioner advocates a tax, in addition to the ordinary revenue, of three-tenths of a mill on all taxable property in the state. A number of letters from prominent Minnesotans, approving of the plan, are published.

Tax exemptions on private woodlands is also discussed.

Extracts from the report of the United States National Academy of Sciences on the inauguration of a forest policy for the United States are also given.

A large part of the volume is given over to sketches of forestry in European countries.

The act of Congress changing the boundary of the Minnesota National Forest is given in full, as is also the recent decision of the Maine Supreme Court in regard to the power of the state to regulate cutting on private land.

Deer Farming in the United States. By D. E. Lantz, Assistant, Biological Survey. (United States Department of Agriculture, Farmers' Bulletin No. 330). Washington, Government Printing Office, 1908.

This bulletin discusses the economic possibilities of raising deer and elk in the United States. "The raising of venison should be, and is naturally, as legitimate a business as the growing of beef or mutton."

A comparison of the chemical constitution of venison, beef and mutton gives the following results:—

	Water.	Protein.	Fat.
Venison (lean).....	75%	20%	2%
Beef (lean).....	65 to 70%	20 to 23%	5 to 14%
Mutton (lean).....	67%	19%	13%

The general popularity of venison is so great and the demand for it so widespread that over-production is improbable. The reindeer is the only member of the deer family that has ever been completely domesticated; but, on the other hand, raising deer for profit does not necessarily imply their complete domestication. Generally speaking the species native to America are to be preferred for breeding, though some species have shown themselves very adaptable to very different conditions. Similarity between the natural and artificial habitats is an important factor in the choice of a species..

The wapiti, or Rocky Mountain elk (Cervus canadensis), and the Virginia, or white-tail, deer (Odocoileus virginianus) are recommended as the species best suited for the production of venison in the United States. The former once ranged northward as far as the Peace River region, but its range is now greatly restricted. The habits of the animal, its venison, its domestication and its management in enclosures are briefly treated, and the experiences of breeders quoted. Stress is laid on the ability of the elk to adapt itself to almost any environment.

The Virginia deer is described under similar headings.

An important point with both animals is their rate of natural increase. The increase of elk under domestication is about equal to that of cattle; of the Virginia deer, one breeder writes: "From fifty does one can count on seventy-five fawns." Another breeder puts the average annual increase down at seventy per cent.

Restrictions imposed by State laws on the killing, sale, and transportation of the deer are declared to be the greatest hindrance to the inauguration of the industry.

A system of licensing private parks and of tagging deer or carcasses sold or shipped so as to provide for easy identification is recommended.

The game often forms an important item in the revenue of a German forest, where the number of wild animals is carefully regulated. No doubt this will in time be true of American forests.

Check List of the Fishes of Ontario. By C. W. Nash, Department of Education, Toronto, 1908.

In a volume of 122 pages Mr. Nash presents a complete list of the species of fishes found in Ontario, with full technical descriptions and short notes on distribution and other particulars. The volume is well illustrated with photogravures of many of the species named. The classification and sequence of groups followed is that of Jordan and Evermann, to whom the author also acknowledges his debt for the technical descriptions. A glossary of technical terms is appended.

Les sols forestiers (The forest soils). By M. Henry, Professor of Natural Sciences at the Ecole des Eaux et Forêts, Nancy, France.

The nature of the plants cultivated on the forest soils and also the mode of harvesting them differ so much from those peculiar to agricultural lands that it was indeed necessary to study them separately. Up to the present, our only knowledge of forest soils was gathered from manuals of agriculture and some scattered studies of this subject.

M. Henry, Professor of Natural Sciences at the Ecole des Eaux et Forêts at Nancy, and also General Secretary of the Society of Agriculture of France, has just published a book on forest soils which will be a valuable addition to any forester's library. In this good-sized volume of 492 pages the reader will find a full discussion of the different elements of the soils, their mode of formation, the various actions of the forest cover, the different properties of the soil, its possible exhaustion by the growth of timber, together with a substantial review of the distribution of forests in France according to geological formations. A few types of forest soils are also described, as well as the method of ameliorating them.

The style is simple and without any pretention. The book should be read without much trouble by any one having some knowledge of French.

The illustrations are good—better, indeed, than are usually found in European books—and a goodly number of diagrams and maps are also given. G. C. P.

CORRESPONDENCE.

PETITCODIAC, N. B.

A. H D. ROSS, ESQ.,

Dear Sir:—I enclose membership fee of $1.00 to Canadian Forestry Association. I am glad to become a member of such an association. I wish it every success.

I would like to see it adopt a vigorous policy—a policy of education, of course, but also, as far as is possible, a legislative policy. The legislators of this country are no more alive to the urgency and importance of adequate fire protection than are the people. The forest wealth of this province has in the last twenty-five years been reduced perhaps 60 per cent. and the destruction goes on. Fire protection in this province does not protect. Any fool with a grievance against a lumbering concern may set a fire. Careless sportsmen leave camp fires burning; careless and ignorant farmers setting fire to stump fields and leaving the flames to wander at will, sparks from passing locomotives, all contribute, according to the dryness of the season, to the great annual loss by fire.

Now, it seems to me that this might all be controlled—largely so, at any rate—by legislative enactment. The number of fire rangers should be increased to at least one in every settlement, in which case the annual pay to such need not be large. His time would not be devoted to the work, but he could ascertain the cause and location of every forest smoke noticeable in his territory, and he should have authority to summon to his assistance as many men as the emergency might require, etc., etc.

Regulations with regard to fire should be ordered read in the public schools, at least once a week during the season of danger, besides which the children should have regular instruction as to the great loss by fire to the lumber itself, to the land, its effect in drying up springs and streams and its effect on climate. Men, qualified to speak, should be sent all through our provinces to lecture on the great need of forest preservation. Literature on the subject should be sent at the expense of the government to every home. In many ways, the subject should be kept constantly and forcibly before the public.

I sincerely hope your society will do more than theorize. I hope it will act and act energetically.

Very respecfully yours,

G. W. FLEMING, (M.D.)

(Extract from a letter from Dr. Murray McFarlane, 18 Carlton St., Toronto.) I have always taken an interest in Forestry, and have just returned from a trip to Algonquin Park, which I consider will prove a most valuable asset to Ontario, provided some steps can be taken to prevent the cutting of the hardwood forests. That would be criminal in the face of the resultant damage to the northern water courses. After having seen the splendid forestry work of France, Saxony and Austria, it grieves me to see the slow progress we are making towards saving our timber.

NOTES.

The Ogdensburg (N. Y.), Soda Pulp Company has secured a large quantity of sunken pine in the Rideau Lakes region of Ontario. The pine is said to have been completely submerged for some eighty years, but is still sound. The company will raise the logs with dredges and take them to Ogdensburg for use in its mills. They expect to recover some 500,000 cords.

"Arbor Day" is gaining some hold in Ireland, celebrations having been lately held at Dublin, Doneraile, and Portumna.

BRITISH COLUMBIA FIRE PROTECTION. The British Columbia Timber and Forestry Chamber of Commerce held its annual meeting on November 11th, when the following officers were elected for the ensuing year:— Hon. President, Mr. Wm. Shannon; President, Mr. E. P. Bremner; 1st Vice-President, Mr. M. S. Logan; 2nd Vice-President, Mr. Wm. Ellis; Secretary-Treasurer, Dr. J. F. Clark. Mr. Bremner, President of the organization, highly commended the efforts of the Dominion Government to conserve the forests of the Railway Belt, efforts which he declared "worthy of every commendation." It was decided to appoint a committee which would represent the British Columbia Forestry Association, the Loggers' Association and the Lumber and Shingle Manufacturers' Association, for the purpose of drafting an outline of suggested amendments to the Bush Fires Act of the province.

NEW BRUNSWICK MODIFIES REGULATIONS. A change in the timber regulations of New Brunswick, lately announced by the surveyor-general of the province, Hon. W. C. H. Grimmer, reduces the minimum size of the logs allowed to be cut on crown lands of the province from eighteen feet in length, with a diameter at the top of ten inches, to sixteen feet in length, with a diameter at the top end of nine inches.

ETHYL ALCOHOL FROM WOOD. A new process of treating wood has been perfected by some United States inventors by which it is claimed that ethyl alcohol, identically the same as that now produced from grain, can be produced from wood, and that at a cost of about seven cents per gallon. The cellulose of the wood is converted into sugar by the action of sulphurous acid gas (produced by burning sulphur), and the sugar then fermented into alcohol. The wood, in the shape of sawdust or of chips, is placed in a large digester, holding four or five long tons of the material; the sulphurous acid gas is then introduced, followed by live steam. The digester is then set revolving, with the steam still applied, and forty minutes of this treatment serves to convert the cellulose of the wood into sugar. After the gas and steam are blown off the treated wood is placed in a filtration battery, where streams of water flow through the material and dissolve the sugar, and the solution is then fermented. Other by-products may be also obtained, as turpentine in the case of long-leaf pine. A series of experiments on long-leaf pine have given about thirty gallons of the alcohol to the long ton of wood. The wood waste, after treatment, can still be used as fuel or for dry distillation.

MICHIGAN FORESTRY. The Michigan Forestry Association held its third annual meeting in Battle Creek, Mich., on Tuesday and Wednesday, November 10th and 11th. Forest fires occupied a large part in the discussions, and the need of more forest reserves and the taxation of woodland areas were also treated at length. The officers elected were as follows:—President. J. H. Bissell, Detroit; Vice-President, Morrice Quinn, Saginaw; Secretary, Henry G. Stephens, Detroit; Treasurer, W. B. Mershon, Saginaw.

UNIVERSITY OF TORONTO NOTES. The members of the staff and the students of the faculty of forestry of the University of Toronto have formed a "Foresters' Club," with the following officers: Hon. President, Dr. B. E. Fernow; President, J. H. White, M.A.; Vice-President, T. H. Dwight; Secretary-Treasurer, F. M. Mitchell; Committee, R. Jarvis, R. L. Campbell. They will meet regularly to discuss forestry topics, and hope to have men prominent in forestry to address them at these meetings. The colors of the faculty will be the University colors, with the addition of green.

The faculty of forestry and department of botany have now moved into their new building, which was opened with a reception on November 26th, at which Prof. and Mrs. B. E. Fernow and Assistant Prof. and Mrs. Faull received the guests.

The total enrolment of students for the session is twenty-eight.

FOREST FIRES FROM SMOKERS. Speaking at the late annual meeting of the Michigan Forestry Association, John J. Hubbell, of the Manistee & Northeastern Railroad, claimed that forest fires originate far more often from the smoking cars than from the locomotives, and suggested putting wire screens over all windows in smoking cars and compartments, to prevent matches and cigar stubs from going outside. He suggested also the prohibiting of employees smoking along the right of way and of the carrying of matches loose in the pocket.

"This great state, with its two and a half millions of generous and well-meaning people, with abundance of wealth and credit, stands idly by while one-half the state is wrapped in fire and smoke. Michigan as a state neglects to perform the fundamental function of all government—the protection of the lives and property of its citizens.

. . . . . .

"Has the state used the power to stop them? Have the counties offered organized resistance to this danger? Have they made any effort to find and restrain the men who set them and to combat the fires when started? From all accounts, no. The settler, the owner of the timber, was left to fight as best he could. Everybody's business was nobody's business; the fires multiplied; the dry season made their spread easy and the whole matter was allowed to grow into a repetition of the disasters of 1871 and 1881."—Prof. F. Roth, State Forest Warden, at the meeting of Michigan Forestry Association.

ENGLISH FORESTRY INSTRUCTION. The School of Forestry in the Forest of Dean, England, has now passed out of the experimental stage and been placed on a permanent basis. The school was established in 1904, and up to the end of 1907 had graduated nineteen students, who are now holding positions as Crown woodmen, foresters on private estates and similar positions. The minimum age of admission has been raised to twenty years, and the students are now paid fifteen shillings per week instead of ten shillings as at first. Practice areas, a nursery and experimental plots and a museum are part of the equipment of the school.

QUEENSLAND FOREST STATISTICS. The State of Queensland, Australia, has now a total of 3,255,571 acres (a little over 5,000 square miles) in its timber reserves. About 500,000 acres were permanently set aside as State forest reserves during 1907. The forest revenue has risen from £14,560 to £22,250. The timber cut for 1907 was 91,200,279 feet, of which 57,274,629 feet were hardwoods and 33,925,650 feet were softwoods.

CANADA'S TIMBER WEALTH.

"Canada is not, as the school geography states, rich in timber. Compared with its size or with the timber lands of the United States, it is rather poor, if by timber you mean trees of size that may be cut into logs for lumber or otherwise shaped for use in the arts. Undoubtedly, Canada is a woodland country; tree growth of some kind covers, perhaps, more than fifty per cent. of her area; but if commercially valuable forest growth is considered, land covered with or capable of producing timber of sawmill size, located in sufficient quantity and accessible for commercial exploitation, not ten per cent. will be found to be of that description. The fine British Columbia timber of which the world has heard so much occupies only about 6,000,000 acres. The timber region on the Pacific coast lies within an area of probably 75,000 square miles, and that on the Atlantic is within an area of 240,000 square miles south of the Height of Land, or altogether 200,000,000 acres. The actual area of commercial saw-timber is not known, but probably does not exceed 50,000,000 acres in British Columbia, with a stand that may be reasonably estimated at 300,000,000,000 feet. A like amount may possibly still be found in the east. This estimated "stand" of 600,000,000,000 feet represents not more than fifteen to twenty years' requirements of coniferous material for the United States. A large amount of pulpwood remains, but much of it is not at all available under present conditions of transportation and development. This is undoubtedly the most valuable portion of the eastern forests, and it is to be hoped that a wiser management of this national property may be inaugurated than has so far been had in the disposing of the timber."—Dr. B. E. Fernow before the Canadian Club of Toronto.

MR. PINCHOT ON FIRE PROTECTION.

"If the New England forests need to be protected against the careless use of the axe and saw, which, at least, takes useful material from them for a time, how much more do they need to be protected from the total waste of fire! Yet, in spite of some excellent forest fire laws in several of the New England States, and also in New York, the ineffectiveness of present fire protective methods has been made startlingly clear during the last few months. It seems to me, emphatically, that the fire problem is best solved by means of an efficient fire patrol and fire-fighting force, paid for this work and mainly dependent on it, such a force as does not now exist anywhere, to my knowledge, outside of the national forests."—*Gifford Pinchot, Forester of the United States.*

FORESTRY IN BULGARIA. The little principality of Bulgaria, long under the sway of Turkey, has of late years made considerable progress in many ways, and forestry is one of the subjects that has engaged its attention. It now has a population of over four million. Of its total area of 38,000 square miles, some thirty per cent. viz., 7,512,000 acres, are forested, the chief trees being Scotch pine, European spruce and fir (abies pectinata). The state forests comprise 2,231,000 acres (about 30 per cent. of the whole); 3,866,000 acres (a little over 50 per cent.) belong to parishes; schools own 132,000 acres, or somewhat less than two per cent., and the remainder, 1,283,500 acres, making about 17 per cent., are owned by private individuals. The forests are under the jurisdiction of the Ministry of Commerce and Agriculture. The forestry budget for 1905 amounted to $150,000. The administration of the forests is presided over by a chief, assisted by an inspector-general of forests and two assistant chiefs. There are six districts, each of about 1,250,000 acres, and each presided over by a district inspector, who must have had scientific forestry training. There are also, under these, forty foresters, one for each 190,000 acres; these have also received some forestry training. The forests are also patrolled, there being a "keeper" to every 3,500 acres. In the parish forests there is a forester to every 125,000 acres.

DECREASED SWEDISH EXPORTS. According to a telegram to the Norwegian paper *Aftenposten*, from Sundsvall, a member of the staff of the *Sundsvalls Tidings* obtained an interview from a gentleman intimately conversant with the conditions of the wood trade, in which he stated that the falling off in the Swedish saw-mill industry will be much greater than has generally been expected. The export of wood products in 1909 will probably be smaller than it has been for many years. The reduced sales and cuttings will probably mean a reduction of Swedish export values by about 25,000,000 kroner, or a reduction of about 25%.

MAINE'S 1908 FOREST FIRE LOSS. Forest Commissioner Ring's official report for 1907-08 gives the total loss caused by the forest fires this year in that State as $618,816. In addition to this a number of the incorporated "towns" in which fires occurred failed to send in reports to the Forestry Department. In the incorporated towns the estimated area burned over during the year was 43,439 acres, with a loss of $257,020; in the unincorporated townships the country burned over amounted to 98,691 acres, with an estimated damage of $361,796.

EQUIVALENTS IN BOARD FEET. In the State of Pennsylvania the number of board feet of lumber contained in ties, poles, posts, etc., is estimated by means of the following table:—

Railroad Tie	44	board feet
Mine Tie	25	"
Telegraph Pole	150	"
Trolley Pole	100	"
Fence Post	10	"
Fence Rail	8	"
Mine Prop	18	"
Car of Mine Props	5,460	"
7,500 Lath	1,000	"
3,500 Shingles	1,000	"
Cord of Wood	1,000	"

IRRIGATION IN WESTERN STATES. During the past five years the United States Government has spent $33,000,000 on irrigation in the Western States. The canals now completed have an aggregate length of 1,815 miles, over half the width of the continent. The works now employ 16,000 men, and the monthly expenditure is $1,250,000. Homes have been created for 10,000 families.

FIRE FIGHTING ON U. S. NATIONAL FORESTS. Only seven-hundredths of one per cent. of the area of the National Forests under the management of the United States Forest Service were burned over in 1907. This area includes several large grass fires, which account for a very large proportion of the burned-over area. The timbered area burned over was less than 30,000 acres, and a little over 31,000,000 board feet of timber was reported destroyed—less than seven one-thousandths of one per cent. of the estimated stand on the burned area.

PER CAPITA CONSUMPTION OF WOOD. According to the table of equivalents used in Pennsylvania, quoted elsewhere, the consumption of wood in Canada for the year 1900 (as given in the census returns of 1901) is approximately 14,000,000,000 board feet, or, in round numbers, 1,200,000,000 cubic feet. According to the same returns, the population of the whole country was 5,371,315. The per capita consumption of wood would thus be almost 225 cubic feet per year.

The Canadian Forestry Association has lately had the pleasure of welcoming to its ranks fifty-seven officers of the Bank of British North America. This is one result of the campaign for members entered upon by the association during the summer.

"What have we done in Canada to develop a policy of forest conservation? While some of our public men are rubbing their eyes after a long sleep, others are still dreaming that the forests of Canada are simply illimitable, and answer the questionings of investigators with the simple assumption of our fathers that every acre of our northern wilds is an acre of merchantable timber."—*Pulp and Paper Magazine.*

Orders for several million feet of British Columbia timber have lately been forwarded from New Zealand. Owing to the recent rise in prices in the United States, the mills in that country no longer find it so profitable to seek an export market, and more orders are coming to the Canadian Pacific Coast dealers.

WILL WATCH THE CUTTING. Strict account is beginning to be taken by the authorities in the Province of Quebec of waste in lumbering. Stumpage dues are to be levied on (1) all stumps over one foot in height, measuring from the beginning of the roots; (2) all timber above six inches in diameter left in the tops; (3) all merchantable timber used for skids and not hauled; (4) all lodged trees; (5) all merchantable timber used for building bridges or making "corduroy" roads; (6) all logs left in the woods. A circular has been issued notifying lumbermen of these regulations. The first account for dues imposed for the above causes was recently filed and amounted to $167.30. This was for only one river valley, and covered the cutting for fifteen days only!

CANADA REPRESENTED. Canada was officially represented at the meetings of the Conservation Commission and the Governors of the several States of the Union at Washington, D.C. (December 7th and following days) by Hon. W. C. Edwards. Mr. R. H. Campbell, Superintendent of Forestry, was also present at the sessions.

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