

when the existing forest consists mainly of balsam, spruce and hemlock intermixed with good-sized old pine trees. In such areas it will be found that few seedlings of pine are coming up among these shade enduring trees, unless it may be on high land or where the canopy happens to be thin. The young pine is not so tolerant of shade as the other conifers. Hemlocks, for instance, may be seen growing up in the gloomy shade of their parent trees where a pine seed would not even germinate. The treatment of a forest of this kind will depend entirely upon its locality. If the less valuable conifers can be cut down and marketed without loss, then by all means remove a sufficient quantity of them to insure such opening in the canopy as will admit light enough to permit the growth of the young pine. If on the other hand the ground is covered thickly with young trees of the shade enduring species, with little or no pine growing amongst them, then a clean sweep may as well be made, first cutting the mature pine trees with the exception of a sufficient number in well-chosen localities spared for future seeding.

As to whether fire should be used or not in clearing the ground depends on the number of young pine trees coming up. In many districts where pine is being cut and which it is desirable to retain in timber, the spruce, balsam and hemlock cannot be cut so as to repay the outlay. The forester must be guided by the existing conditions in the locality, or allow the question to stand over for future solution, bearing in mind that new factors are likely before long to simplify the problem.

It is very evident, for instance, that if Chicago and other cities on or near the lake frontier, continue to increase in population at the same rate as in recent years, all varieties of timber will greatly increase in value, and the kinds now slighted by the lumberman for want of any profitable market, if growing in territory tributary to the lakes so as to admit of easy transportation, will be an increasingly valuable asset.

Though, as has been said, no two forests are alike, and a great variety of special conditions as to soil, climate and location may create frequent divergencies in the result, yet the evolution of an ordinary pine forest can easily be traced in its broad general outlines. The rocky and broken region of Central Ontario, the same style of country in Wisconsin, and Minnesota, with the gravel ridges and sand flats of Michigan, are peculiarly the home of the pine tree. No doubt large quantities grow in New York, Pennsylvania and the North-eastern States, but were found more as existing among the hardwoods which the soil was better fitted to nourish than as the prevailing forest type. Its adaptability to the districts where it specially flourishes and predominates, is shown by its power to maintain itself and thrive in conditions adverse to other species. While it grows on rich soil and attains its greatest proportions alongside the hardwoods, it will flourish where its roots are only embedded in the fissures of rocks or amongst the disintegrated blocks and debris at the foot of escarpments where hardwoods could only survive as stunted bushes.

#### FOREST EVOLUTION.

The prominent features in the evolutions of a pine forest can be seen in its various stages in almost any pine district. While a pine covered tract is overrun by one of the frequently recurring fires to which all coniferous forests are liable, it will usually be found that here and there a tree or a small group of trees has been spared by some favoring circumstance.

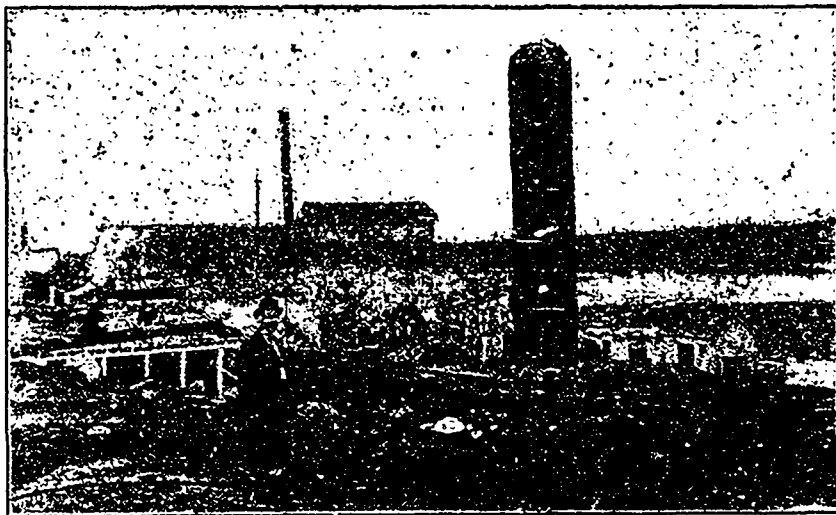
What then takes place is that the ground is first seeded by poplar and white birch, trees which are very widely distributed and each year shed immense quantities of seed well adapted by their structure for being carried long distances by the wind. The seedlings of these varieties spring up immediately and during their earlier years grow rapidly, covering the burned over ground. Conifers, on the other hand, do not bear seed every year and are not so prolific.

White pine, so far as has been observed, seeds irregularly perhaps every third or fourth year, so that as a rule the deciduous trees which have seeded first hold possession, get a good start and commence to shade the

soil, making an ideal condition for the growth of young pine. When a seed year for pine comes round, then those trees left in the district will distribute their seed and seedling pines begin to make their appearance among the varieties already growing. Finding the requisite amount of light and shade amongst the poplars, they grow up under these favorable circumstances as forest trees, shedding their lower branches as they grow older owing to the close neighborhood of the older trees and shooting upward rapidly.

It is a matter of common observance that pine growing up without shade progresses more slowly, as the main strength of the tree is put forth in developing the branches, which expand at the expense of the stem. The restriction of space in the forest, however, promotes the upward growth as the trees struggle towards the light. If a sufficient number of parent trees have been left to cover the ground fairly with a young growth, then commences a conflict for existence between the rival occupants of the soil. It will be generally found that in say from twenty to thirty years after the new growth began the tallest pine and poplar are about equal in height, but after this period the struggle is very uneven.

The pine will so completely overmaster the poplar that in about thirty years more hardly a poplar or a birch will be left alive, except it may be where pine has not seeded or some other variety is disputing possession. Of course the process indicated is liable to be modified or reversed by conditions in which other varieties of forest vegetation are introduced, especially in wet or swampy places



GRAVENHURST MILL OF THE LONGFORD LUMBER COMPANY.

which will be occupied by the trees best fitted for such surroundings. When a forest of pine once fairly covers the ground its life may with care and attention be continued indefinitely, adding yearly by its growth to the wealth of the country, besides exercising other valuable functions in the economy of nature.

#### RATE OF GROWTH

The rate of growth of pine trees is a question of great interest to all concerned in silviculture, and as has been pointed out, the answer depends greatly upon varying local and individual considerations. As a general rule, however, any lumberman can testify that having cut the merchantable trees in a pine forest, leaving the smaller growth, he can, if fire is kept out, go back in twenty years and take another crop, not so large, it may be, as the first, yet sufficient to pay him handsomely for the operation.

The rate of growth of any given tree can easily be determined by counting the rings denoting the annual increase, the history of the life of the tree being thus written on the cross section.

The question of how far pine seed will distribute itself is more difficult of solution. After many observations conducted in different districts we are still unable to say how far a pine seed may be carried. Obviously it depends on the position of the tree and the strength of the wind. If the parent tree stands in a hollow or even on level ground surrounded by other trees, it cannot fly very far, but if situated on a ridge or mountain—a situation much affected by pine trees—the seed could be carried a long distance. The structure of the seed is peculiarly fitted for this, as the kernel is light and attached to a broad sail of thin texture. When the cones open in the

fall of the year on a tree high up on a hillside, and the seeds become detached from the cone, which is most likely to occur in a violent windstorm, they may be whirled a great distance. It is only on this assumption that the appearance of young trees springing up a mile or two from where any parent tree may be seen, can be accounted for. This will apply to all conifers, though more frequently noticeable as regards pine, as the latter are more generally found occupying high and sterile ground, where they can maintain themselves better than the other varieties.

Reference has been made to the effects of fire as regards re-forestation. When a district has been burned over once the utmost care should be taken to prevent another visitation. The deliberate or careless setting of fire in a forest should be a criminal offence. A second fire occurring soon after a first is very detrimental to the soil, besides killing off such young trees as may have appeared in the meantime. And if fire sweeps the same locality again and again, as in that part of the township of Burleigh visited by the Commission in 1897 it will leave nothing but a howling wilderness, a veritable barren land that will require generations to recover any degree of fertility.

While precautions are being wisely taken by the Government of Ontario, through their fire ranging system, to prevent forest fires, it by no means follows that fire should never be used. As has already been shown, fire is, under certain circumstances, the best and cheapest agency that can be used in preparing the ground for another forest crop. The soil is often thickly covered with moss, needles, leaves, old trees and dead branches, in addition to the debris left by the lumbermen, that it is difficult for seeds to come in contact with the ground.

#### THE LONGFORD LUMBER COMPANY.

AMONG the prominent manufacturing firms of North Ontario is the Longford Lumber Company, of which Mr. Wm. Thomson is president and general manager. The mills at West Gravenhurst, commonly known as the "White Mills," are located on the Northern Division of the Grand Trunk Railway, which affords the company excellent shipping facilities. The company have been fortunate in having associated with them Mr. F. S. McNab, who superintended the building of the mill in 1887, and it is largely due to him that the present complete system is being carried on.

The capacity of the mill is from 80,000 to 90,000 feet per day. It is equipped with all the latest and most improved machinery. There is a brick engine and boiler house containing two large engines. The saw mill equipment includes two Prescott band mills, the band saws manufactured by Shurley & Deitrich, of Galt, Ont. The company have their own fire protection, consisting of two large pumps, which keep the tanks supplied with water. There is no handling of waste, as it is carried by tramways to the refuse burner. A large tug boat is used for towing logs to the mill, etc. The company also have mills at Longford, Ont. A view of the mill at Gravenhurst is shown on this page.

#### REBATE ON EXPORTED TIMBER.

THE government of British Columbia has given notice that the order-in-council of the 1st of March, 1903, allowing a rebate on all lumber exported beyond the limits of the province, has been rescinded. There is a royalty of 50 cents per one thousand feet charged by the government on timber, but since the order above referred to has been in force, a rebate of one-half this amount was allowed when the lumber was exported from the province. This rebate has now been expunged.

Many lines of shafting require much more power to run them than is actually necessary, because heavy machinery has been located on the floor above, thus causing it to settle and throw the shafting out of line. For this reason adjustable hangers are much preferable to the old-fashioned, non-adjustable kind.