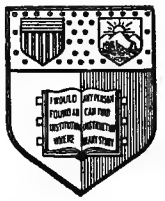
SD373
C46



New York
State College of Agriculture
At Cornell University
Ithaca, N. Y.

Library

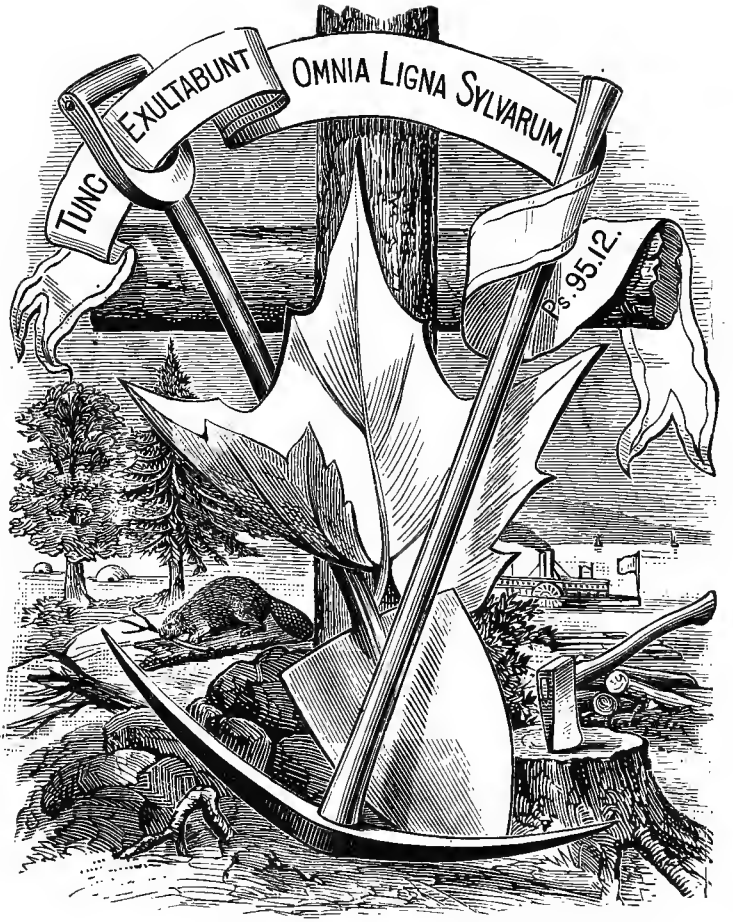
Cornell University Library
SD 373.C46
The Canadian forester's illustrated guid
3 1924 003 682 014
mann



The original of this book is in
the Cornell University Library.

There are no known copyright restrictions in
the United States on the use of the text.

http://www.archive.org/details/cu31924003682014


TUNC EXULTABUNT
OMNIA LIGNA SYLVARUM.
Ps. 95.12.

THE

CANADIAN FORESTER'S

ILLUSTRATED GUIDE

BY

J. C. CHAPAIS, B. C. L.

MEMBER OF THE GENERAL COMMITTEE OF THE FORESTRY ASSOCIATION OF THE PROVINCE OF QUEBEC, CANADA.

WITH 126 ENGRAVINGS

(FROM THE FRENCH.)



MONTREAL

EUSÈBE SENÉCAL & FILS, PUBLISHERS

20, ST. VINCENT STREET

1885

Entered according to Act of Parliament of Canada in the year one thousand eight hundred and eighty five, by J. C. CHAPAIS, in the office of the Minister of Agriculture

INTRODUCTION

The economists and practical agriculturists of our province have for a long time been sorely disturbed by the injuries to which our superb forests have been subjected. Not a year passes without our having to deplore the loss of miles upon miles of woodlands, containing thousands of the finest trees, losses caused, for the most part, by the carelessness of settlers and men in pursuit of game, who seem to think that the fires they light for the preparation of food, &c., will extinguish themselves. Again, the purchasers of timber-limits devote themselves entirely to procuring the greatest possible quantity of lumber, without troubling themselves in the least about the future. Everything is made serviceable to them, or if anything is unserviceable, it is supposed to be injurious and for that reason is swept away.

Alarmed at such a state of things, and observing at the same time how large a proportion of our territory is already denuded of its wood, a few large-minded men united, last September, and founded a Forestry Association, the object of which is to promote the preservation and the replanting of the old forests of our province, as well as the creation of new ones.

The first step, then, in the right direction has been taken. Our onward march must be energetic, and all the necessary means must be employed to follow out the programme of the association; and to this end, the members of the council and of the general committee of the society must set the example, and work with all their hearts to make as many active proselytes as possible in all parts of the country.

As a member of the general committee, I have thought it my duty to compile the little book which I now present to my readers, in order to aid those who wish to

enrol themselves as members of our association in accomplishing their work as *Foresters*.

My readers would look in vain for a complete and elaborate treatise on arboriculture in this *guide*. All I have aimed at is a concise statement of the general principles of forestry. These I have condensed and arranged in such a way that they may be within the reach of all who are inclined to study the forestry-question and the important subjects connected with it.

That the work might be as useful as possible, I have endeavoured, by means of illustrations, to spread abroad an acquaintance with the different species and varieties of trees of which the forests of Canada are composed. To this end, I have presented to the reader engravings of almost every species, one representing the tree itself, another its bough and leaf, and a third the seed. Most of these have been copied from nature, and I have taken great pains to assure myself of the fidelity with which the others represent the objects they are meant to designate.

As our national as well as our provincial interests are deeply concerned in the forestry-question, I have done my best to make my work useful to all the provinces of the Dominion on this side of the Rocky Mountains. The special character of the sylvan flora of the Pacific coast forbids my including British Columbia in the limits of my work; that province demanding an entirely distinct description.

My book is divided into four separate parts under the following heads: *First part: the preservation of our forests; second part: the restoration of the forests; third part: the creation of new forests; and fourth part: special subjects connected with forestry.*

FIRST PART.

THE PRESERVATION OF FORESTS.

CHAPTER I.

GENERAL CONSIDERATIONS.

The traveller who, leaving behind him the wood-divested districts of Europe, suddenly comes upon our magnificent forests, is struck with astonishment at the luxuriant growth of the fine specimens of timber with which he meets in his wanderings. But his astonishment at their beauty fades into insignificance, compared with his surprise at the cool neglect with which they are treated, when he remembers the care and attention with which the different European governments treat the few forests still remaining in their possession.

And there is nothing wonderful in this. What does one see on all sides? Extensive districts destroyed by fire, offering to the eye nothing but the half-burnt trunks of the great trees, which, like gigantic spectres, seem from their rigid look to protest against man's neglect; whole regions of waste ground, entirely denuded of timber by the axe of the greedy lumberman, who carries off all the wood useful in his business, and most unnecessarily destroys all that he considersunserviceable; and, lastly, lands once cut over, (1) now covered with

(1) *Taillis*—copse, in our English wood-language—the *underwood* is cut every 10, 12 or 14 years, for hop-poles, broom-handles, hurdles, &c., and sells for from $40 to $120 per acre, standing. *Taillis*, from *tailler*, to cut, evidently conveys the idea of this mode of treatment. (Query—does our cry, when we see the hunted fox, *tallyho*, pronounced, or rather yelled, *Tarlyo*, derive from "*au tallis, ho!*")—TRS.

brushwood, the remains of former clearances, and as dry as tinder, which offers but too ready a chance for the reception of a spark from the pipe or half extinguished match of the careless tramp.

Who would not be moved at such a sight? Could the force of human negligence go further? What, because we are surrounded on all sides by forests, because these forests hinder the cultivation of the land, because we possess thousands upon thousands of acres of woodlands, must we for such reasons as these burn and destroy the whole? If a rich man were to fling his money out of the window, as has sometimes been heard of, what should we predict? Would not every one say that, before long, he would be begging his bread? The same sad fate might well be prophesied of the nation, which, because it possesses the finest forests in the world, destroys them from a deliberate purpose.

As every body is interested in this question, let us see what duty each has to perform who would aid in the preservation of our woodlands. The government should be the first to put its hand to the plough; then the limit-owners; the wood-dealers, &c.; next the settlers; and, lastly, tourists, anglers, hunters, and all who frequent the forests during the course of the year. (1)

(1) *To hunt*, in England, means to pursue the stag, the fox, the otter, or the hare, with hounds. The idea of a gun is utterly excluded.

CHAP. II.

DUTIES OF THE PROVINCIAL GOVERNMENTS AS REGARDS THE PRESERVATION OF THE FORESTS.

In the hands of the different provincial governments lie the chief means of preserving our forests : I mean the power of legislation.

A great part of the woodlands of the Dominion still remains in the hands of the governments of the different provinces. Our statesmen thus possess the power of doing all that is necessary to protect our forests from decay and ruin.

I shall content myself in this place with pointing out the way in which our legislators should proceed with a view to the immediate preservation of our timbered districts.

My own opinion is, that a law declaring that, as a general rule, no woodland, unfit for cultivation when cleared, shall for the future be granted to settlers, would be the first direction-post in the right road. What do we see now-a-days? A vast extent of land, utterly valueless from an agricultural point of view, has been conceded; the first settlers have cleared off the wood, and have immediately vanished from the scene. Their successors, dying of hunger on these ungrateful soils, have also vanished, and taken their departure for the stranger's land. There lies the land, stripped for ever of its natural wealth ; utterly useless, and lost to all the ends of rural economy. Had the government retained it in its own hands, it would now be returning a revenue ; wood for fuel and for building could be sold from it; and, certain rules for the preservation of the growing timber being observed, the restoration of the forest

would be insured. The woodmen, too, might be compelled to free the land from boughs, chips, and other wastage, which tend to increase the number of bush-fires. Instead of the sad spectacle of sterile, devastated districts, which now distresses us, we should look upon many a fine forest, ready to furnish all kinds of wood to our descendants.

Next, the general fall of timber must be so regulated, that all trees that do not exceed a certain size shall be left standing. If, in addition, the law prohibits the repetition of the fall more than once in ten years, these limits, instead of being worn out, as they are at present, by continued cutting, would be always fit for exploitation. The same precautions as to the removal of the wastage will be necessary here as elsewhere. I will speak more in detail hereafter of the part this wastage plays in causing bush-fires.

The settler himself must be the special object of our legislators' attention—as regarded from the forester's standpoint, I mean. When engaged in clearing his farm, the settler is the sworn enemy of the forest. In his blind hatred, he wages direct war with it; and, as he is the stronger, his axe never pauses till the last tree is laid low. A few years later, if his land does not turn out to be of the best quality, he is forced to leave it, and to seek a foreign soil; unless he sets to work to clear, and therefore to ruin, another part of his own country. To put a stop to this evil, nothing would be easier than for the government to oblige each settler to keep a certain number of acres of his farm uncleared. At the end of fifteen or twenty years, he would bless those who had thus forced him to observe the injunctions of prudence. The settled townships would then have all the wood required by their inhabitants, and we should

no longer see, what is now no uncommon sight, whole regions absolutely stripped of their wood.

The settler must also be forced to observe the strictest rules of prudence in the management of the fires necessarily employed in the process of clearing his farm. I will treat more fully on this point further on.

Tourists, sportmen, anglers, must be watched at least as closely as the settler. Their abode and their behaviour in the forest must be under the control of strict rules and regulations.

Lastly, that the laws in question may be carried out entirely in all the points I have drawn attention to, the forests must be under the superintendence of a well organised body of police. By police, I mean to include the foresters and other agents, whose duty it will be to see that the laws in question be properly applied, and put into execution against all offenders.

To crown the whole, there should be a penal clause in the act, punishing all contraventions of the law not only with a severe fine, but with imprisonment also.

A system based on the ideas which I have just offered to my readers, consideration—some of which have already been incorporated into the law,—may, perhaps, not be a perfect system, but it would be an approach to an improved state of things.

I fancy that legislation has already been initiated in each of the provinces on this matter; but, unfortunately, the law is not always put into execution. It is therefore important that, on one side, the laws connected with our forests be made as complete as possible, on the other, that the application of the laws be strict and invariable.

CHAPTER III

THE DUTIES OF LIMIT-OWNERS, LUMBER-MERCHANTS, AND OTHERS, AS REGARDS THE PRESERVATION OF THE FORESTS.

The government, in passing such a law as I have sketched in the preceding chapter, would impose no obligations on limit-owners except those which it would be their duty to assume, even if they had not the force of law.

To state more clearly what I mean by these obligations, I will quote the example of a firm which has been engaged in the lumber-trade for thirty years, and which turns its limits to profit in a very intelligent manner, as the following account will show. When the firm began business, it determined never to fell any tree below a certain girth. Another principle was, not to cut over the same place several years in succession, but to allow ten years, at least, to elapse between the falls. Its servants, too, acted as a sort of police, and watched the hunters, &c., as closely as possible. The result is, that, to-day, these limits are almost as valuable as on the day the firm began operations. Instead of having to buy new limits, as the short-sighted are often obliged to do, the mills have abundant provision of wood from the property of the firm. In fact, the firm is free and independent in its own possessions, employing to great profit their territory, which, treated in this way, has become an almost inexhaustible source of revenue.

Well, what this firm has done, let all do. What is possible to one is possible to all. Let all lumbermen unite in the determination never to fell any tree of a less diameter than a foot, let them allow time for the trees to grow on their limits, let them assist the forest-

guardians in preventing robberies and fires, and their action, united to that of the government, will produce immediate good effects.

One of the chief objections, made by certain lumbermen, is, that they have not sufficient control over their servants to insure the following out of the plan. This objection does not seem even plausible.

Let the lumbermen instil strongly into the minds of their head-men the ideas we have put forward, and hold them responsible for their execution. All will then go well; for the truth is, that up to the present time an incredible amount of carelessness has ruled in this branch of commerce, whence chiefly spring the principal evils which we are combating.

CHAPTER IV.

THE DUTIES OF SETTLERS AS REGARDS THE PRESERVATION OF THE FORESTS.

It is vain to deny it: our settlers have been more guilty of the destruction of our forests than any other class of men. Dispersed here and there in the bush, obliged to clear and sow at the most rapid possible rate, the settlers do not go gingerly to work. Axe in hand, the woodman chops away freely, until the piece of land he intends to sow is cleared. Then, he piles up the trees and sets them on fire, it may be in the height of summer, when the last year's leaves and the moss-covered branches are as dry as tinder, only waiting for a spark to set them blazing. Burning-time is come, burn we must, and, in truth, the whole burns together. Soon, the flame passes beyond the clearing; it runs along the dry leaves which cover the ground, reaching out its fiery tongues in all directions—the forest is on fire! The first

victim is the careless settler himself; then comes the turn of the ancient trees which, one after the other, lose their leaves and branches, and remain naked, blackened, hideous, in the desert prepared by the improvidence of man. The passing traveller is horrified at the sight of a waste, where once stood a luxuriant forest.

My readers know well that what I have just described happens every year in one or more parts of the province. I have described, above, the means government should use to stop this evil. But the remedy is valuable in proportion to the way in which the settlers themselves aid in its administration. Why do they not determine for themselves never to burn without using all possible precaution, and at a season of the year when it would not be dangerous to the forest. What is a month's delay, compared with the damage caused by a fire blazing away at an improper season ?

So much for fires. A word, now, as to the reserve of wood I wish to see made by each settler. Can a law be necessary to secure this reserve ? Reflection alone, it seems to me, should be enough to induce every settler to keep part of his land uncleared. He, too often, comes from an old parish, where the inhabitants have been accustomed to go nine, twelve, even fifteen miles for their fire-wood, and even further for their lumber. The settler in question has himself done it. And now, right in the bush itself, he forgets it all, he sees only the land he is about clearing, and reflects not that the parish he has left was once in the forest, though to day it is miles away from it. It is time to put a stop to such folly as this. Let every one who takes up a lot of land look out for the worst part of it, and keep it untouched by axe or fire. The value of the reserve will in a few years double the value of the whole lot.

CHAPTER V.

THE DUTIES OF TOURISTS, HUNTERS, ANGLERS, &C., AS REGARDS THE PRESERVATION OF FORESTS.

I said, just now, that the settlers themselves are the chief contributors to the forest-fires. Unfortunately, they have active assistants in hunters, anglers, tourists, and others. These stroll through the bush; they light a fire, to dry their clothes, to cook with, or for some other reason, and when they have done with it, it may go out or not as it likes But a coal remains. The fire has been made on a bed of leaves and moss, and without the slightest precaution. Up gets the wind, all is in a blaze! And the author of the destruction goes on his way in happy ignorance. How true is all this! And yet, nothing could have been easier than to have lighted the fire on a site carefully cleared from inflammable matters, to have kept it at a distance from the trunks of trees, and, after watching it carefully while burning, to have put it out completely before leaving. Simple precautions, these; they suggest themselves, and yet how few observe them! The settler who burns his brush, &c., is excusable up to a certain point. Burn he must, and his fire is not always manageable. But what excuse can be made for the careless hunter who ruins a whole township because he will not take the trouble to extinguish a fire which he himself has lighted, and which is under his own control. No excuse for him: and if the settler deserves punishment, how much more he! Yes, it is he who should suffer, and severely too. It is he whom the forest-police should watch, for his negligence is the worst of all.

Hunters and other frequenters of the bush, be wise.

Remember how irreparable is the damage your carelessness may cause. Not only will the forest disappear before the fire you have lighted, but entire townships, newly cleared and covered with harvests, which constitute the sole wealth of the poor settlers, may, perhaps, be devastated by the flames. What a responsibility to incur from a simple act of negligence !

Here ends the first part of my work. I think I have shown, that by wise legislation, earnestness, and attention, our fine forests can be easily preserved. Now, our task is to describe the labour to be undertaken in restoring those forests which are half-ruined to their primitive state of vigour.

SECOND PART.

RESTORATION OF THE FORESTS.

CHAPTER I.

GENERAL CONSIDERATIONS.

After having shown, in the preceding chapters, that it is the duty of the state and of all our citizens to watch over the preservation of the forests, I proceed in my endeavour to prove that their restoration is a no less important work. If a large part of the public domain is still covered with forests, which are as yet almost intact, another part, hardly less extensive, presents to the gazer nothing more than a few clumps of trees half-destroyed by one cause or another; strips of wood gnawed by the flames; whole townships of land unfit for cultivation almost entirely cleared by the axe, and which, in no long time, will become absolutely of no value to the public.

The settlements in the neighbourhood of these places are threatened with a scarcity of lumber and firewood; and the scarcity is not very distant. In a few years, they will find themselves in the same position as the entirely cleared parts of the Dominion. In fact, it is acknowledged that a wood half cleared, and left to its own devices, is devoted to destruction. On the slopes of the mountains, the rains carry off the soil from the clearings, leaving nothing but the bare rock. The earth is washed away, and gradually borne off, leaving the roots of the nearest trees naked, and their subsequent destruction is not long delayed. In places ravaged by the flames, the trunks of the half-burnt trees soon rot:

water collects in the cavities formed by the roots of those which the wind has thrown to the ground; frost raises the surface, and thus loosens the roots of the young trees; if the ill-used wood is near settled townships, the stock break in, devouring all the tender shoots of the young struggling plants, and stamping to death with their clumsy hoofs the naked roots of the older trees, till at last, by a concurrence of all these causes, the maltreated forest entirely disappears.

Now, all this may be avoided, the evil may be cured, and we are about to see in what way each of us can do his part in the patriotic work.

CHAPTER II.

DUTY OF THE PROVINCIAL GOVERNMENTS AS REGARDS THE RESTORATION OF THE FORESTS.

Governments can assist greatly in restoring the forests to their pristine condition. The action they are called upon to undertake is not a direct action, as in the case of the preservation of uninjured woods, seeing that those which require restoration have generally passed out of their control.

Nevertheless, they can assist the work greatly. I will relate an isolated fact which will serve to show how our legislators can attain the proposed end. A Horticultural Society in the Province of Quebec, with very little encouragement from government, left, in fact, almost to its own resources, offered certain prizes for the replanting of woodlands. A farmer, a competitor for these prizes, carried off the first, after showing that he had replanted in maple 62 arpents, (1) whence the wood had

(1) 13 arpents—11 acres, nearly.—TRS.

almost entirely disappeared nearly 25 years previously. Well, I want to see the provincial governments do what has been done by a simple horticultural society with very few funds at its disposal.

In the province of Quebec there are eighty agricultural and five horticultural societies, aided by the government. Besides these, there are thirty-nine agricultural clubs organised, and in full operation, in the different parishes in the country. Thus, we have one hundred and twenty-four associations of husbandmen spread over the whole extent of the province. Societies of the same class, in greater or lesser numbers, exist in all parts of the confederation. Let the governments of the different provinces devote, every year, a certain sum to be distributed among these associations, which sum shall be given as prizes to encourage the restoration of the woodlands, and the fruits of this timely liberality will soon be apparent.

For, if a purely local horticultural society has succeeded in inducing farmers to compete for similar prizes in a country where woodlands are still plentiful, how much more likely should we be to succeed, acting, as we should be doing, over the whole country, and with the governments taking the initiative, in those places where there remain nothing but a few half-denuded spots, and where firewood and lumber are both on the point of absolutely disappearing.

This, if I do not deceive myself, is an excellent way of inducing farmers to take precautions against a scarcity of wood, and, in that belief, I submit it in full confidence to the attention of our legislators.

CHAPTER III.

DUTIES OF AGRICULTURAL CLUBS AND SOCIETIES AS REGARDS THE RESTORATION OF THE FORESTS.

In the foregoing chapter, I quoted the example of a horticultural society (that of the county of L'Islet, in the province of Quebec) as one worthy of being followed by the different provincial governments of the Dominion.

I would propose the same thing to all the agricultural clubs and societies, of whatever sort, which exist in the confederation. Even if the governments themselves do not take the initiative, the societies ought, for the pure sake of promoting the interests of agriculture, to undertake with heartfelt earnestness the work of the restoration of the forests.

Local societies, the agricultural societies of the province of Quebec, for example, might offer prizes for work of this description done in their respective neighbourhoods ; and, then, those who had won first prizes would, doubtless, compete for the prizes offered by the county societies, and thus, a noble emulation would be excited among the farmers, not of each locality only, but also of each county.

The societies would appoint a committee of judges in each county, the members of which committee, would be charged with the duty of visiting the forest-lands which had been improved or planted by the competitors, and, after inspection, they would make their report to the societies.

All those interested in these competitions would become, *ipso facto*, members of the forestry associations. They would receive advice from them, and follow out their regulations. Thus the societies would grow con-

siderably in numbers and influence, an influence which would manifest itself in the course of a few years by magnificent results. But before we get so far, it is necessary that the active assistance of the farmer be secured, and how to win this shall be the subject of my next chapter.

CHAPTER IV.

DUTIES OF FARMERS AS REGARDS THE RESTORATION OF THE FORESTS.

The traveller, in passing through the longer-settled parishes of our province, sees, scattered here and there, on the hill-tops, on the slopes of the mountains, in the valleys, and in the low-lying marshes, clumps of trees varying in species with the quality of the soil. Here, are found sugar maples, there, poplars; soft maples, larch, fir, tamarack, cedars; all, more or less, useful woods. Observing all these thickets, which add amazingly to the beauty of the country, the traveller conceives that the inhabitants of the district possess all the timber necessary for their wants. A false conclusion! let him wait awhile, and examine these patches of woodland attentively. What does he find? cattle gnawing the branches, and stamping the roots to death. The trees, flourishing enough to a careless eye, are drooping, weakly, half-dead for want of moisture, and on the point of perishing for lack of nourishment. In a few years, they will have entirely disappeared, and the site which they now occupy will be naked and barren.

How many of these lovely groves have I seen, young as I still am, where, when children, I and my playfellows used to wander, listening to the music of the birds, and watching the sportive habits of the nimble

squirrels. The groves are gone, though barely twenty-five years have elapsed since we took our pastime therein. The cattle, as I said above, begin the destruction; the axe of the poor man suffering from the cold of a rough winter's day, carries on the work by felling the already half-dead trees, and the rest, rotten, and with difficulty retaining their hold on the soil, are up-rooted by the fierce blast, and a weary desert occupies the once green and smiling spot.

Where the wood is still thick, though the grove may be small, the remedy is easy: enclose it with a fence. I expect to be told that this is impossible, or that the work would be costly, if done on a large scale. To which I reply that, the larger the wood, the better the enclosure would pay, considering the great value it would gain by the growth of the protected timber. The cattle would no longer browse on the shoots, the trees would shed their seed on the ground, the young plants would spring up and take the place of their predecessors, which, when arrived at maturity, or menaced with death from decay would be carried off to the mill or to the wood-pile. To accomplish this is one of the easiest duties of the farmer.

But there is more than this to do. Those who have well-wooded property do not keep it for the mere pleasure of looking at it. Each year, the owner takes what he requires for his own use. If he does this carelessly and hap-hazard fashion, in a few years his store will have been expended, while, on the contrary, if he knows how to treat it properly, it will last for ever.

Let us see how he should proceed to ensure this durability. First, as before, all cattle should be excluded; then, no immature trees should be felled—from ten to thirty young trees will be ready to take place of each of those taken away. Indeed, the ground is covered with

the seeds of the felled trees, and it is by this that the forest are re-formed. A thick brushwood is soon established by the young plants, if neither the hoofs nor the teeth of cattle are allowed to injure them. But here, there is one danger: they should not be left too thick; they would injure each other, keep off the beneficent rays of the sun, and never become fine trees. Judicious thinning, therefore, should be practised every three or four years.

In spite of all precautions, certain spots will suffer; some from fire, some from sudden rushes of water after heavy rains which carry off the top-soil, and so on. The vacancies due to these different causes must not be neglected. It is through breaches of this sort that the enemy, sterility, finds an entrance. How shall we oppose his attacks? Fill the naked spots by re-planting.

Of re-planting I will speak farther on. At present, I must content myself with saying that, to re-plant a bare spot in the middle of a wood, it is only needful to take from the space around it the young trees, which, being set immediately after being dug up, will infallibly take root at once.

By treating it in this fashion, every farmer can keep his reserve of bush entire for an indefinite period; not only for his own life-time, but for the generations that shall come after him, if, be it understood, they continue to observe the same precautions.

And it is not only the farmers who are concerned in what I have said about the re-planting of the bare spots being one of the important points connected with the restoration of the forests. Those lumbermen, who hold timber limits on long leases, ought, for their own sakes, to carry out the re-planting of the clearings as often as may be necessary. The governments of the different

provinces ought even to compel them to do it, and the foresters should be obliged, by a regulation passed to that effect, to re-plant all clearings which they shall find have been made on the crown-lands.

People, doubtless, will exclaim against all this as impracticable, too costly, etc., but they will be wrong. Let us look, for our edification, at what the different European governments have done. They would have thought themselves remarkably fortunate if they had nothing but the filling up of bare spots to trouble them. Their enormous outlay was caused by the necessity of re-planting whole districts menaced with absolute depopulation, as well as with entire denudation of wood. Let us take care lest we find ourselves in a like peril; the steps to avoid which should be taken before it becomes too great.

Another operation which will be found advisable in the restoration of the woodlands is the pruning of the young trees, to insure their regular growth, and of the old trees, to insure them a prolonged existence, and to repair any accident of which they may have been the victims. Of this operation I shall give a special description when I speak of the establishment of new forests, a subject which will furnish matter for the third part of my work.

THIRD PART.

PLANTING NEW FORESTS.

CHAPT. R I.

GENERAL CONSIDERATIONS.

It will, perhaps, surprise my readers to see that I have remitted to the third division of my book the most important by far of its contents. The reason which induced me to treat first of the preservation and then of the restoration of our forests is this: We have still, fortunately, a large part of our public domain remaining in woodlands full of fine timber. Our first duty is to preserve these forests intact, and, where they have been damaged, to restore them to their primitive condition. Once assured of the possibility of keeping our rich woods safe, no one will deny that it is our duty to seek to restore them where such necessity exists.

When we talk of re-planting, many a one will shrug his shoulders. Those who seem to think it possible that our forests may be ruined, and that, as has already happened in Europe, we may suffer from a scarcity of wood, are treated as pessimists.

But in spite of this, there exists very evident proof that the fears of these pretended pessimists are well founded. This proof is, the complete denudation of wood of certain districts of the country—so complete is it, that the firewood used there has to be carried from places more than twenty leagues, and timber for building from places thirty, and even fifty leagues, off.

If it be thus in regions full formerly of the finest timber, still more must we dread to see the rest of our forests disappear by degrees. For the truth is, these forests are no better treated than those that have already vanished, and have not only to supply the local demand, but the demand of the cleared districts as well.

In order that an equilibrium may be established, and our woods utilised but not destroyed, we must not only preserve and restore them, but we must create new ones, that is to say, we must re-plant.

Here, I may say, that almost all that I have stated with regard to the preservation of forests applies equally to their creation, such as the system of prizes for the encouragement of planting, and the like.

Re-planting is a work repugnant to certain minds. They see very little to encourage them to plant, because, as they say, they will never enjoy the fruits of their labour. They are wrong! I, who am comparatively young, have seen parts of the forest falling under the axe, and replaced by the golden sheaves of the husbandman; and now I see the spots clothed again with wood. and that very wood once more in process of felling. I remember well, among the sweet memories of my childhood, a trip to the sugar-bush. It was in a grove of ancient maples that the little *fête* took place; I was then in my seventh year. The following winter, those very maples were warming our house, and the owner of the land had carried off a crop grown among the stumps. Pass by the spot in April now, and you will hear the song of the sugar-maker, still engaged in his work, in the same place—but the trees are not the same, they are new ones, shot up where the old ones stood—and all this in twenty seven years!

And yet, the maple is not one of the quickest growing

trees. The poplar, the willow, the negundo, the larch, all grow more rapidly; and I know of soft maples that, only eight years from sowing, measure eight inches in diameter at a foot from the ground.

Thus, unless he is very old, the planter is sure to enjoy the fruits of his labour. But there is more than this to be considered; suppose it to be impossible for him to reap the crop of his own planting, there are other reasons which should induce us to re-plant our hills and our barren plains.

These reasons are so well displayed in the lines I quote below, that I cannot resist the temptation of placing them before the eyes of my readers; the original is a fable of Lafontaine:

An old man of eighty was planting some trees,
Three lusty young neighbors drew near—
"To build would be odd, but still stranger to plant,
Our friend has grown foolish, we fear!"

"In the name of all conscience," said they, with a smile,
"What harvest for you will these bear?
Your age of four-score has no future to boast,
Why cumber it thus with more care?
'Tis only for you to repent of the past,
Throw future designs to the air!"

The old man looked up and sagely replied:
"You speak of my hopes and your own;
Life's enterprise, often, is left incomplete,
Though begun on the threshold of youth.
For fate unrelenting may sport with your hopes,
As much as it may with my years;
The chances of life render equal its span,
Though unequal to youth it appears.
And which of us, think ye, the last of the four,
Will behold the bright rays of that sun?
Does this moment assure you another is yours
To finish your labours begun?

The shade of this tree,
Tho' perchance not for me,
For others a blessing may spread,
As under the branches they tread.
Nor would you forbid
The prudent provide
For others who follow. Howe'er you deride,
Such fruit of my toil, each day I enjoy,
As daily for others my strength I employ
And who can explore,
What Fate has in store?
For old though I be, with regret I may see,
And mourn over, your premature graves." (1)

CHAPTER II.

THE PLACES IN WHICH TO PLANT

I will class under six heads the lands on which replanting is necessary.

The first comprises the clearings we meet with in the forests. Of these I have spoken in the second part of this work. These clearings, whether caused by partial fires, by the axe, by floods, or by storms, are the open doors through which the destroyers of the forests enter. The soil of the bare spots, parched by the sun, no longer offers the protecting shade necessary to the growth of the tender plants, and it follows, that the seeds which fall from the trees sprout only to wither immediately. The trees, still more exposed to the attacks of the wind, are, in addition, ravaged by mice and other rodents, which find a hospitable abode in the grass which springs in the clearings. From the two causes united they perish rapidly; from the violent attacks of the one, or from the imperceptible operations of the other; and, as no new

(1) I borrow these lines from a little work on forestry, published by the Hon. M. Joly.

plant is ready to take the place of the old one, the void enlarges itself, and the evil goes on increasing. And for these reasons the clearings should be re-planted.

The second description of lands under this head is the slopes of the hills and mountains. And this is a vital point. The timber-trees grown on these slopes retain the moisture of the soil. At their disappearance, the water formed by the melted snow of spring, by the summer thunder-storms, by the continuous rains of autumn, raise the soil, no longer kept in its place by the roots of the trees, and carry it down to the valleys below, leaving the rock naked and despoiled of all its vegetation. Moreover, the water which, while the wood remained, filtered gently through the soil, descending, so to speak, drop by drop to the lowlands, being no longer kept in check by the soil, rushes down in torrents; hollowing out deep ravines in the sides of the mountains, and covering the valleys with its destructive inundations. Such is the history of the quasi-periodical floods of France, of Spain, and of other countries where the forests have perished.

Enough has been said to show the necessity of re-planting the mountain-sides. Our sons and grandsons will thank us for our care, and for having guarded them from the disasters which recur almost every year in those places where the slopes of the hills and mountains have been denuded of their natural covering. The soils unfit for cultivation come under the third head of lands to be re-planted. Rural economy lays down the rule, that every part of a farm should yield its share of profit to the general stock. Now, certain soils, for divers reasons, are unfit for agriculture properly so called. To grow wood on them is the only way to make them productive. Almost all these lands are fit for planting, and

will produce, if not wood of the first class, at least such as will serve for fuel.

Really sterile lands may, with a little care, be converted into shrubberies (*bocages*). Where stone prevails so much as to make ordinary farming impossible, trees can always be planted, except where the bare rock crops out. Lastly, savannahs, bogs, where no possibility of drainage exists, may be planted: the methods to be followed in these places I will describe farther on.

In the fourth category I place that part of each farm which forms the reserve of wood for the proprietor's use. Wherever wood has disappeared, each farmer should plant a few acres of trees. For the site of this plantation, he should choose that part of his farm which is least susceptible of cultivation. It is seldom that some inferior spot cannot be found on a farm. But even where the land is all of first rate quality, it is still advisable to plant a piece of it, to put an end to the scarcity of wood. Do not say that this is impracticable; the thing is done both on a large and on a small scale by our neighbours in the United States, and the results are most satisfactory.

Under the fifth head, come the lands which are intended to furnish the railroad timber—telegraph-posts, fences, ties, &c. Do not be surprised that I make a special class of lands to be planted for the use of railroad companies, for they are, without doubt, the main cause of the ruin of our forests. It is by the million of feet that we must reckon the quantity of wood felled each year to supply only the ties and sleepers that support the rails. The sleepers last but a short time, and need, therefore, frequent renewals.

The marvellous development of our network of railways, forewarns us of a time not distant, when we shall

see the Dominion furrowed over its entire surface with iron roads. The North West especially, which is rapidly filling up, thanks to the rush of immigrants which is approaching from all parts, will be covered with a vast network of roads, which will require for themselves alone a greater supply of wood than all the rest of the Dominion put together. Now, the North West has not much wood. It is to the other provinces, already in difficulties for their own consumption, that the North West must look for supplies of the necessary material. It is time, then, before scarcity and ruin arrive, to set before our capitalists the example of certain companies in the United States. There, especially on the Pacific slope, the Americans have planted millions of trees to furnish sleepers and other requisite materials. Our companies should do the same, and do it at once. I am acquainted with certain parts of our woodlands, in the neighbourhood of our earlier lines, which cannot, even now, furnish wood of the size proper for these requirements. And how will it be in twenty-five, in fifty, in a hundred years from this time? There will be scarcity, ruin, not only for the companies but for the whole Dominion.

In a sixth category of lands for planting must be placed the prairies of the North West. Every one knows that in Manitoba and in the great North West, there are large districts without any timber. A few miles of woodland along the rivers are the sole wood-resource of the colonist; but the quantity is very small compared with the forests of the other provinces of the Dominion. For three principal reasons, it is absolutely our duty and our interest to sow and plant trees in these regions:

First, because wood is wanted for the firing and buildings of the population. If wood is already scarce

in the North West, what will it be when the present population has increased a hundred fold? It may be said with truth that, if things go on as at present, in twenty years from to-day there will not be enough wood found there to make a match-box. Their population is increasing in an inconceivable ratio, and the demand for firewood and timber increases proportionally. In this lies the danger, and a pressing one it is, of not being able to preserve the equilibrium which should exist between the expenditure of wood, on the one side, and the capacity of production of the Canadian forests, on the other. It is, therefore, a matter of the highest importance, that the planting of the proper districts of the North West should be set about at once and on a large scale.

The second reason why planting trees should be practised is furnished by the counsels of science. Meteorologists, whose occupation it is to determine the origin of tempests, and to give an account of their causes and effects, have shown that wood-denuded countries are exposed to terrible tornadoes at certain seasons, followed by hot, drying winds most injurious to vegetation. As regards the tornadoes, these are due to the freedom with which the wind sweeps over vasts tracts of land where, for hundreds of miles, not a single obstacle is presented to its course. It is for this reason, that a wind, of no very great initial pace, finds means to develop into a terrific storm, if it finds nothing to impede its progress and its swiftness. On the other hand, the absence of trees causes the soil, which is always exposed to the ardent rays of the sun, to lose the moisture which the violent storms of which I have just spoken have communicated to it; and it necessarily follows, that the land is exposed to the extremes of drought and wet, than which there are no two things more injurious to vegetation.

Missing Page

The third and last reason is suggested by the fact, that treeless regions are much more exposed than others to the periodic invasions of certain destructive insects, such as grasshoppers, of which the inhabitants of Manitoba have often had to complain. If to this be added the demands of *hygiene*—that the atmosphere should always contain a certain amount of moisture, and that trees should abound, here and there, in all countries, to serve as filters to purify the air from the quantity of putrid emanations it contains—my readers will be convinced that it is absolutely necessary to the well-being of a country abounding in prairies, that a judicious system of tree-planting in fit localities should be immediately put in practice.

CHAPTER III.

WHAT TREES TO PLANT.

The necessity of re-planting the wood-lands having been, I hope, demonstrated to your satisfaction, and the different soils and localities fit for the work described, let us now consider what kinds of trees we ought to select for the purpose.

It is not advisable to go beyond the indigenous trees, that is, those which grow naturally in the country. It is true that there may be some chance of success with certain kinds of trees which, though not natives here, are indigenous in countries which enjoy almost the same climate as our own. Still, these kinds are few in number, and besides, their use would be experimental, and consequently, hazardous; so that, if they are tried at all, it should be on a small scale, and purely as an experiment.

But it is far otherwise with our magnificent native

species; no risk is run with them, as they are sure to succeed in every spot where they are found to be indigenous.

In order to shed more light on the next part of my work, I append a list of all the different species of forest-trees of which I intend to speak; in this list will be seen the botanical name of each species, in French and Latin; the common or trivial name, in French and English; with a note pointing out the province or provinces in which each is indigenous. The list has been composed with the greatest care; and in order to avoid mistakes, and nothing is easier than to make mistakes in treating of so special a subject, I have trusted almost entirely, in drawing up the list, to the information furnished by a publication essentially Canadian: LA FLORE CANADIENNE, by M. l'abbé Provancher.

CHAPTER IV.

A SHORT DESCRIPTION OF THE FOREST-TREES COMMON TO ALL THE PROVINCES OF THE DOMINION.

That the reader may the more easily form a judgment as to the value, the habits, and the characteristics of the trees of our country, I will give, here, a short account of the different species, beginning with those which are common to all the provinces, proceeding, afterwards, to enter more into detail in describing those which belong more distinctively to each individual province.

Two great divisions distinguish, botanically, all forest-trees: they are either deciduous or evergreen; that is, their leaves are shed in the autumn, or they retain them persistently throughout the year. The latter characteristic is common to all *conifers* except the *larch*, which sheds its leaves in the fall. I shall, therefore

divide the chapters describing the forest-trees into two sections: the first comprising the deciduous trees, the second the conifers.

SECTION I.

DECIDUOUS TREES.

The following varieties of deciduous forest-trees are common to all the provinces of the Dominion:

Acer Pennsylvanicum.....Striped-maple.
Acer rubrum.....Red-maple.
Acer saccharinum.....Sugar-maple.
Acer spicatum.....Mountain-maple.
Betula excelsa.....Yellow-birch.
Betula lenta.....Black-birch.
Betula nigra.....Red-birch.
Betula papyrifera.....Canoe-birch.
Betula populifolia.....Poplar-leaved birch.
Fraxinus Americana.....White-ash.
Fraxinus sambucifolia.....Black-ash.
Populus balsamifera.....Balsam-poplar.
Populus Canadensis.....Cotton-wood.
Populus tremuloïdes.....American-aspen.
Salix alba.....White-willow.
Salix vitellina.....Yellow-willow.
Sorbus Americana.....Mountain-ash.
Ulmus Americana.....White-elm.

Acer Pennsylvanicum—Striped-Maple.

When speaking of the Mountain-maple, I say that it should be preserved in the numerous hilly districts where it is found, and allowed to shoot again from the stump; and so with the striped maple. It servesth e same purpose as the other, namely, to prevent the earth from being washed away, and the rock from being denuded of its covering. It is never found more than twenty feet high. Engraving No. 1, p. 38, shows the leaf of this maple and engraving No. 2, same page, its seeds

Acer Rubrum—Red-Maple.

After the sugar-maple, the red maple is the most valuable. It differs from the former in that it prefers a damp habitat. Seldom more than fifty feet high,



1.—Acer Pennsylvanicum
Leaf of striped-maple.



2.—Seed of striped-maple.

it ripens its seed in June, and the sooner after maturity this is sown the better. Rarely can good seed of this tree be bought, as if it once gets dry, it is worthless. With a sap less rich in sugar, the wood of



3.—Acer rubrum—Red-maple.

the red maple is also inferior to the wood of the sugar-maple, but, *en revanche*, it grows much more rapidly. The colour of its flowers gives its name to the tree. The

seed is distinguished from that of other maples by measuring one inch from wing to wing, while the others measure two inches; and the colour, too, is reddish,



4.—Leaf of red maple.

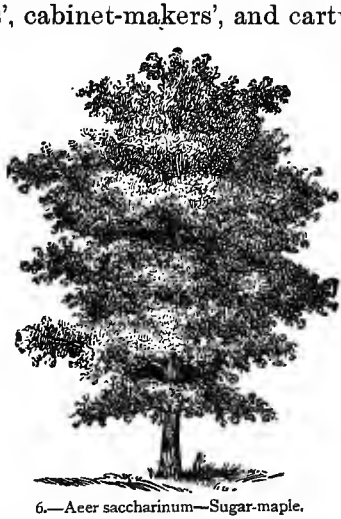


5 —Seed of red maple.

whereas the colour of the other maples is yellow or whitish. The cut 3, represents the red-maple; the cut 4 the leaf, and the cut 5 the seed.

Acer Saccharinum—Sugar-Maple.

The most interesting tree of this part of the world. The numerous good qualities of this species, its usefulness in joiners', cabinet-makers', and cartwrights' work,



6.—Aeer saccharinum—Sugar-maple.

its goodness as firewood, and the value of its sap, containing, as it does five per cent of sugar, together with the unrivalled beauty of its foliage, have caused its adoption,

conjointly with the industrious beaver, as the emblem of the French-Canadian nationality. The sugar-maple delights more especially in hilly districts, and in spots where the soil is dry, stony or gravelly, rich and light. Sandy land suits it least of all. The seed ripens in autumn, and should be sown at once. It might succeed if kept in dampish sand all the winter and sown in spring. The appearance of the seed is peculiar; it is like a double *samarre* with wings opposite each other. A pound contains eight thousand seeds, which should be covered



7.—Leaf of sugar-maple.



8.—Seed of sugar-maple.

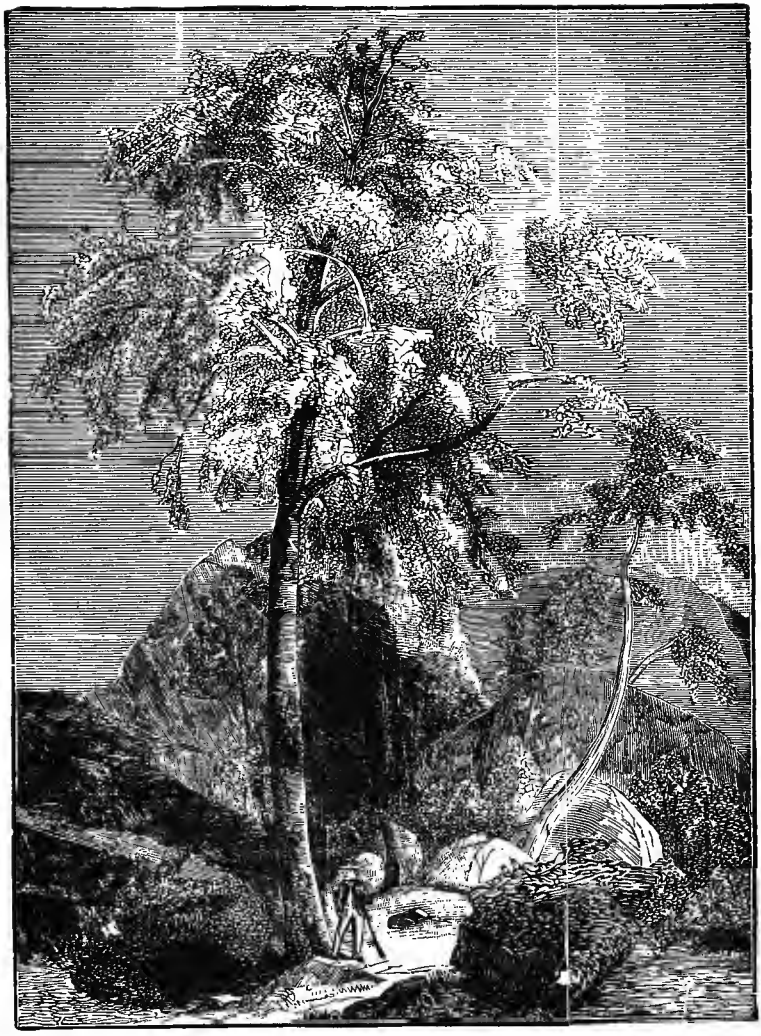
one inch deep when sown. Slow enough is the growth of this tree, particularly at first, but when mature, it arrives at a height of eighty feet, measuring three feet in diameter at the base, and sometimes even more. Fine plants from self-sown seed are often found in the underwood; they are easily transplanted, and take almost invariably. It is a mere waste of time to attempt to set out large trees of this species: they hardly ever succeed. Engraving 6, p. 39, represents the sugar-maple, engraving 7 the leaf and 8 the seed of this maple.

Acer Spicatum—Mountain-Maple.



9.—Seed of Mountain-maple—magnified.

This kind of maple, common enough in this country, never grows above fifteen feet high. I only mention it because it does well in dry rocky soils, and on the slopes of mountains. In these spots, it should be allowed to grow from the stump after cutting—a natural habit of



10 —Betula-excelsa—Yellow-birc .

this tree. Engraving No. 9, p. 40, shows the seed of the Mountain-maple.

Betula-excelsa — Yellow-birch. *Betula-lenta — Black-birch.* *Betula-nigra — Red-birch.* *Betula-papyrifera — Canoe-birch.* *Betula-populifolia—Poplar-leaved-birch.*

Almost all the birches having the same characteristics as regards their cultivation, I proceed to give a



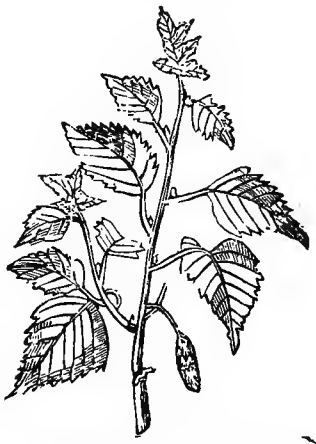
11 —Yellow-birch, leaves, branch and catkin.

description which will serve for all the above-named

kinds, pointing out, however, where necessary, any difference in their treatment. Cool, sandy soils best suit the birch. As its roots do not descend far, it does not require deep land. Its sap, which is abundant in spring, contains about one per cent of sugar. The seed ripens in autumn, and may be sown either then or in spring; but as it is rarely ripe before November, it is generally necessary to wait till the latter season before entrusting it to the ground. If the seed is buried in damp sand, and kept in a cool place, it will preserve its germinating power for six months. A pound of this contains about four hundred thousand seeds, not more



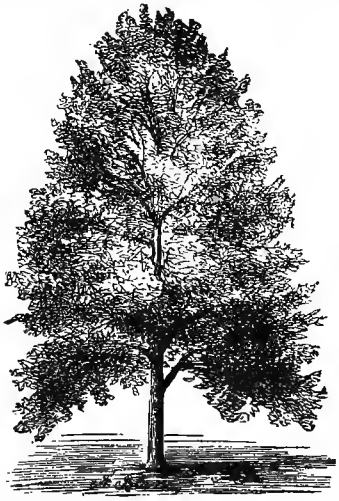
12.—Yellow birch—Seed magnified.



13.—Butula lenta—Black-birch—Branch, leaves and seed-pod.

than twenty per cent of which will grow; it should, therefore, be sown very thickly, on land in a roughish state, and only covered slightly by a pressure of the foot. If every thing goes well, the young plants will appear above ground in a month, and at the end of a year from sowing, they will have attained a height of

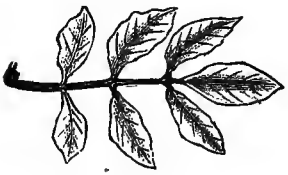
three inches, when they may be transplanted into the nursery, to be finally set out in their permanent resting place when they are from two to three feet high. The poplar-leaved-birch, at maturity, arrives at a height of about thirty-five feet, and the canoe-birch measures sixty feet by two feet in diameter; while the yellow-birch attains fifty feet by one foot, the black-birch seventy feet by three feet, and the red-birch fifty feet. I do not think these birches will pay to grow from seed, but they ought



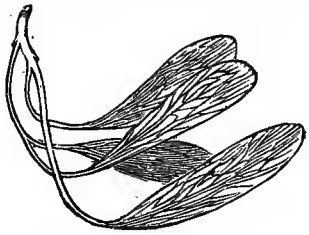
14 — Fraxinus Americana—White-ash.

to be preserved and cultivated in places where they grow naturally in succession to a fall of wood composed of resinous trees, a very common, if not a universal, occurrence. It may also answer to plant birch where moist sandy lands are to be found near a wood of these trees, in which a crowd of young plants are growing naturally. Plants of three years old, which can be recognised by the bark beginning to whiten, should be selected for this purpose. The white birch furnishes the material of

which the famous *bark-canoes* are built; it is a favourite wood for making boot and shoe-pegs, as well as the reels



15.—Leaf of white-ash.



16.—Seed of white-ash.

or spindles on which thread is wound; and it is also used for making paper-pulp.

The black birch is considered excellent as fire-wood. The engraving No. 10, p. 41, represents the yellow birch; No. 11, p. 42, shows its leaf on the branch with its catkin, or seed-pod; No. 12, p. 43, shows the seed, enlarged; and No. 13, same page, represents the branch and leaf of the black-birch, with its catkin.

Fraxinus Americana—White-Ash.

This ash rejoices in rich, deep soils, rather damp than otherwise, and shuns soils that are dry and too hard.



17.—Fraxinus nigra—Leaf of black-ash.



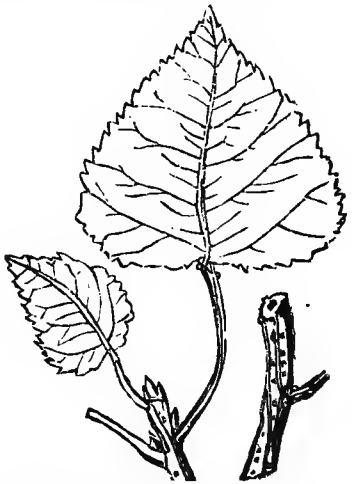
18.—Seed of black-ash.

At maturity, it attains a height of eighty feet by two feet, and sometimes more, in diameter. It is a quick grower, and, in good soil, it has been known to measure thirty feet by seven inches in diameter twenty years from sowing. Cartwrights, coopers, and common cabinet-makers, are always glad to get this wood, of which,

except as to these details, all that I have said about the black ash may be predicated. Engravings No. 14, p. 44, and No. 15 represent the tree and leaf, and engraving No. 16 the seed of the white-ash.

Fraxinus Sambucifolia—Black-Ash.

Low, damp, marshy places suit this tree. The seed ripens in autumn, and, should be sown immediately, if possible, but in this country, particularly in Quebec and Manitoba, it had better be kept in moist sand, and the sowing deferred to the spring, though, in this case, the



19.—Populus Canadensis—Cotton-wood—Leaves.

seed sometimes takes a year to sprout. It would be better to sow where the trees are intended eventually to stand, rather than in a nursery-bed ; four or five grains should be deposited at intervals of four feet each way, and it would be as well to sow Indian corn or some other plant with the ash-seed, to check the growth of weeds and to afford shade to the young trees. A pound of ash-seed contains about twenty thousand *pickles*, eighty per

cent of which ought to grow. One inch is deep enough to bury it. If it must be sown in a nursery-bed, it should be two years old before transplantation. Should the seed come up sparsely, there is no need to be discouraged, for it sometimes happens that eighteen months elapse before the whole germinates. The black ash attains a height of about seventy-five feet, and its special characteristic is, that its leaves come out very late in spring, and fall very early in autumn. Though slow in growth, this tree is useful for barrel-hoops, &c., at a very early stage of its existence.



20.—Seed of cotton-wood, with tuft of down.

One of its good qualities is, that it sprouts very rapidly from the stumps after felling; and, consequently, if

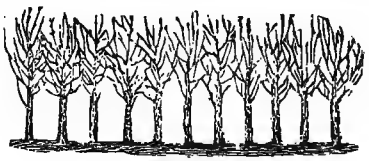


21.—Populus tremuloïdes—Leaves of the aspen.

stock are hindered from browsing upon it, a good, thick underwood is soon formed, which only requires to be kept clean and trimmed to become a useful wood. The leaf of the black ash is depicted in the engraving No. 17 p. 45, and its seed in No. 18, same page.

Populus Balsamifera—Balsam-Poplar. Populus Canadensis—Cotton-wood. Populus Tremuloïdes—American Aspen.

As all the poplars have pretty nearly the same characteristics as regards forestry-work, I will content myself with giving a description that will answer for all the above-named species, except where a special peculiarity may seem to demand our notice. Poplars like a cool, light soil. I do not recommend them for all situations; but for some districts, and particularly for Manitoba, I cannot sufficiently press their cultivation; for, where wood is scarce and the demand immediate, the rapidity of their growth and the facility of their



22.—Willow-hedge.

transplantation, render the poplar a most valuable tree Besides, from the ease with which they are propagated from cuttings, they are found useful wherever they grow. They are planted in company with hickories, oaks, and walnuts, to protect the young plants by the shade they afford. Cuttings are made in this fashion: the wood is divided into pieces two feet long; the end which is intended to enter the ground is bevelled, or cut *en biseau*, and is buried so deep that only a very little of the cutting is above ground. Wood of the year, or of two years old, may be used for this purpose. The cuttings should be made after the fall of the leaf, and set, at once, where they are to remain, at a distance of four feet apart between the rows and five feet in the rows, provided

that poplars alone are to be set out. The land must be hoed and cultivated for the first three years. These trees are often found occupying the land as a second growth, after the clearance of a forest of conifers. Where nothing better is to be had, this second growth may be cared for, as it costs nothing, and furnishes a fair firewood in a very short time. I cannot recommend my



23.—Salix alba—White-willow.

readers to sow poplars; still, for the information of amateurs who may wish to do so, I may mention that the seed ripens early, in June, and *must* be sown at once in a damp soil. Very little covering is needed. It sprouts quickly; and if the young shoot is not visible in a few

days, the odds are that it lacks moisture, a want always irremediably fatal.

The balsam-tree grows to sixty feet high by two and a half in diameter; the white-poplar to eighty feet high--a very fine tree it is, too—the cotton-wood, reaches forty feet by one in diameter. The only one of these valued for its wood is the white-poplar, though the cotton-wood furnishes good pulp for the manufacture of paper. Engravings No. 19, p. 46, and No. 20, p. 47, represent the leaf and seed of the cotton-wood, and No. 21, p. 47, a bough and the leaves of the American aspen.



24.—Leaves of the white-willow.

Salix Alba—White Willow. Salix Vitellina—Yellow-willow.

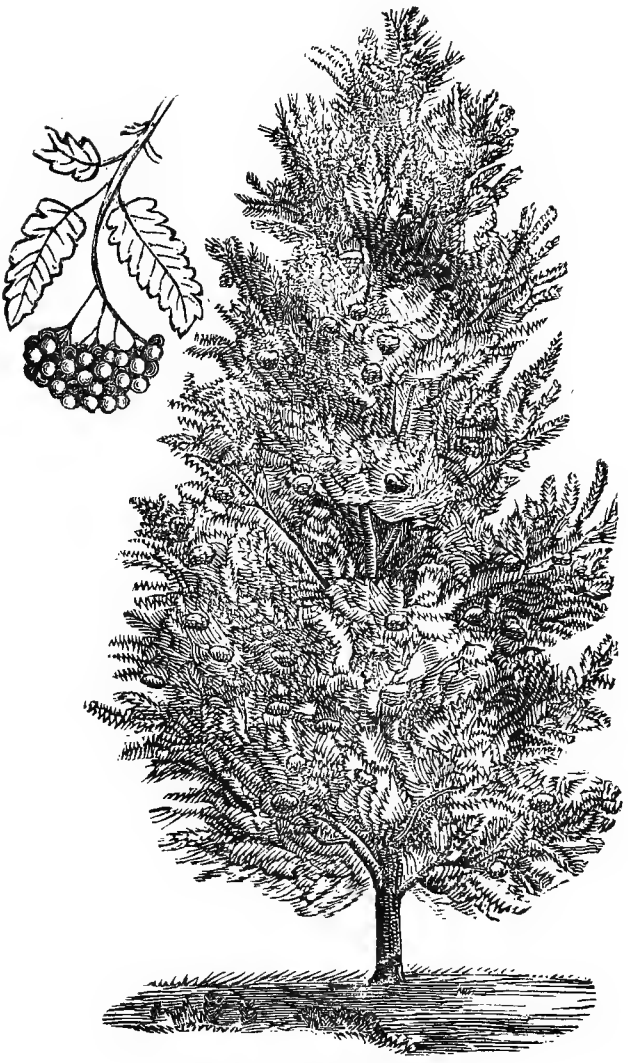
The willows, though, according to some, they may not be indigenous in the country, have so spread themselves throughout it, that they are able to dispute the rights of the original occupants of the soil, and on this account, I shall treat them as *autochthenes*, and class them as such in my general list. The willow *delights*

in damp, light, alluvial soils, in valleys and on the banks of rivers; it *grows well* in strong land, and even in clays, and in the very worst soils *it manages to get along*. In fact, you cannot put them out of their place. They will grow from seed, which, ripening in spring should be sown at once and slightly covered, but they are always propagated by cuttings, just like poplars. The white-willow grows to a height of sixty feet, but the yellow never exceeds forty. Their growth is marvellously quick, and, under good ordinary conditions,



25.— Salix v tellina—Leaves of the yellow-willow.

these trees have been known to attain a height of thirty feet by one foot and a half in diameter in ten years. As a firewood, the willow is preferable to the poplar and the fir, and has the advantage of beating both of them in rapidity of growth. It is hardly right to talk of the willows as forest-trees; their principal use is to act as nurses to the more delicate species, which, in their early days, require protection against the sun and wind. They



26.—Sorbus Americana—Mountain-ash with seeds.

are, also, very useful when planted on soils subject to be worn away by streams, which flood them in spring, and by the ice brought down by rivers. The willow is much employed to retain the earth on the naked sides of mountains, and to obstruct the rush of those destructive torrents which carry off the soil from the declivities and slopes of hilly lands.



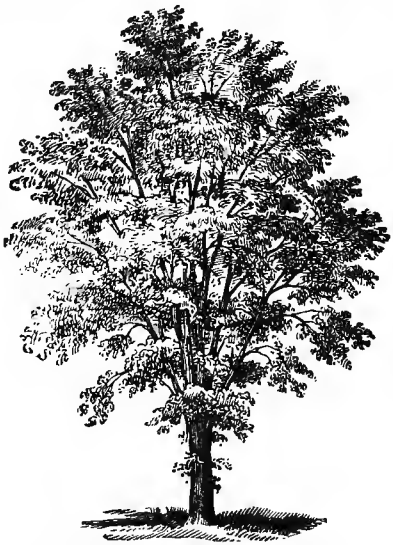
27.—Leaves and flowers of the Mountain-ash.

When willows are cut for firewood, it should be done *pollard-fashion*, an operation which I will explain when I come to treat of tree-pruning, and which I recommend especially to the attention of the settlers on the North-West prairies. Live hedges, and very strong if not pretty ones, too, may be made from the willow, and every three or four years they will furnish a fair firewood. Cuttings are made as usual, and are inserted in the ground a foot apart. A hedge is thus formed in two years, which is doubly useful: as a fence and for the

stove, which hedge is shown in engraving No. 22, p. 48. But instead of standing two feet out of ground, as in the eng. it were better that the cuttings should be driven almost entirely ought of sight. Engraving No. 23, p. 49, shows the white-willow, engraving No. 24, p. 50, shows a branch and leaves of the same, and No. 25 a branch and leaves of the yellow-willow.

Sorbus Americana—Mountain-Ash.

This tree is of small importance to the forester. It is found mixed with a crowd of other species in cool,



28.—Ulmus Americana—American elm.

mountainous places. Seldom more than twenty-five feet high, the mountain ash ripens its seed in autumn, seventy-five thousand of which seeds go to the pound. Easily preserved as this is, it were better kept in damp sand; for when once dry, it germinates with difficulty. The wood of the mountain-ash is hard and compact,

but as it never arrives at a large size, it is of small utility. It is grown more as an ornamental tree than anything else; and, thanks to the lovely trusses of creamy flowers which it bears in spring, to be replaced in autumn by pretty bunches of red fruit, which hang on the tree all the winter, no more charming denizen of our shrubberies can be found. The engraving No. 25,



29 —American elm—Leaves and seed.

p. 52, shows the mountain-ash and engraving No. 26, p. 53, its leaves and flowers.

Ulmus Americana—White Elm.

The moist, rich, alluvial soils, which occur on the banks of rivers, are favourable to the growth of this tree. June sees the ripening of the seed, which should be sown at once, and covered very slightly. In less than a month it is up, and it reaches a foot in height the first season. Fifty thousand pickles are found in a pound of seed. The elm transplants well, and is cultivated almost like the maples. Seventy feet by three and even four

feet in diameter is the size of this tree at maturity. It grows very quickly, and specimens have been found twenty-five feet high by five inches in diameter twelve years from sowing. Young plants, taken up in the forests where, the soil being suitable to the elm, they grow in great numbers, may be transplanted successfully the first year. The wood of the elm is much sought after by the cartwright, in spite of its tendency to shrink (*travailler*). Engraving No. 28, p. 54, shows the American elm, and engraving No. 29, p 55, its leaf and seed

SECTION II.

CONIFEROUS TREES.

Of the varities of coniferous trees mentioned in the general list, the following are those which are common to all the provinces of the Dominion :

Abies alba.....White spruce.
Abies Americana .....Double-balsam fir.
Abies balsamifera.....Balsam-fir.
Abies excelsa.....Norway spruce.
Abies nigra.....Black-spruce.
Larix Americana.....American larch.
Pinus Banksiana.....Cypress.
Pinus resinosa .....Norway pine.
Pinus strobus .....Weymouth or white-pine.

Abies Alba—White-Spruce.

The white-spruce grows freely in almost every soil, and delights especially in those that are cool and gravelly. It does not do so well in soils that are damp, and dies off soon in strong clays. The land need not be deep, for this tree has no tap-root—its roots are all laterals. Though the seed, which can be kept for two or even three years, ripens in autumn, still, it is advisable to

sow in spring the seed of the previous year, of which one pound contains about fifty thousand pickles, eighty per cent of which germinate under ordinary conditions. The seed is winged, as may be seen in the engraving : this is a common characteristic of the family, as of all the firs. They are contained, like those of all the conifers, in cones composed of overlapping scales. Sow thickly,

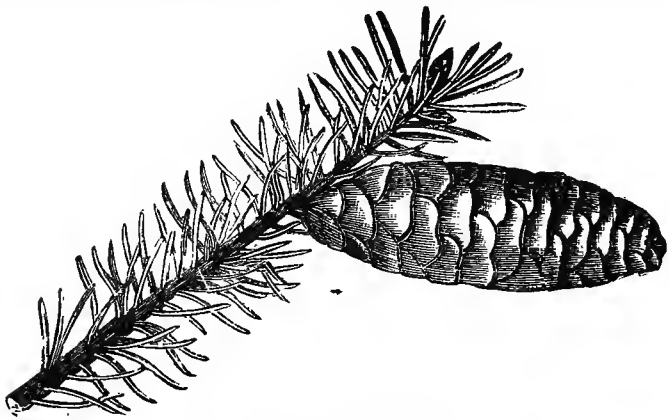


30.—Albies alba—White-spruce.

and cover shallow with good mould, and then press the soil down : this is called *plomber*, in technical terms of the art. The seed germinates in three or four weeks, and at the end of the season the plant will measure three inches. The nursery-bed should be sheltered from the direct rays of the sun, and to this end it is covered with a trellis of laths sufficiently high to admit a man to hoe. Two years after planting out from the seed-bed, it is

finally transplanted into its permanent location, being then three or four years old.

The white spruce attains a height of about fifty feet, and a diameter of two feet at the base. Forests composed



31.—Leaves and cone of white-spruce.

of these trees may be felled every ten or fifteen years for lumbering purposes, provided that all trees less than a foot in diameter be left standing. White spruce makes fair firewood and good building timber; but it soon rots if exposed to the air, and, viewed from this point, is inferior to pine. The quality of the wood depends entirely on the soil in which the tree is grown. Engraving No. 30, p. 57, shows the white spruce, No. 31, a bough, and No. 32, its seed.

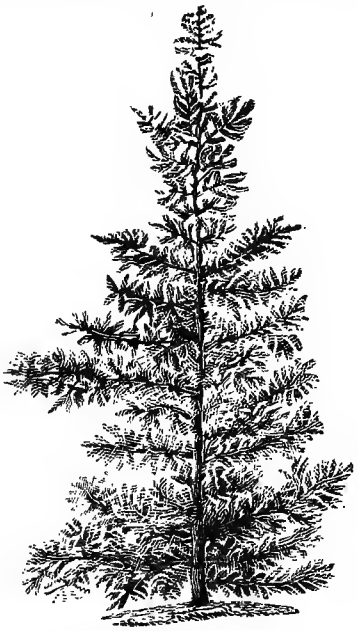


32.—Winged seed of white-spruce.

Abies Americana—*Double-Balsam-Fir*. *Abies Balsamifera*—*Balsam-Fir*.

The fir, a very common tree in this country, prefers a moist soil, and does not disdain a marshy one. The seed, which matures in the fall, must be sown at once, as it easily loses its germinating power, and

even if treated thus, not more than twenty-five per cent will grow. Forty thousand pickles are found in a pound of seed; it takes five or six weeks to come up. Fifty feet is the height of the balsam-fir, by one foot in diameter; but the double balsam-fir grows to sixty feet, and is easily distinguished from the former, since it has not, like it, vesicles filled with resin-



33—Abies balsamifera—Balsam-fir.

ous gum, and is, in addition, loftier in growth, though the leaves and cones are shorter. The two varieties are often found growing together. The fir grows quickly, and is very useful in young plantations of tender trees, as a protection against the wind, especially in damp places, where no other conifer would grow. The wood of the fir is almost valueless; for firing it is hardly worth

more than the poplar. The balsam-fir produces a gum called, in common parlance, *gomme de sapin*, and known in medicine as Canada-balsam. Engraving No. 33, p. 59,



34.—Leaves and cone of balsam-fir.

represents the balsam-fir, No. 34 one of its boughs, and No. 35 the seed.

Abies Excelsa—*Norway Spruce.*

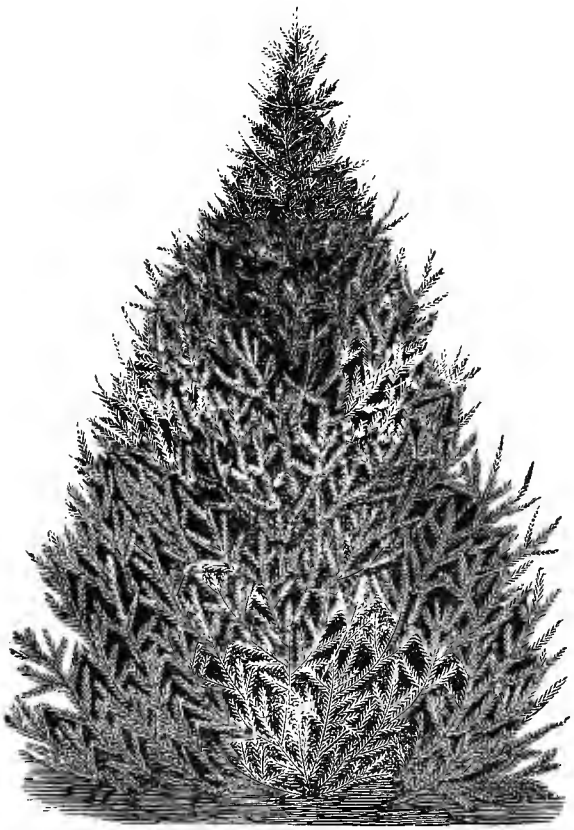
Here is an exotic which, in my opinion, deserves a place among the conifers fitted for cultivation in all the provinces of the Dominion. This fine tree seems to be so well inclined to become acclimatised in our country, that I have thought it right to enter it in the list of our indigenous trees. It is hardy, presents a magnificent appearance, and reaches a height of one hundred feet. It is easy of transplantation, and of rapid growth, although it is said to start slowly; a fault which I have proved to be unjustly laid to its charge. It has been known, without special care,



85.—Winged seed of balsam-fir in the husk of the cone.

to attain a height of thirty-four feet by fifteen inches in diameter at the base, in twenty-four years.

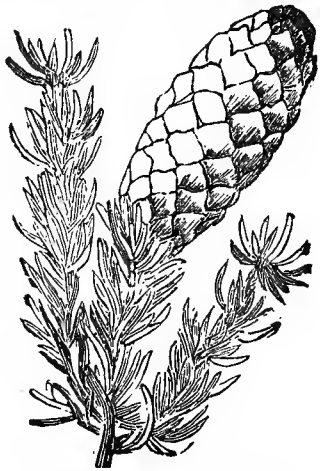
One quality of this tree is to throw out extremely strong lateral branches, which makes it highly suitable



36.—Abies excelsa Norway spruce.

for wind-oreaks round orchards, nurseries, or permanent plantations of walnuts, oaks, &c., And this is the principal reason why I recommend its cultivation. There is one peculiaritv in its wood: it is fit for use before it

reaches a foot in diameter, which is not the case with the other spruces. As regards other matters, including its cultivation, all that I have said about the white



37.—Leaves and cone of Norway spruce.

spruce applies to the Norway spruce. Engraving No. 36, p. 61, shows the Norway spruce; No. 37 represents one of its branches, and No. 38 its seed.

Abies Nigra—Black-Spruce.



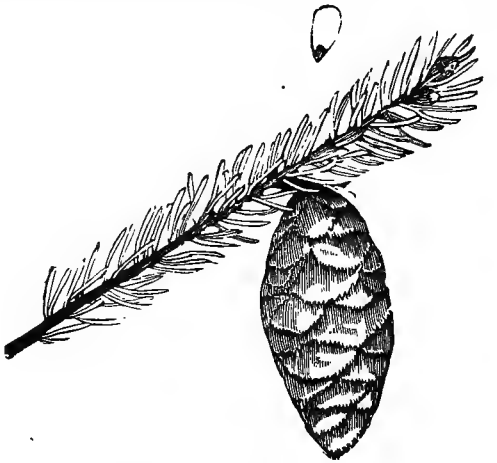
38.—Seeds of Norway spruce.

Every thing I have said about the white-spruce is applicable to the black-spruce. The only marked differences between the two kinds are, that the black-spruce, in suitable soils, attains a height of hundred feet, and is a little inferior to the other in the quality of its wood for the joiner's use.

With the tender shoots of the black spruce is made the noted *spruce beer*, the favourite beverage of the Canadian during the summer months. The engraving No. 38, p. 63, represents a bough of the black spruce, with its cone and seed.

Larix Americana—American Larch.

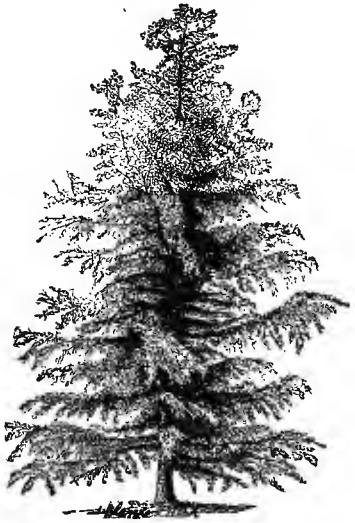
The larch delights in low, damp, and even marshy places. The seed ripens in autumn, and is preserved, like the seed of other conifers, in moist sand. About thirty thousand pickles go to the pound. This tree, which grows rapidly, is seventy feet high at maturity, and, twenty years from sowing, furnishes dimension timber from forty to fifty feet in length. Sow in spring,



38.—Leaves, cone, and seed of black-spruce.

and in two years time, when the plant will be about a foot high, transplant it into the nursery. Its final transplantation should be done very early in the spring. This is absolutely essential, for the tree starts into growth with the first thaw, and is then very difficult to transplant. As the ground will not be shaded for the first four years, the hoe and grubber must be kept going all the time. Larch-wood is strong and heavy; hence, it was employed by the farmer for fence-pegs and harrow-teeth, before iron was used for the one purpose, and wire for

the other. The property which larch possesses of re sisting the influence of water, causes it to be a favourite timber with ship-builders. A great deal of it is used for railroad sleepers, for which purpose it becomes large enough in twenty four years from sowing. I strongly recommend the cultivation of the larch to all our



39.—Larix Americana—American larch.

farmers, and more especially to railroad-companies. The tree of the American larch is shown in engraving No. 39 and the seed in No. 40, p. 65.

Pinus Banksiana—Banksian pine. Pinus Resinosa—Red-Pine. Pinus Strobus—White or Weymouth Pine.

The pines are the most important of all the trees with which the Canadian lumberer has to deal. The Canada white-pine is the most valuable of the three species which are most frequently met with in the Dominion. Cool, damp soils suit it, but it will do well in light,

sandy soils with a clay subsoil. Plains of arid sand may be advantageously planted with this tree, the seed of which takes eighteen months to ripen; it is collected in autumn and sown in spring, placing not more than half an inch of earth upon it. Germination takes place, generally, in thirty days, but, occasionally, the plant remains invisible for twelve months. A pound of white-pine seed contains ten thousand pickles, and



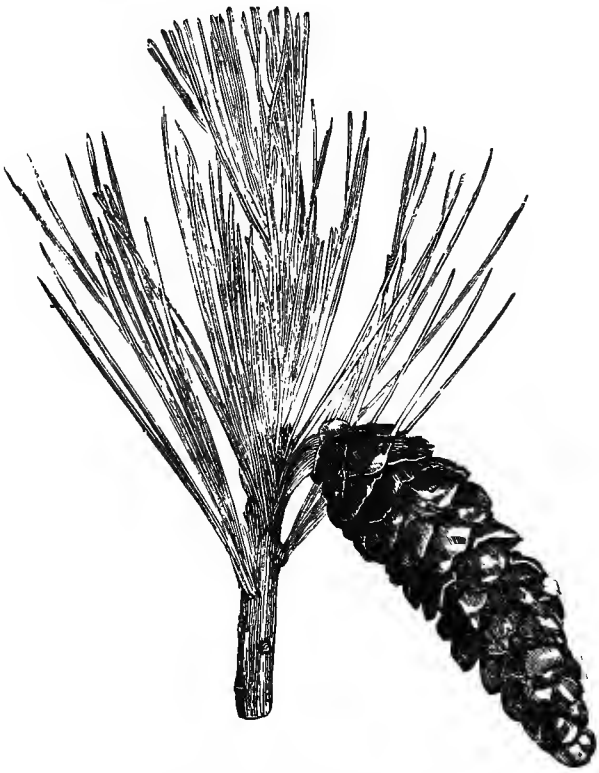
40.—Winged seed of American larch



41.—Pinus strobus—Weymouth, or white-pine.

a pound of red-pine seed, forty thousand. They grow very quickly, and may be set out in the nursery two years from the seed. When the time of final transplantation arrives, they should be planted at a distance of eight feet, every way from tree to tree, and the vacant

spaces should be filled up with two or three willows or poplars, in fact with any quick-growing trees which may be cut six or seven years afterwards. In fourteen years, the white-pine may be expected to furnish timber thirty-five feet high by nine inches in dia-



42.—Leaves and cone of white-pine.

meter, on an average; and in twenty-six years, fifty feet by eighteen or twenty inches, may be looked for. The Canadian white-pine attains a height of from one hundred and twenty-five to one hundred and forty feet, with an average diameter of seven feet. At the Centenary

Exposition, at Philadelphia, a plank of this wood was exhibited, eight feet four inches wide, by nine inches thick. The red-pine does not grow to the same dimensions, hardly ever exceeding seventy-five feet, neither is its wood of so fine a quality. Dry, sandy land is its favourite. Rock-pine is only mentioned here for the sake of recommending its preservation and use where it grows naturally. It is worth hardly anything, from a commercial point of



43.—Seed of white-pine in husk of cone.



44.—Leaves and branch of red-pine.

view, except for firing. Poor, stony soils suit it, and it rarely exceeds forty feet in height. Engraving No. 41, p. 65, represent the Weymouth or white-pine, No. 42, p. 66, its bough, and No. 43 its seed. Engraving No. 44, shows a branch of the red-pine.

CHAPTER V.

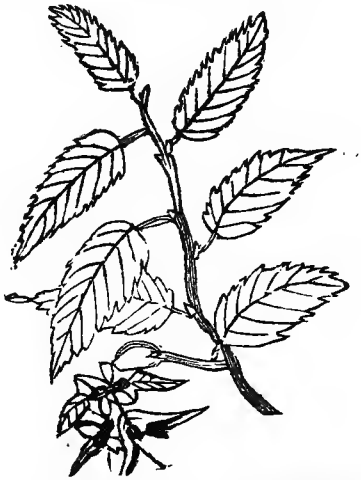
SUMMARY DESCRIPTION OF THE FOREST TREES WHICH INHABIT THE PROVINCE OF ONTARIO.

Besides the species common to all the provinces, Ontario possesses a considerable number in addition,

Missing Page

Missing Page

wheels, and for firing, if there is enough of it. For these reasons, it should be preserved with care and its growth assisted. The hornbeam delights in rich soils; the seed is dry, hard, and winged, and a pound of it contains about ten thousand pickles, which are slow to germinate. It would be as well to sow in autumn, though the



46—Carpinus Americana—Leaves and seeds of hornbeam.

seed can be kept in damp sand till spring. Eng. No. 46 represents the leaves of the hornbeam, and Eng. No. 47. p. 71, its seed.

Carya Alba—Shell-bark Hickory. Carya Amara—Bitter-Hickory. Carya Glabra—Pig nut. Carya Microcarpa—Small-fruit Hickory. Carya Tomentosa—White-heart Hickory.

I unite all these hickories under one head, for the purpose of giving a description common to the whole, in which I shall point out wherein they differ from one another. The hickory delights in cool, rich soils. Its seed, a white nut with a thin shell, the kernel of which is

extremely bitter in the *carya amara*, but eatable in the other sorts, ripens in autumn. Some people recommend sowing it at once, but, if kept in damp sand, it will retain its power of germinating until spring. There are from fifty to a hundred nuts in a pound weight—the number differs according to the size of the various sorts. There are two ways of sowing: in the place where the plantation is intended to be permanent, or in beds, for subsequent setting out in the nursery. Two inches of earth will sufficiently cover the seed. Sowing in the permanent plantation has been recommended for some time, because the plant having a long tap-root, if this is broken in transplantation the tree takes a long time to recover from the injury. Still, the foresters in Europe have sown it in beds for many years. At a year old, with a very sharp spade, they cut the tap-root about eight inches below the surface, thrusting in the spade, very obliquely, under the plant in spring or autumn, when the sap is quiescent. Treated thus, the young tree shoots out numerous lateral rootlets, and, a year after the operation, it is transplanted into its permanent abode, where it is sure to take, and grows as rapidly as the sugar-maple. The hickory, not putting out its leaves until the spring is far advanced, demands protection from the smothering effects of weeds. Hence, when the permanent location planting is practised, it would be well to sow at the same time some of the quicker growing trees, such as the red maple, the poplar, the willow, &c. The shade derived from the vigorous shoots and leaves of such will prevent the weeds from taking possession of the land. When



47.—Seeds of hornbeam.



48.—Carya amara—Nut of bitter-hickory.

they have done their work, the inferior trees can be cut, and the ground left to the hickories alone.

No firewood is to be compared with the hickory; and for all purposes requiring great power of resistance it is most excellent. The small-fruit hickory grows to a height of seventy feet by two feet in diameter; the bitter-hickory to fifty feet; and the shell-bark to sixty feet. The wood of the last, wrongly named *noyer tendre*



49.— Carya alba—Leaves and nuts of shell-bark hickory.

(soft walnut), is very hard, and is much sought after on that account. Of all woods it is the best for firing. The pig nut is also of good quality, and attains a height of seventy feet, while the white-heart does not exceed fifty. The latter's kernel is contained in a very hard shell. Eng. No. 48, p. 71, represents the seed of bitter-hickory, No. 49 the leaves and seed of the shell-bark hickory; No. 50, p. 73, represents the pignut seed and No. 51, same page, the seed of the white-heart hickory.

Castanea Vesca—Chesnut.

Rich, silicious soils suit this tree best; it abhors wet clays. Its seed, the edible chesnut, three hundred to the

pound, ripens in autumn, and may be preserved in damp sand till spring. It should be sown in its permanent location, as its transplantation rarely succeeds. Of quick growth, its height at maturity is sixty feet. The wood of the chestnut is hard and durable, but coarse and por-



50.—Carya glabra—Nut of pignut.



51.—Carya tomentosa—Nut of white-heart hickory.

ous. One of its chief advantages is that after cutting it shoots freely from the stump. Good posts for fencing, and fair firewood, though full of sparks, are yielded by the chestnut. (1) Engraving No. 52 represents the chestnut and No. 53, p. 74, its leaves and seed.

Fagus Sylvatica—Beech.

Hating sands, this well known tree finds a pleasant abode in hilly, gravelly soils, where there is little depth of earth. The *mast*, which ripens, as all the world knows, in autumn, must be sown at once, as it soon loses its power of germination. It should be but slightly covered, and will be found up in the spring. A pound of mast contains fifteen hundred pickles. As it is by no means easy to raise the beech from seed, perhaps it would be wiser to take the young plants which spring in the underwood, and set them out in a nursery. The



52.—Castanea vesca—Chestnut.

(1) And splendid hop-poles.—*Trs.*

beech, like the hickory and butternut, requires the protection of more rapidly growing trees in its youth. It grows slowly, though quicker than the oak, and when full grown is sixty feet high. Though worth preserving, it is not worth taking much trouble about, for its wood is inferior to the maple and even to the yellow-birch as a combustible, and for other purposes it is not much in demand. The mast, when crushed, furnishes a by no



53.—Leaves of the chestnut and fruit.

means despicable salad oil. The eng. No. 54, p. 75, depicts the beech, No. 55, p. 76, its leaves, and No. 56, same page, the mast.

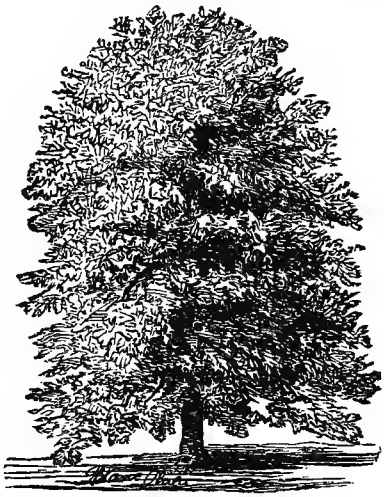
Fraxinus Pubeseens—Red-Ash.

This ash, which delights in rich soils, seldom exceeds forty feet in height. The wood is inferior in quality, but is in request for baskets and barrel-hoops. For its cultivation, &c., see the other articles on the ash. Cut No. 57, p. 77, shows the red-ash, and No. 58, p. 78, its leaf.

Gymnocladus Canadensis—Coffee-tree.

This tree, the singular name of which in French, *chicot*, is derived from the appearance of the end of its

boughs in winter, grows to fifty feet high by fifteen inches in diameter. It grows well from the seed, which must be scalded before sowing, as the integument is very hard. The wood of the coffee-tree is of a reddish colour, tough, with a fine grain, and is highly prized by the cabinet-maker. It is worth attention where it grows



54.—Fagus sylvatica—Beech.

naturally, but is hardly worth cultivating. Engraving No. 59, p. 78, represents the seed of the coffee-tree.

Juglans Cinerea—Butternut. Juglans Nigra—Black-Walnut.

The walnuts rejoice in rich soils. The seed should be set in autumn, immediately after it ripens, as it is very difficult to preserve it during winter. Still, kept in damp sand, in a cool, or rather, in a cold place, it will do well enough. Twenty five nuts weigh about a pound, and they should be sown where they are to remain, as the tap-root is very strong, which makes the plants impatient of removal. The observations on the oak and the

hickory are applicable to these trees. Two inches is deep enough to bury the seed. The butternut grows rapidly, and at last attains a height of fifty feet. If sown in beds, it must be transplanted very young, as the tap-



55.—Leaf and flowers of beec.

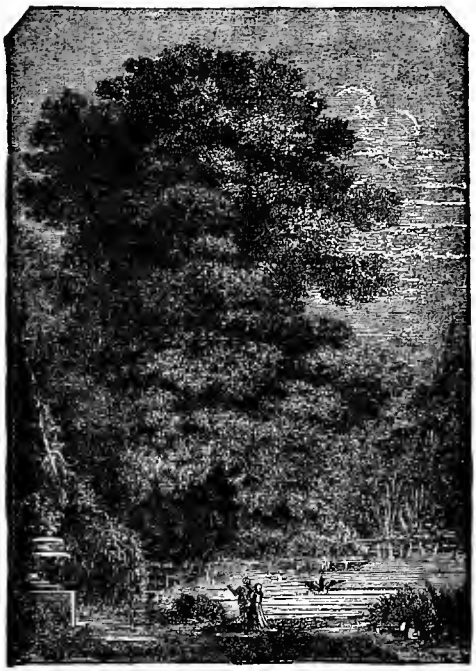
root would be broken off the tree were it allowed to stand too long without removal. It would be better to cut the tap-root in the bed, and to treat the plant as recommended for the hickory. The black-walnut grows to a height of ninety feet, and furnishes the costly wood so highly esteemed by cabinet-makers. The butternut, less valuable than the black-walnut on account of the inferiority of its colour, is used for the same purpose. The cultivation of the walnuts is, in general, precisely the same as that recommended for the oak and hickory, to which my readers may refer. Cut No. 60, p. 78, depicts the butternut, and No. 61, p. 79, its leaf and seed; No. 62, p. 80, represents the black-walnut, and No. 63, p. 81, its leaf and nut.



56.—Beech-mast.

Liriodendron Tulipiferum—Tulip-tree.

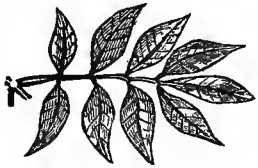
This magnificent tree, now rarely seen in Canada, is will suited to low damp soils. It reaches a height of one hundred feet or more, by five to six feet in diameter. A pound of seed, which ripens in autum, contains twenty thousand pickles, and it may be sown then or in spring.



57.—Fraxinus pubescens—Red-ash.

If sown in autumn, it will not come up till the following spring; if sown in spring, it takes a whole year to germinate. The long tap-root of the tulip-tree causes it to be impatient of transplantation, though the seed comes up well, and, consequently, it must be treated like the tap-root of the oaks, hickories, &c., i. e., it must

be severed in the seed-bed, as recommended in the chapters on those trees. The wood of the tulip-tree is excellent for carving, and may take the place of pine in



58.—Leaf of red-ash.



59 —Gymnocladus Canadensis—Coffee-tree.

joiners-work; but it must be painted if intended for out-door work. Paper is made of the bark. Engraving No. 64, p. 81, represents the leaf, and No. 65, same page, the seed of the tulip-tree.

Ostrya Virginica—Ironwood.

Thirty feet is the usual height of the ironwood, which rejoices in rich, high places. For information regarding



60 —Juglans cinerea—Butternut.

this tree, see the remarks on the American hornbeam; the hard, tough wood of the iron wood answers for the same purposes as that of the hornbeam. Engraving No. 66, p. 82, represents the leaf of the iron wood, and No. 67, same page, its seed.

Platanus Occidentalis—Button-wood.

In rich, alluvial soils, and on river-banks, this tree does well. Eighty feet is its usual height. The seed ripens in autumn, and keeps well in a dry state. Spring is the proper season for sowing it, and the covering of earth should be slight. A pound of the seed contains about three hundred thousand pickles, of which about twenty per cent. grow. When young, the plants require protection, but they may be set out in the nursery at the end of a year; and three years from sowing may occupy the place of their per-



61.—Leaf and nut of butternut.

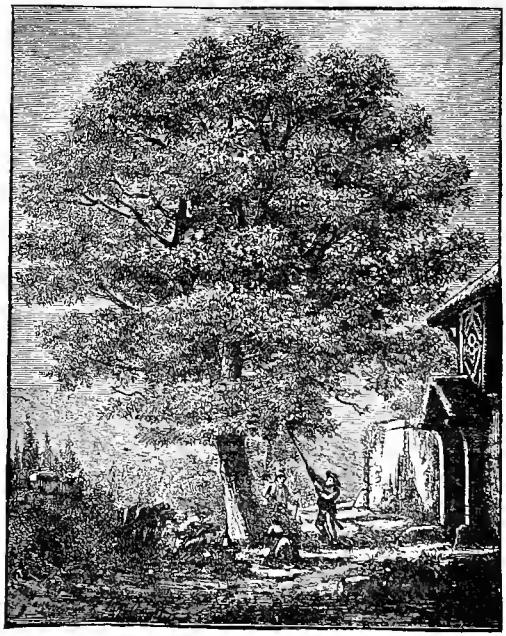
manent abode. The button-wood is said to grow as fast as the poplar, and is equally suited to the system of propagation by cuttings. Its wood is, in quality, &c., equal to that of the maple; and as an ornamental tree, it is very beautiful. Engraving No. 68, p. 83, displays the leaf and seed-ball of the button-wood, and No. 69, p. 84, the seed-ball with a seed.

Populus Grandidentata—Large-toothed Aspen.

This poplar rarely exceeds a height of forty feet by fifteen inches in diameter. The details of its treatment will be found in the chapter devoted to a summary of the species common to all the provinces.

Quercus Alba—*White-oak. Quercus Castanea*—*Yellow-Chestnut-oak. Quercus Coccinea*—*Scarlet-oak. Quercus Prinus*—*Swamp-Chestnut-oak. Quercus Rubra*—*Red-oak. Quercus Stellata*—*Post-oak. Quercus Tinctoria*—*Quercitron-oak.*

The white-oak rejoices in deep, heavy land, not too damp. In stony soils the chestnut-oak does well. The



62.—Juglans nigra—Black-walnut,

quercitron-oak loves dry land; the scarlet-oak, rich land; the post-oak loves an alluvial soil, and the scarlet, has the same tastes as the white-oak, only it is less afraid of moisture. The seed, or acorns, of the quercitron, the scarlet, and the red sorts, takes two years to ripen; but the others mature in the autumn of the first

year. The seed, one hundred to the pound, may be sown in the fall, or preserved till spring in damp sand, kept cool. Sow exactly as advised for the hickory, and cut off the tap-root in the same way: the result of this treatment will be identical in both cases. To



63.—Leaf and nuts of black-walnut.

make this operation the clearer, I offer an engraving No. 70, p. 85, of a year-old oak with its tap-root, another, No. 71, p. 86, the same without the tap-root; and a third, No. 72, p. 87, depicting it a year after the amputation. It will be seen, by the last cut, that the excision



64.—Liriodendron tulipiferum—Leaf of tulip-tree.



65.—Seed of tulip-tree.

of the tap-root has had the effect of causing the plant to throw out a great number of hairy rootlets, by means of which it has been able to assimilate a greater quantity of nourishment in a given time. In its youth, the oak, like the hickory, should be mixed with other species for

shade and shelter. The seedling becomes about a foot high the first year, and may be transplanted a year from the amputation of the tap-root. The ultimate height of the different oaks is as follows: the white-oak, seventy feet by four; the chestnut-oak, sixty feet; the quercitron eighty feet; the post oak, fifty feet; the swamp-chestnut oak, one hundred feet; and the red-oak grows as large as



66.—Ostrya Virginica—Iron wood.

the white, but not so high. Slow grower as is the white oak, it is said to reach, in twenty four years, a height of twenty five feet, with a diameter of two feet at twelve inches from the ground. Thus, in these few years it becomes of great value for building, and is worth sowing, even by those who look to reap a profit in their own lifetime. The ship-builder, the plough-maker, the cooper, all value highly the timber of the oak, and it furnishes excellent firewood. The inner bark of the quercitron supplies the dyer with a yellow-dye—hence its trivial name—*Dyer's oak*. Eng. No. 73, p. 88, represents the white-oak, No. 74, same page, its leaves and No. 75, same page, its acorn; eng. No. 76, p. 90, represents the chesnut-oak, and No. 77,



67.—Seed of ironwood.

p. 92, its leaf; eng. No. 78, same page, the leaf of the quercitron-oak, and No. 79, same page, its acorn; eng. No. 80, p. 94, the leaf of the scarlet-oak, and No. 81, same page, its acorn; eng. No. 82, same page, the leaf of the swamp-chestnut-oak; eng. No. 83, same page, the leaf of the red-oak, and No. 84, same page, its acorn.

Tilia Americana—Bass-wood.

The lime rejoices in rich, deep, cool, moist soils. It flowers in June, to the great delight of the bees, and ripens its seed in autumn. Kept in damp sand, the seed

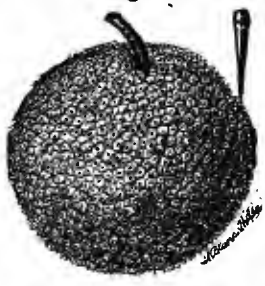


68.--Platanus occidentalis—Leaf and capsule of button-wood.

will preserve its vitality for six months. Five thousand pickles go to the pound. A rapid grower, the lime attains a height of eighty feet by three and even four feet in diameter. Its wood is white, soft, light, difficult to split, and furnishes a fair combustible, though its proper use is for carving and cabinet-work in general. Eng. No. 85, p. 97, represents the bass-wood; No. 86, p. 98, shows its leaves, and No. 87, same page, its seed.

Ulmus Fulva—The Red-Elm.

This tree delights in a lofty situation, and does especially well in cool, rich, mountainous soil. It is not so large as the white-elm, seldom exceeding sixty feet in height; the quality of the wood, however, is better, and couples (1) made from its twigs are strong and very elastic.



69.—Capsule and seed of button-wood, natural size.

It is said to grow as fast as the negundo: a strong statement! In other points, it is of the same habit as the American elm. The red-elm may be called the National Tree of the United States. Eng. No. 88, p. 99, represents the leaf the red-elm, and No. 89, p. 100, its seed.

SECTION II.

Coniferous Trees.

The following is a list of the conifers, besides those already described, which are found in Ontario

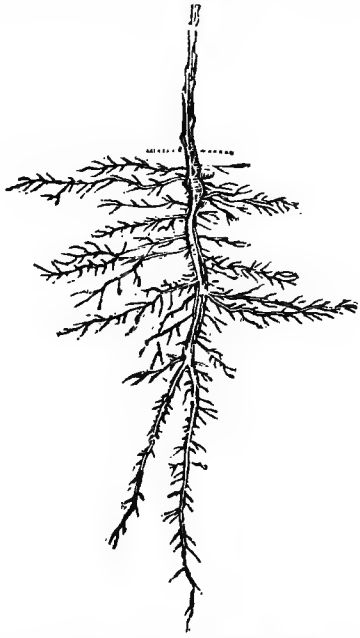
Juniperus Virginiana.....Red-cedar.
Pinus mitis .....Yellow-pine.
Thuya occidentalis .....Arbor vitæ.
Tsuga Canadensis. .....Hemlock-spruce.

Juniperus Virginiana—Red-Cedar.

The seed of this tree ripens in autumn, and should be

(1) Sometimes called "shackles": particularly in the counties of Kent, Surrey, &c.—Eng. They are used to fasten hurdles together.—Fas.

sown in spring in a seed-bed; it attains a height of thirty feet, and prefers dry places. It may be transplanted a year from seed, and finally set out at three years old. As the seed is loath to sprout, the bed should be frequently watered. The wood of the red-cedar, which is close-grained and sweet-scented, is used to make the



70.—Year-old oak, with its tap-root.

sheaths of lead-pencils. This is hardly to be called a forest-tree, but good hedges can be made of it, if properly trimmed. Eng. No. 90, p. 101, shows the red cedar, and No. 91, p. 102, its leaves and seeds.

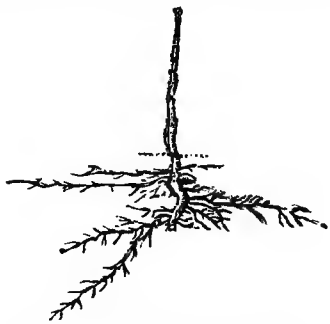
Pinus mitis—*Yellow-Pine.*

This pine, which does not, at maturity, often exceed sixty feet by fifteen inches in diameter, loves sandy situations. Its wood, very fine in grain, is much used in

building and in joiners-work. For other details, see the chapters on pines, in the summary of trees common to all the provinces of the Dominion. Eng. No. 92, p. 103, shows a bough of the yellow-pine, and No. 93, same page, its seeds.

Thuya occidentalis—Arbor vitæ—White-Cedar.

The white cedar grows naturally in low, marshy places. The seed ripens in autumn, and the tree, eventually, reaches a height of forty feet by twenty inches in diameter. It grows but slowly, taking twenty years to

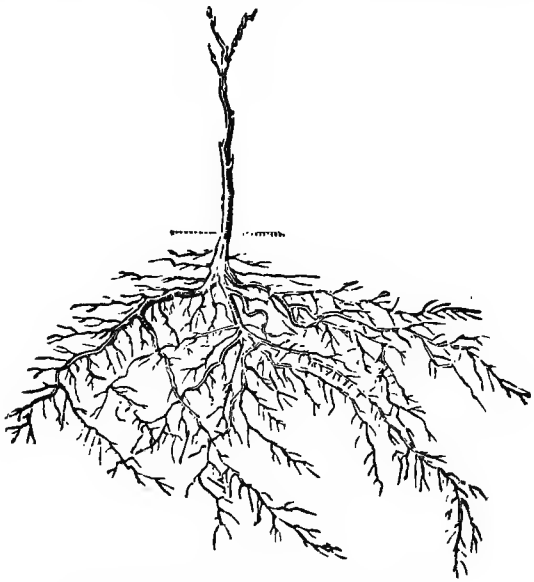


[71.—Year-old oak, without its tap-root.

attain a height of sixteen feet by four inches. Useful as the white cedar is as a windguard, there are other trees which, in that capacity, are preferable to it; the Norway spruce, for example. It is only as an ornament that I can advise its cultivation. Still, it is worth taking care of, by hoeing, &c., where it grows, as its wood is excellent for shingles, fence posts, which made of this wood will last forty years, and rails, which will last sixty. The white-cedar will bear clipping into any desired shape. It is said to take well from cuttings, and young plants found in the bush transplant most successfully. Engraving No. 94, p. 104, represents the white-cedar, and No. 95, p. 105, its seeds.

Tsuga Canadensis—Hemlock-Spruce.

This species finds itself at home on stony hill-sides, where the soil is light. It will grow, but much more slowly, on richer lands. The seed, a pound of which contains eighty thousand pickles, ripens in autumn, and should be treated like that of the spruce, and at two years old the plants may be set out permanently. As



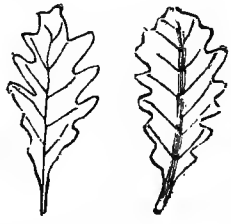
72.—Oak with tap-root cut off, a year after tho operation.

regards beauty of form, it is one of our noblest indigenous trees, often reaching eighty feet in height. The wood of the hemlock is coarse in grain, and difficult to work up. Now-a-days, boards, planks, and laths, in great numbers are made of it, on account of the scarcity of pine. Sleepers, or ties, for railroad use are derived from it; but they are of very inferior quality In tanneries the bark of the hemlock is much used, and this

is one of the principal causes of the rapid disappearance of this tree ; for, unfortunately, bark is harvested for sale to the tanners, and the unhappy tree is left to perish where it lies. Eng. 96, p. 105, shows the hemlock-spruce, and No. 97, p. 107, represents a bough, with the cone, of the same tree.



73.—Quercus alba—White-oak.



74.—Leaves of white-oak.



75.—Acorns of white-oak.

Thus, the sylvan flora of Ontario, regarded from the forester's point of view, and setting aside, as I have done, all the shrubs and the comparatively useless trees, is composed of the following species :

Abies alba .....White-spruce.
Abies Americana .....Double-balsam fir.
Abies balsamifera.....Balsam fir.
Abies excelsa .....Norway spruce.
Abies nigra.....Black-spruce.
Acer dasycarpum .....Silver-maple.
Acer Pennsylvanicum.....Striped-maple.
Acer rubrum .....Red-maple.
Acer saccharinum.....Sugar-maple.
Acer spicatum .....Mountain-maple.
Betula excelsa.....Yellow-birch.
Betula lenta .....Black-birch.
Betula nigra.....Red-birch.
Betula papyrifera .....Canoe-birch.
Betula populifolia .....Poplar-leaved birch.
Carpinus Americana.....Hornbeam.
Carya alba .....Shell-bark hickory.

Carya amara .....Bitter-hickory.
Carya microcarpa .....Small-fruit hickory.
Carya glabra .....Pignut.
Carya tomentosa .....White-heart hickory.
Castanea vesca .....Chestnut.
Fagus sylvatica .....Beech.
Fraxinus Americana .....White-ash.
Fraxinus pubescens .....Red-ash.
Fraxinus sambucifolia .....Black-ash.
Gymnocladus Canadensis .....Coffee-tree.
Juglans cinerea .....Butternut.
Juglans nigra .....Black-walnut.
Juniperus Virginiana .....Red-cedar.
Larix Americana .....American larch.
Liriodendron tulipiferum (1) .....Tulip-tree.
Ostrya Virginica .....Ironwood.
Pinus Banksiana .....Cypress.
Pinus mitis .....Yellow-pine.
Pinus resinosa .....Red-pine.
Pinus strobus .....Weymouth or white-pine.
Platanus occidentalis .....Button-wood.
Populus balsamifera .....Balsam-poplar.
Populus Canadensis .....Cotton-wood.
Populus grandidentata .....Large-toothed aspen.
Populus tremuloïdes .....American aspen.
Quercus alba .....White-oak.
Quercus castanea .....Chestnut-oak.
Quercus coccinea .....Scarlet-oak.
Quercus prinus .....Swamp-chestnut oak. (2)
Quercus rubra .....Red oak.
Quercus stellata .....Post-oak.
Quercus tinctoria .....Quercitron-oak.
Salix alba .....White-willow.
Salix vitellina .....Yellow-willow.
Sorbus Americana .....Mountain-ash.
Thuya occidentalis .....Arbor vitæ.
Tsuga Canadensis .....Hemlock-spruce.
Tilia Americana .....Lime-tree—Bass-wood
Ulmus Americana .....American elm.
Ulmus fulva .....Red-elm.

(1) A droll name—literally "tulip-bearing lily-tree"!—Trs.
(2) Quercus prinus is in England called the *holm-oak*.—Trs.

All these species are found over almost the whole of Ontario, except the American chestnut, the black-walnut, and the Virginia tulip-tree, which are only met with in in the S. W. part of the province.



76.—Quercus castanea—Yellow-chestnut-oak.

Ontario might enter with profit upon the cultivation of the green-ash and the negundo, or ash-leaved maple, both of which are indigenous in Manitoba, but answer perfectly in the other provinces. A description of these two trees will be found in the chapter on the sylvan flora of Manitoba.

CHAPTER VI.

FOREST TREES INDIGENOUS IN THE PROVINCE OF QUEBEC.

I have described in the two preceding chapters all the forest-trees belonging to the province of Quebec. All that remains is to give a distinctive list of them, and to point out the districts in which they grow naturally :

Albies alba.....White-spruce.
Abies Americana.....Double-balsam fir.
Abies balsamifera.....Balsam-fir.
Abies excelsa.....Norway spruce.
Abies nigra.....Black-spruce.
Acer dasycarpum.....Silver-maple.
Acer Pennsylvanicum.....Striped-maple.
Acer rubrum.....Red-maple.
Acer saccharinum.....Sugar-maple.
Acer spicatum.....Mountain-maple.
Betula excelsa.....Yellow-birch.
Betula lenta.....Black-birch.
Betula nigra.....Red-birch.
Betula papyrifera.....Canoe-birch.
Betula populifolia.....Poplar-leaved birch.
Carpinus Americana.....Hornbeam.
Carya amara.....Bitter-hickory.
Carya alba.....Shell-bark hickory.
Carya tomentosa.....White-heart hickory.
Fagus sylvatica.....Beech.
Fraxinus Americana.....White-ash.
Fraxinus pubescens.....Red-ash.
Fraxinus sambucifolia.....Black-ash.
Gymnocladus Canadensis.....Coffee-tree.
Juglans cinerea.....Butternut.
Larix Americana.....American larch.
Ostrya virginica.....Ironwood.
Pinus Banksiana.....Cypress.
Pinus mitis.....Yellow-pine.
Pinus resinosa.....Red-pine.
Pinus strobus.....Weymouth or white-pine.
Platanus occidentalis.....Button-wood.
Populus balsamifera.....Balsam-poplar.

Populus Canadensis.....Cotton-wood.
Populus grandidentata.....Large-toothed aspen.
Populus tremuloïdes.....American aspen.
Quercus alba.....White-oak.
Quercus rubra.....Red-oak.
Quercus stellata.....Post-oak.
Salix alba.....White-willow.
Salix vitellina.....Yellow-willow.
Sorbus Americana.....Mountain-ash.
Thuya occidentalis.....Arbor vitæ.
Tilia Americana.....Lime-tree or bass-wood.
Tsuga occidentalis.....Hemlock.
Ulmus Americana.....American elm.
Ulmus fulva.....Red-elm.

Some of these species are found in very part of Quebec; success, therefore, may be looked for everywhere in



77.—Leaf of yellow-chestnut-oak.



78 —Leaf of quercus tinctoria—Quercitron-oak.



79 —Acorn of quercitron-oak.

planting them, if the quality of the soil be such as is demanded by nature for their free growth. The subjoined list contains the names of the trees in question:

American larch.
Aspen.
Balsam-poplar.
Black-spruce.
Canoe-birch.
Mountain-ash.
Norway spruce.
White-spruce.

The following species are found almost everywhere in the province as far as Mingan, on the north bank of

the St. Lawrence. The Rock-pine, however, is an exception: it is hardly ever met with above Quebec:

Arbor vitæ or white-cedar.	Red-ash.
Balsam-fir.	Red-pine.
Black-ash.	Rock-pine.
Black-birch.	White-pine.
Double-balsam fir.	Yellow-birch.
Poplar-leaved birch.	Yellow-pine.
Red-birch.	

As far as the Saguenay, the following occur:

American elm.	Striped-maple.
Large-toothed poplar.	Sugar-maple.
Mountain-maple.	White-willow.
Red-maple.	Yellow-willow

Leaving Cap Tourmente, the following species join the others:

American ash.	Lime-tree.
Hemlock.	Red oak.
Ironwood.	

Ascending the river from Quebec, the following species, in addition to the above-named, are found:

Beech.	Post-oak.
Butternut.	White-oak.
Hornbeam.	

And lastly, in the western region of the province, from Three Rivers onwards, we find the following eight additional species:

Bitter-hickory.	Red-elm.
Button-wood.	Shell-bark hickory.
Coffee-tree.	Silver-maple.
Cottonwood.	White-heart hickory.

I may mention here two trees, which though not indigenous in the province of Quebec, are proved by many experiments to be easy of cultivation in our latitude as far as ninety miles below Quebec: the *black-walnut*, and the *negundo* or ash-leaved maple. Of these two, the black

walnut is, as every one knows, of great value in commerce, and the other, the negundo, has the remarkable quality of great precocity, sugar being furnished by this tree at seven or eight years old. The black-walnut has been described in the chapter on the species belonging



80.—Quercus coccinea—Leaf of scarlet-oak.



81.—Acorn of scarlet-oak.



82.—Quercus prinus—Leaf of swamp chestnut oak.

to Ontario, and the negundo will be described in the chapter on Manitoba, where it is indigenous.

CHAPTER VII.

FOREST TREES INDIGENOUS IN NEW BRUNSWICK AND NOVA SCOTIA

The species peculiar to these two provinces have been already named; the whole of them being comprised in



83.—Quercus rubra—Leaf of red-oak.



84.—Acorn.

the sylvan flora of Ontario. Below, will be found a complete list:

Abies alba.....White-spruce.
Abies Americana.....Double-balsam fir.
Abies balsamifera.....Balsam-fir.

Abies excelsa ..... Norway spruce.
Abies nigra ..... Black-spruce.
Acer Pennsylvanicum ..... Striped-maple.
Acer rubrum ..... Red-maple.
Acer saccharinum ..... Sugar-maple.
Acer spicatum ..... Mountain-maple.
Betula excelsa ..... Yellow-birch.
Betula lenta ..... Black-birch.
Betula nigra ..... Red-birch.
Betula papyrifera ..... Canoe-birch.
Betula populifolia ..... Poplar-leaved birch.
Carpinus Americana. ..... Hornbeam.
Fagus sylvatica ..... Beech.
Fraxinus Americana ..... White-ash.
Fraxinus pubescens ..... Red-ash.
Fraxinus sambucifolia ..... Black-ash.
Juglans cinerea ..... Butternut.
Larix Americana ..... American larch.
Ostrya Virginica ..... Ironwood.
Pinus Banksiana ..... Cypress.
Pinus resinosa ..... Red-pine.
Pinus strobus ..... Weymouth or white-pine.
Populus balsamifera ..... Balsam-poplar.
Populus Canadensis ..... Cottonwood.
Populus grandidentata ..... Large-toothed aspen.
Populus tremuloïdes ..... American aspen,
Quercus alba ..... White-oak.
Quercus rubra ..... Red-oak.
Salix alba. ..... White-willow.
Salix vitellina ..... Yellow-willow.
Sorbus Americana ..... Mountain-ash.
Thuya occidentalis ..... Arbor vitæ.
Tilia Americana ..... Lime-tree or bass-wood.
Tsuga occidentalis ..... Hemlock.
Ulmus Americana ..... American elm.

All these species are found over nearly the whole extent of the two provinces, except the white-oak and the butternut, which do not grow in the southern districts, and the arbor vitæ which disappears entirely in Nova Scotia.

CHAPTER VIII.

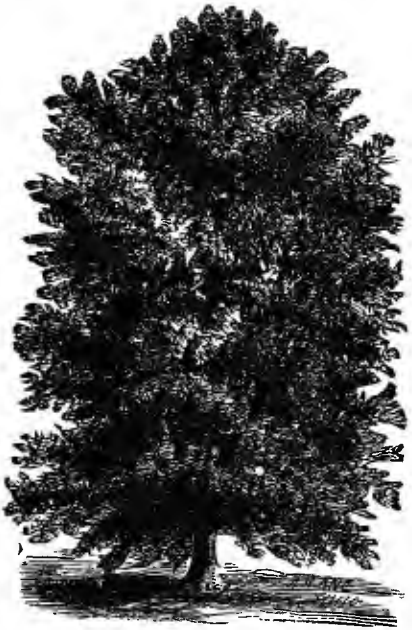
FOREST-TREES INDIGENOUS IN PRINCE EDWARD'S ISLAND.

Prince Edward's Island contains the following species, all of which have been already described:

Abies alba ..... White-spruce.
Abies Americana ..... Double-balsam fir.
Abies balsamifera ..... Balsam-fir.
Abies excelsa ..... Norway spruce.
Abies nigra ..... Black-spruce.
Acer Pennsylvanicum ..... Striped-maple.
Acer rubrum ..... Red-maple.
Acer saccharinum ..... Sugar-maple.
Acer spicatum ..... Mountain-maple.
Betula excelsa ..... Yellow-birch.
Betula lenta ..... Black-birch.
Betula nigra ..... Red-birch.
Betula papyrifera ..... Canoe-birch.
Betula populifolia ..... Poplar-leaved birch.
Carpinus Americana ..... Hornbeam.
Fagus sylvatica ..... Beech.
Fraxinus Americana ..... White-oak.
Fraxinus pubescens ..... Red-oak.
Fraxinus sambucifolia ..... Black-oak.
Larix Americana ..... American larch.
Ostrya Virginica ..... Ironwood.
Pinus Banksiana ..... Cypress.
Pinus resinosa ..... Red-pine.
Pinus strobus ..... Weymouth or white-pine.
Populus balsamifera ..... Balsam-poplar.
Populus Canadensis ..... Cotton-wood.
Populus grandidentata ..... Large-toothed aspen.
Populus tremuloïdes ..... American aspen.
Salix alba ..... White-willow.
Salix vitellina ..... Yellow-willow.
Sorbus Americana ..... Mountain-ash.
Thuya occidentalis ..... Arbor vitæ.
Tsuga Canadensis ..... Hemlock.
Ulmus Americana ..... American elm.

All these are common over the entire island, except

the arbor vitæ, which only grows spontaneously on the west side.



85.—Tilia Americana—Lime, basswood.

CHAPTER IX.

A SHORT DESCRIPTION AND A LIST OF THE SPECIES INDIGENOUS IN MANITOBA.

Three species, not indigenous in the other provinces, are found in Manitoba :

Fraxinus viridis .....Green-ash.
Negundo fraxinifolium .....Box-elder.
Quercus macrocarpa .....Burr-oak.

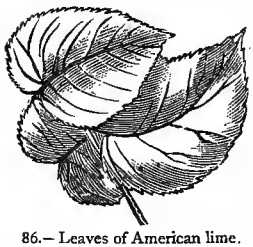
Quercus macrocarpa—Burr-oak.

The acorn of this tree is much larger than that of the other oaks (whence its name, *large-fruited.*—TRS.) It is its only absolutely distinguishing mark. All that I have

said of the oak in the preceding chapters applies to this one. Engraving No. 98, p. 107, shows the acorn of the burr-oak.

Fraxinus viridis—Green-Ash.

This is smaller than the white ash, but in every other respect its qualities are the same, though its growth is more rapid. In fact, it is said to increase in size as fast as the negundo, a description of which tree I append. The green-ash prefers a rich, deep soil, and is perfectly suited to forest-culture in the prairies of the West. Its wood is used for the same purposes as the wood of the other kinds of ash, and its treatment will be found in the chapters on that tree. Engraving No. 99, p. 107, represents the seed of the green-ash.



86.—Leaves of American lime.

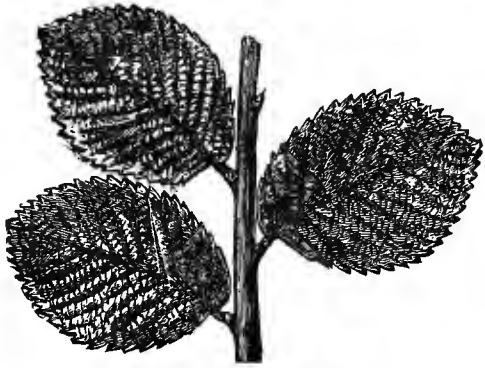
Negundo—Ash-leaved maple.

The qualities which make the negundo so valuable are its rapid growth and the sugar-yielding properties of its sap. At thirty years from seed it arrives at maturity, measuring, usually, thirty feet in height. The seed, which it begins to yield at three years old, ripens in autumn, and should be sown at once; the following year the plant will be one foot high. Five years from sowing, trees of this species have produced sugar! Some people, who evidently know nothing about the matter, deny that the negundo affords sugar. All that I have said about the red-maple (the plane), applies to this tree. I recommend the cultivation of the negundo, in Quebec and Ontario, as being very profitable, and it should be



87.—Seed of American lime.

tried in the other provinces as well, where it will probably meet with success. Engraving No 100, p. 108, represents the negundo, but not as it appears in the forest. The picture is taken from nature; the original, an ornamental tree, stood alone, and, in consequence, extended its branches much more widely than usual. Engraving 101, p. 109, shows its seed.



88.—Ulmus fulva—Red-elm leaves.

The following trees are comprised in the sylvan flora of Manitoba:

Abies alba.....White-spruce.
Abies Americana.....Double-balsam fir.
Abies balsamifera.....Balsam-fir.
Abies excelsa.....Norway spruce.
Abies nigra.....Black-spruce.
Acer Pennsylvanicum.....Striped-maple.
Acer rubrum.....Red-maple.
Acer spicatum.....Mountain-maple.
Betula excelsa.....Yellow-birch.
Betula lenta.....Black-birch.
Betula nigra.....Red-birch.
Betula papyrifera.....Canoe-birch.
Betula populifolia.....Poplar-leaved birch.
Fraxinus Americana.....White-ash.
Fraxinus viridis.....Green-ash.

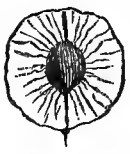
Fraxinus sambucifolia .....Black-ash.
Larix Americana.....American larch.
Negundo fraxinifolium .....Box-elder.
Pinus Banksiana.....Cypress.
Pinus resinosa.....Red-pine.
Pinus strobus.....Weymouth or white-pine.
Populus balsamifera .....Balsam-poplar.
Populus Canadensis.....Cotton-wood.
Populus tremuloïdes.....American aspen.
Quercus macrocarpa .....Burr-oak.
Salix alba.....White-willow.
Salix vitellina .....Yellow-willow.
Sorbus Americana .....Mountain-ash.
Thuya occidentalis.....Arbor vitae.
Tilia Americana.....Lime—bass-wood.
Ulmus Americana. .....American elm.

All these are found in every part of Manitoba, except the *maples*, the *white pine*, and the *lime-tree or bass-wood*, which are only to be met with in the south-west part of that province.

CHAPTER X.

RECAPITULATION OF THE SEVEN LAST CHAPTERS.

The reader has now attained to a full knowledge of the sylvan flora of the Dominion of Canada. He knows what trees are common to all the provinces, and those which are peculiar to each province. An exact idea of the habits of each tree, as well as of its uses, has been gained, and the species best suited to his own plantations are familiar to him.



89.—Seed of red-elm.

Before going any farther, I will state in figures the results of the preceding chapters, so that the richness of each province in forest-trees may be brought clearly before our eyes in a botanical point of view.

Twenty-six varieties of forest trees are common to all the provinces of the Dominion; of these eighteen are deciduous, and the remaining eight coniferous.



90.—Juniperus Virginiana—Red-cedar.

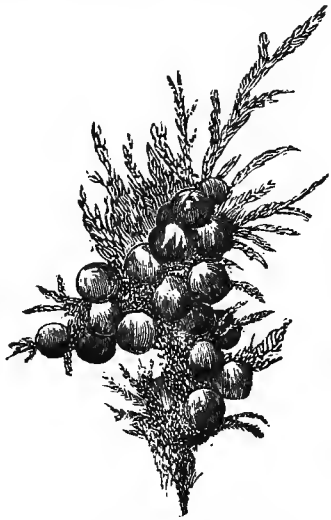
In Ontario fifty-seven varieties are met with, forty-four of which are deciduous and thirteen conifers.

There are forty-seven varieties in Quebec, thirty-seven deciduous and ten conifers.

New Brunswick shows thirty-eight kinds, twenty-seven deciduous and eleven conifers.

We find in Nova Scotia thirty-seven varieties, and of these twenty-seven are deciduous and ten conifers.

Prince Edward's Island presents to our view thirty-four sorts, of which twenty-three are deciduous and eleven conifers; while Manitoba, the poorest of all the



91.—Leaves and seed of red-cedar.

provinces, can only produce thirty-one species, twenty-three belonging to the deciduous kind, and the remaining eight to the conifers.

Thus, from our point of view, the sylvan flora of the Dominion of Canada comprises sixty-one varieties, of which forty-eight shed their leaves in autumn, and the remainder, thirteen in number, are evergreens.

As a useful table for reference, the following list is appended:—

PROVINCES.	DECIDUOUS SPECIES.	CONIFERS OR EVERGREENS.	TOTAL.
Ontario	44	13	57
Quebec	37	10	47
New Brunswick	27	11	38
Nova Scotia	27	10	37
Prince Edward's Island	23	11	34
Manitoba	23	8	31
The whole Dominion	48	13	61

I have thought it right to include in my list of names every tree of any value; it being understood that I by no means recommend the cultivation from seed of all the



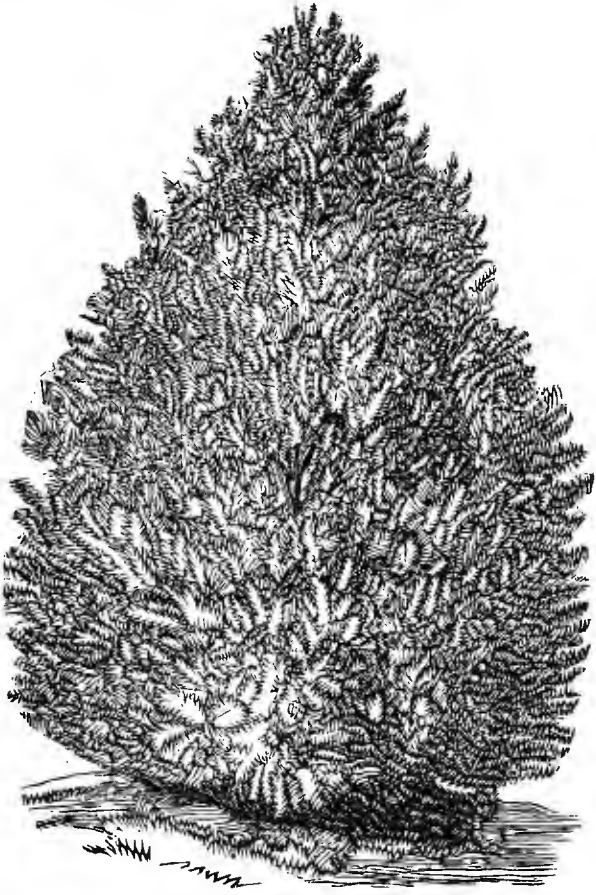
92.—Pinus mitis—Leaves of yellow-pine.

species; still, I name them, because it often happens that in the neighbourhood of land entirely cleared of wood, outlying parts of the forest are found containing young plants of different sorts which, though of no special value, may serve the purpose of re-planting. After a fire, or a complete clearance, has taken place, too, a species may, and often does, spring up, which, though difficult of cultivation from seed,



93.—Seeds of yellow-pine.

when growing naturally, as in this case, produces excellent results and deserves preservation.



94.—Thuya occidentalis—Arbor vitæ.

We now arrive at the general principles of forest-restoration, and of the cultivation required by the new forests which are thus produced.

CHAPTER XI.

NATURAL RESTORATION OF THE FORESTS.

Extensive districts, long cleared of their forest-growth, frequently cover themselves again with wood, if care is taken to aid nature in her operations. Generally speaking, plains and damp marshes, where a few wretched stunted trees show themselves here and there, are susceptible of this treatment. Drainage, by means of deep open-ditches of sufficient frequency to admit of the



95.—Seeds of arbor-vitæ.

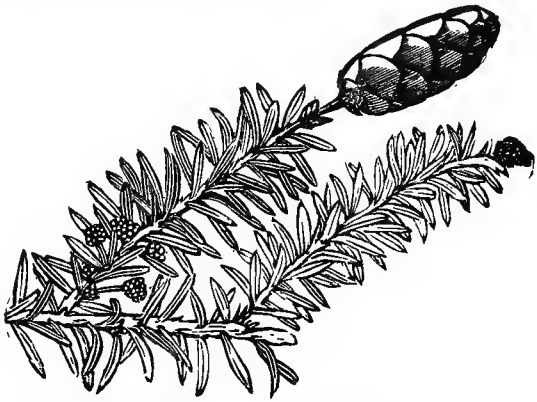


96.—Tsuga Cunadensis—Hemlock.

trees growing, if not of perfectly drying the land, is the only thing necessary. The moment that this has been done, a multitude of little trees will spring up, which were only waiting for this amelioration to show themselves; and the new growth is usually so prolific and so

rapid, that we should be inclined to call it spontaneous, did we not know how long seeds would lie dormant in the ground, until all things necessary for their growth were present. The same thing occurs on certain hill-sides, where, protection being afforded against the teeth and hoofs of cattle, their hoary heads soon become crowned with a wreath of luxuriant verdure.

In the parish where I was born, I know of a wood of larch growing in a marshy spot which, twenty-eight

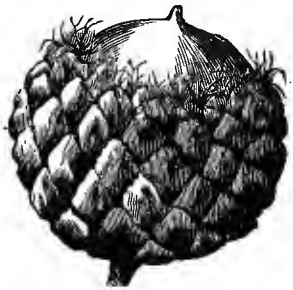


9.—Hemlock leaves and cone

years ago, was perfectly naked. Now, song-birds of every kind meet there, sixty feet between heaven and earth—the proprietor being M. Rossignol (nightingale). So much for the natural re-wooding of marshes.

As for the hill-sides, I can bring forward, in support of my statement, the glorious greenery under which the students, who have succeeded *our* generation in the cool shades which surround the College of St Anne Lapocatière in the Province of Quebec, amuse themselves. This hill, fifty years ago, was covered with a growth of little spruces, which, thanks to the care they have received, have now developed into lofty trees.

What has been done by nature and care in the two cases I have just cited, may be done in many places on a more or less extensive scale. A little study of the aspect and soil of the land intended to be re-wooded, will show if there be any prospect of obtaining a natural new growth of wood. If the examination demonstrates



98.—Quercus macrocarpa—Acorn of burr-oak.



99.—Fraxinus viridis—Seed of green-ash.

that art must be employed, the system of replanting, which I am about to describe, must be had recourse to.

CHAPTER XII.

A WORD ABOUT SEEDS.

When once it has been determined to establish a plantation, the first thing to be done is to look out for the easiest way of getting young plants. There are three means of obtaining them: 1st, sowing the seeds in beds for subsequent setting out in nurseries; 2nd, buying plants from nurserymen who make a business of raising them; 3rd, digging up the plants from the forest where they grow naturally.

If you prefer sowing the seeds, you must learn where to get them, and the method of treatment required by them.

Seeds are of three kinds ; each of the three demanding a different sort of treatment, viz., *nuts* and *acorns*, *hard seeds*, and *soft seeds*.

Nuts (walnuts) should be sown, if possible, as soon as they are ripe. If the spring must be waited for, the nuts will keep if laid in damp sand and kept in a cool place (a cold cellar will do) ; or, better still, kept out of doors, covered thickly with straw, leaves, etc. In this case,



100.—Negundo fraxini folium—Ash-leaved maple.

though, you must look out for mice and squirrels, who are very fond of these delicacies.

Hard seeds are the peach-stones, pips, etc. We need not trouble ourselves about them, as they have nothing to do with our design, and I only mention them to establish their order and classification.

The soft seeds comprise the seeds of all the coniferous and deciduous trees except those mentioned under the two preceding heads. Most of these keep well enough in sand, if placed in a *cool*, but not a *cold*, place. Some, however, want sowing as soon as they are ripe, as the fir, the silver-maple, the plane, the elm, the poplar, and

the willow, as well as most of the ash-tribe, if they are expected to show themselves the first year.

The seeds of the conifers will sprout much sooner if they are steeped in hot water four or five days before sowing. The water must be changed every day, to avoid fermentation, and the seeds should be mixed with fine, dry sand, to facilitate the operation of sowing.

I should not advise novices to collect their own seed. Even experts do not find it an easy job. Still, the seeds of ash and maple are not difficult to recognize and collect, and it would be well to try to gather in the woods for ourselves the seeds of the fir, the red- and white-maple, the elm, the poplar, and the willow; for these all lose their power of germination in a very short time. Buy them of seedsmen, and you stand a good chance of their never coming up.



101.—Seed of ash-leaved maple.

For the rest, they may be bought with advantage from men who make a special business of collecting them, and whose prices are relatively moderate, running from one dollar to three dollars a pound. The latter price is rarely exceeded. I have stated, in describing the species, the number of pickles in a pound of seed of each variety, and special information has been given as to the treatment of each sort of seed.

CHAPTER XIII.

SEED-BEDS AND NURSERIES.

The cultivation of trees from seed is, comparatively, very easy. If the following hints be remembered, no one

will find any difficulty in providing himself with plants of several sorts of trees in the course of one or two seasons. The proposed methods are those practised in the United States, but modified to suit our climate. The nursery will be of no great cost, and it will furnish young trees enough to plant one or two acres of land.

The system usually practised is to sow the seed in a seed-bed, and, subsequently, to set out the young plants in a nursery. But we must not forget that, as I have stated already, walnuts and acorns should, if possible, be sown in the place of their permanent abode.

The seed-bed.—Choose for the seed-bed a piece of rich land, well dug and raked fine, and as free as possible from weeds. Over this construct a lattice-work high enough to permit of a man working underneath it. This is to serve for the protection of the young plants, during the first summer, against the rays of the sun. It may be covered in with laths, matting, etc. The young conifers are especially in need of this shade, and nature herself affords it them in the forest, where the seedlings are invariably protected by trees of larger growth.

How to sow.—Sow in drills six inches apart, and sow without regard to economy: in other words, sow thickly. To get through the work quickly as well as accurately, make a rake with teeth rather long and thick and six inches apart; you will find this implement an excellent marker. As a rule, the seeds should be covered very slightly; in fact, they should be not nearly so deeply buried as garden-seeds. It is recommended to sow very late in autumn or early in spring; but, as most seeds ripen very late, it is almost always necessary, in Quebec and the other provinces of the same latitude, to wait till spring. In these cases sow as early as possible, and take care that the seed is of the best quality. I have already given

the names of those seeds which must be sown immediately they are ripe, under pain of an unsuccessful issue. The ground should be well trodden after the sowing is done.

If, after sowing, drought prevails, copious waterings should be given ; and frequent hoeings will be necessary as soon as weeds appear, for these are the worst enemies of the tender little plants. The hoer cannot be too careful in his work.

Nursery.—The land intended for the nursery should be as carefully chosen as that occupied by the seed-bed. It should be deeply ploughed or dug; all stones and rubbish should be cleared off; cross-ploughing and grubbing, to level the ground, should follow; and thorough harrowing should finish the cultivation. This should be done at the time chosen for planting out. In the autumn, when the seedlings are on an average from six to twelve inches high, you may set them out in the nursery, as thus : plant in rows three feet apart, with a distance of from six to twelve inches between the plants in the rows. When the ground has been pulverised and made level, stretch a cord, fastened to two pegs, in the direction of the first row you mean to plant. With a spade, open a small trench along the cord, deep and wide enough to contain the roots of the plants. Place these in the trench, holding them upright and pressing a little earth on the roots with the hand, and then fill up the trench with the spade. Lastly, tread the earth firmly, but carefully, about the plants.

If the rows are not kept at a regular distance, it will add greatly to the difficulty of conducting the subsequent cultivation necessary to keep the nursery in good order.

Great care must be taken to prevent the roots of the

seedlings from drying during the work: for them, to dry is to die. Conifers, especially, perish at once after even a few minutes exposure of their roots to the air.

Hoeing and horse-hoeing must be frequently attended to after transplantation into the nursery.

Such are the principal rules for sowing the seeds of forest-trees and setting out the seedlings in the nursery. Exceptions to these rules occur: I have spoken of them in the chapter specially devoted to the species in question.

CHAPTER XIV.

PROPAGATION BY CUTTINGS.

Some varieties of trees are easily propagated by means of cuttings, and the advantages of this practice, as regards those species which admit of it, are considerable. The procedure is far quicker and surer than seeding, and affords, very rapidly, strong, healthy plants.

Poplars and willows are the trees best adapted to propagation by cuttings. The former should be divided into lengths of about two feet by an inch and a half or two inches in diameter, leaving one end round and the other cut into the form of a wedge; taking great care not to bruise the bark. The wedge-shaped end is to be stuck in the ground. Poplar-cuttings should be made in autumn, after the fall of the leaf. Willows may be propagated in like manner, but any season will do for them.

To plant these cuttings, proceed as follows: spread a good dressing of dung, and plough it in with a deep furrow. A second ploughing will mix the manure well with the earth; the cutting is then thrust into the

ground, two or three inches only being left bare, and the soil is well trodden round it.

Cuttings should not be made from too large branches Some trees, at first, thrive well for a time after being set as cuttings, but in a few years they die without any apparent reason. Can the too great thickness of the cuttings be the real cause of the tree's premature decay? As thus: the end out of ground dries up; the buried end has only put forth roots near the surface and the tree forms branches at the foot only; and so exposed, the one to the air and the other to the damp, the two ends perish, become decomposed, and, while the tree appears to be doing well, it, in reality, is becoming hollow through the rotting of its two extremities, and the time is near when decomposition will attack the vital parts, and the end of the tree's life is at hand.

It is a good plan to set a cutting of poplar or willow between every other plant of walnut, oak, chesnut, or hickory, in the permanent plantation. An early shade will be thus afforded to the young plants, and the invasion of weeds repressed. When, at the end of five or six years, the walnuts, etc., can take care of themselves, the willows and poplars, which by that time will have become serviceable as summer fuel, may be removed.

CHAPTER XV.

FINAL PLANTING OUT.

This is the best way of preparing the land which you intend to plant:—

A year before the planting is to begin, manure the site and grow a crop of grain. After harvest, give the land a deep furrow and a cross-ploughing in the spring. This is particularly necessary in breaking up those parts of

the prairies of Manitoba which are intended for plantations.

It is important that young trees should be set very near together. First, because they will thus occupy the whole ground, and prevent the growth of weeds, diminishing thereby, considerably, the cost of hoeing; next, they, with their leaves, afford each other mutual protection against drought, so injurious to young plantations; and, lastly, when there is an abundance of plants, the proprietor can the more easily repair any failure which may occur: blanks *will* occur in every plantation. In fact, there will always be sufficient trees to make the new wood regular, if a much greater number be planted than will be absolutely required to stand when they have attained a certain height.

Another, and, so to speak, the chief reason for close planting is that, treated thus, trees are more likely to produce a fine, straight growth. Fewer lateral branches are put forth, and later, when the superfluous trees are cut down, the wood will consist of a mass of lofty, erect stems, furnishing excellent building timber. In planting thickly, we only copy nature.

After many experiments, the planters in the States, it seems, have come to the conclusion, that trees should be set in rows four feet apart, with a space of two feet between the trees in the rows. This would require four thousand and fifty trees to the acre. Three years after planting, every other tree is cut, and the remainder will then stand four feet apart in every direction. Five or six years having elapsed, the same proportion being observed in thinning, the trees will be eight feet one way, and four feet the other, apart. Twelve years from planting, every other row is cut, and the trees will then be eight feet distant from each other, every way. The

same process is continued when deemed advisable; at one time a whole row, at another every alternate tree is removed, until, at the end of a certain number of years, the work is done, and you have a forest or wood, with the trees all standing sixteen feet apart.

Conifers should not exceed two feet in height when set out. Walnuts, oaks, hickories, and chesnuts, if it is thought good to transplant them, should be of the same height.

Plants may be easily procured, either for setting out in the nursery, or for permanent planting, without the trouble of growing them from seed. I recommend all who are not *gardeners* to buy their seedlings, for the cultivation of them demands as much care as does a garden.

Plants of every sort come to hand quite safely by post, now-a-days, and the charge is very moderate. Trees sent by the mails take root freely, and many mistakes, as well as great waste of pains, are avoided.

Before ending this chapter, a word on the much dis puted question: what season is the best for planting? My own opinion is, that both spring and autumn present so many advantages and disadvantages, that neither one nor the other can claim our preference.

CHAPTER XVI.

PLANTING CERTAIN SPECIAL SOILS.

Certain soils are unfit for cultivation: some, because they are too stony, others, because they are too wet. These soils will pay best in wood; in fact, planting is the only way of utilising them. I have already spoken of the necessity of re-planting the denuded faces of the

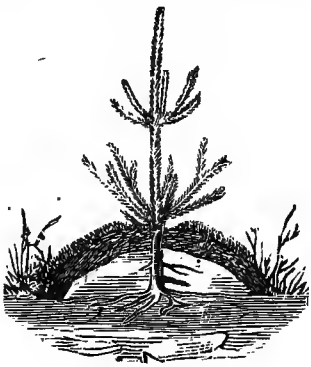
slopes of our mountains, and the prairies of the North-West, which are, in many places, absolutely tree-less. We will now see how to proceed in planting the soils in question.

Rocky soils.—On these soils, wherever you intend to set a tree, first raise the turf which covers the rock; then, make a trench in the rock large enough to contain the roots of the plant, or the walnut or acorn, if you work by seed; put the turf at the bottom of the trench, and cover it with the surrounding soil. This should be done in spring, and the plantation or sowing in these branches the following year, at the same season. The turf will become a rich mould, which will assist the growth of the young plant, and success is certain.

Wet soils.—For wet soils, a perfectly opposite treatment is necessary; that is to say, instead of hollowing out the land, you must raise it in this fashion: place the plant on the surface, and spread out its roots with care; cover them with good mould, enough to keep them upright, and lay turves, taken from round the spot where the plant is placed, on the mould, taking every pains to so adjust them that all the mould shall be covered, and no fissure left between the turves. This system of *mound-planting* has been successfully practised in Europe for many years, and is suitable to all soils, even to the driest. A Canadian amateur has succeeded well with it (engraving 102, p. 117, gives a perfect idea of the method); hence, I can recommend the practice with confidence. Drainage should be carefully attended to when you intend to plant on mounds; but even in places where drainage is impossible, there is a fair chance of success.

Mountain-slopes.—If, as sometimes happens, the slope is covered with a good bed of vegetable mould, you

have only to make a trench in it, the earth taken from which you must lay on the lower lip of such trench. Place the tree in the trench, and to fill it up, instead of using the removed earth, throw down a sufficient quantity from the upper lip. The tree will then find itself on a sort of seat (*assise*), the incline of the slope will be interrupted, and the rain will be hindered in its downward course, to the great benefit of the tree. But, if the soil of the slope is rocky, and only covered with a thin layer of turf, you must proceed exactly on the same



102.—Tree planted *en butte*.

system I recommended for planting rocky soils. The only difference is, that the first turf must be laid on the lower lip of the trench, and the turf from the upper lip must be put at the bottom of the trench. And, finally, mould must be brought to cover up the roots of the young plant.

Lastly, should you wish to plant in places where the naked rock appears at the surface, trenches must be sunk in the rock and filled with earth from extraneous sources ; a laborious and ungrateful task, it is true, but necessary, and one that has been practised in France on a large scale for the last few years. In Canada, fortu-

nately, there are very few spots fit for re-planting which are utterly deprived of vegetable mould.

Prairie soils.—The great difficulty to be overcome in planting prairie-land is the want of moisture; the soil is dry and little rain falls. As a remedy, it is proposed to cultivate the soil to be planted to its full depth, as I have already described elsewhere. The more the land is worked, the greater its power of retaining the subterranean moisture, and the greater the ease with which it seizes the moisture in the atmosphere. Spring must be chosen for planting, immediately after the ground is thawed, that the moistest season of the year may nourish the tender plants. If, in addition to these precautions, the most suitable trees are chosen for planting, success may be expected.

Experts in the States proceed as follows in making plantations in the prairies of the West, and a like plan is perfectly applicable to Manitoba. Round each lot of two hundred acres of land, a border, eight rods wide, is planted on the north and west sides of the lot, these sides being the most exposed to the predominant winds. This border is, of course, intended to serve as a shelter, and once well-wooded, greatly aids in the cultivation of the lot, at the same time affording fuel to its occupants, and wood for the use of the farm, such as rails, posts, etc. The species recommended for the purpose are the ash, the negundo, and the indigenous conifers, which, with the negundo, are probably the trees best suited to this region. Poplars and willows, too, are of great service in that province.

CHAPTER XVII.

CARE OF TREES AFTER PLANTING ; PRUNING, ETC.

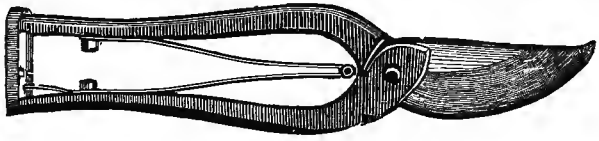
When once a plantation has been well established, it must be kept in good order. For the first four years, at least, the land must be kept free from weeds. For this the grubber and the horse-hoe are the most suitable implements. In general, after four years, the trees afford sufficient shade to render any further cultivation unnecessary ; still, the work of pruning remains to be done.

In speaking of this operation, I do not mean to say that pruning is, in all cases, absolutely necessary. On the contrary ; in my opinion, if the close-planting system be followed, very little pruning will be required. When the trees are young, those branches which have a tendency to grow out of shape and to derange the symmetry of the tree and the balance of its growth, must be pinched off. If this is carefully done, no subsequent pruning will be wanted, unless on account of accidents caused by the winds, animals, etc.

But, as these accidents happen pretty frequently, I will describe the tools used for pruning, without injuring, the trees, as well as the manner and season for using them. A common saw, a cutter (1) (see engraving 103, p. 120), for the smaller branches within reach, and another cutter placed at the end of a long handle, as shown in eng. 104, same page, are all that need be employed. The last is intended to cut the higher branches which, even with a ladder, would be difficult to reach. Every time the saw is used, the wound should be trimmed with a knife, to pare off the roughness left by the saw, which would retain the wet.

(1) Called, I believe, by the opprobrious term of *averruncator*.—TRS.

When an unusually large branch has to be severed, it should not be done at once, but at several times, in order not to disturb too abruptly the circulation of the sap. First, cut off the branch one or two feet from the stem, and a few months afterwards take it off close. Engraving 105, p. 121, will give a good idea of the operation, the



103.— Branch pruner

dotted line *a a* showing the first cut, and *b b* the second. If the large branch pruned in this way has been skilfully removed, the wound, at the expiration of two years, will have the appearance shown in engraving 106, same page, where the swelling of the newly formed bark is seen around the healed wound. A well pruned tree at the end of some years only exhibits where the cut was made a part of the bark smoother than the rest, and a slight crack closed at the place where the lips of the swelling of the new bark have united (see engraving 107, p. 122). To prevent the branch you are pruning from splitting, by breaking with its own weight in falling, a cut is first made on the under side, a little lower than opposite the upper cut (see engraving 108, same page).



104.—Long handled branch pruner.

The branch must be always cut off close to the trunk of the tree. If the branch retains a stump it will dry up, and a tree with many stumps presents the miserable appearance of the engraving 109, p. 123, at *a b c*. If we

wish to know what happens to a stump thus left, we have only to look at it immediately after the pruning, as in engraviug 110, p. 123, and then four years afterwards, when it has lost its bark, eng. 111, same page. Two or three years later, it will look like eng. 112, same page, where it is shown half-devoured by the rot. In a few years more, it will show as in engraving 113, p. 124, where we see the stump rotted away, and surrounded by a cavity which retains the wet, and where the decay, which finally attacks the heart of the tree, first develops itself. Should you see fit to fell the tree to observe the



105.—Pruning large branches.



106.—Formation of new bark.

progress of the evil, it will present the aspect seen on the right of the eng. 114, same page ; whereas, had the pruning been judiciously carried out, we should see nothing more, at that time, than the scar which appears on the left of the same engraving.

I must not leave this subject of pruning, without speaking of the season in which it should be done. Opinions differ on the subject : mine goes in favour of winter, that is to say, from November to March. The only exception is the conifers, which should be pruned at midsummer.

As I am speaking of the care to be taken of plantations after they are established, I may as well mention a

mistake that some people commit in gathering the fallen leaves every autumn. In many works on agriculture, a regular system of collecting the leaves is advised, for the purpose of making manure, serving as litter, or as cattle-food. A greater error cannot be committed. The soil which grows the trees demands, as does cultivated land, something in return for what it yields. Now the only supplies the soil of the forest receives are those given by nature, namely, the leaves, and these, decomposing on



107.—Wound healed over.



108.—How to cut off large branches.

its surface, furnish it with the elements of food assimilated by the trees it bears. Do not then deprive the forest of its leaves.

Conifers should absolutely never be pruned, except in case of accidents, particularly the lower branches; to cut these off spoils the symmetry of the tree, and is, besides, highly injurious to their growth.

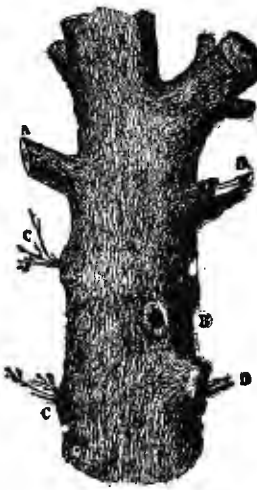
A very severe system of pruning is practised on willows. It consists in cutting off all the larger branches at ten or twelve inches from the main trunk. This is done every two or three years, and the branches, when dry, furnish a by no means despicable summer

fuel. This is called *pollarding*, and the engraving 115, p. 125, gives an excellent idea of the process.

CHAPTER XVIII.

INSECTS INJURIOUS TO TREES.

I will not attempt to give the names and descriptions of all the insects which commit depredations on forest-trees. Their name is legion, and man, in the woodlands, is almost impotent as regards these tiny but terrific enemies.



109.—Badly pruned tree.

Still, there is one point I must insist on. The periodical invasion by insects of countries where they have been, heretofore, hardly perceptible, is always due to a tangible though passing cause. Thus, for example, an excessively mild winter suffers a host of larvæ, a large proportion of which brutes is generally destroyed by the cold, to pass the winter safe and sound; hence, in the


110.


111.


112

following summer, an extraordinary development of insect life. On the other hand, this unusual develop-

ment does not go on for many years. In the general economy of nature, the Creator has always placed the remedy near the evil, and so we see that all insects have one or more enemies, in the shape of other insects or birds, which prey upon them. And it is worthy of observation that, when any tribe of insects begins to increase in a ratio that menaces the equilibrium, so to speak, of vegetation, the enemies of that tribe almost simultaneously begin to multiply, and in a very short time, often in two years, things return to their ordinary condition

Though man be almost impotent against the attacks of insects in the forest, he can defend himself rather



113.



114.—A tree well and badly pruned.

more easily, and often even successfully in the nursery.

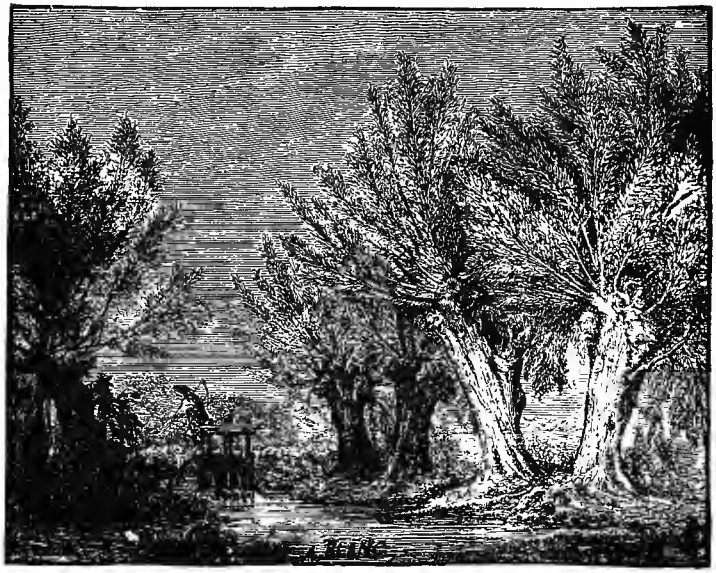
I will point out concisely the remedies usually employed. Every one can decide, regard being had to the sort of insects which he, in his own nursery, has to contend with, what means he prefers to employ.

It is fully proved that by burning brushwood, etc. near the nursery, a multitude of moths injurious to the trees will commit suicide.

Stretch a cloth on the ground under the trees, shake the latter well, and it is surprising what a number of insects will be caught. Sweeping the branches with a broom, will destroy many of the cocoon-spinning caterpillars.

Some cover the bark of the trunk with a coat of treacle, printer's ink, or any greasy, sticky, or oily stuff; or better, they put the coat on paper or rags wrapped round the trunk. If this plan be followed, tar, a very efficacious dressing, might be used; but, in all cases, the dressing must be renewed when dry.

Again, to hinder climbing insects from ascending the trunk, a small bason, filled with oil or tar, is placed



115.—Pollard willows.

round the trunk, at the foot of the trees, and the trunk is washed with soft-soap, thin whitewash, etc.

An excellent dressing is the following: mix a pound of flour of brimstone with a quarter of a bushel of quick-lime, pouring on a quantity of hot water sufficient to make the whole of the consistence of ordinary whitewash. This must be done *in a closed vessel*. Apply the

dressing, freshly made, with a brush, in the month of April.

Sprinkle slaked-lime or hellebore, when the dew is on, over the leaves of trees attacked by caterpillars.

In autumn, turn up the land carefully; the larvæ hidden in the soil will thus be exposed to the action of the frost. Sometimes, Indian corn is sown round the trees, pigs are turned into the nursery, and many a chrysalis is destroyed by these animated grubbers. A ploughing before winter sets in, and another in early spring, will expose a crowd of insects to the ravages of the frost and the voracity of birds.

It is well to look over the trees in winter, for the purpose of destroying the nests of insects, and the strings of eggs which are often found encircling the branches.

Lastly, the greatest protection should be given to insectivorous birds, the most useful auxiliaries to man in the destruction of insect pests. Their breeding should be favoured, and children should be taught that birds should b the objects of their love and care, instead, as often, too often indeed, happens, the victims of their cruelty.

CHAPTER XIX.

CULTIVATION OF ORNAMENTAL TREES.

It appears to me, that, did I not say a word on the advantage to be gained by making use of our fine forest trees for the ornamentation of our abodes, I should be omitting one of the not least important divisions of my subject.

I have already spoken, in the course of this work, of the reserve of wood which each settler should make on

his farm, when he is clearing it; a reserve which may assure him, for the future, plenty of fuel, and timber for building. To this I will add, that round the house a shrubbery should be retained, and carefully cultivated, to afford shade and coolness, as well as to add to the beauty of the surroundings of the abode.

To give such advice to the settler, is to show others the necessity and the advantage of setting out trees round their houses and their appurtenances. Any property, however mean its appearance when situated on a naked spot, will, if situated in the midst of a pretty grove, planted with taste and discernment, look comfortable and well-to-do.

I will not treat this subject at length, as it might seem to be unconnected with this work. Still, I must bring forward one argument in favour of planting ornamental trees in towns and villages, and round single houses. Trees, regarded from a sanitary point of view, have a salutary effect. They prevent the land shaded by their leaves from being too much heated by the sun, and thus hinder the formation of a quantity of fetid gases, whose emanations infect and vitiate the air of our towns and larger villages. They retain, too, a healthy coolness during the great heats of summer; they preserve, in some degree, the moisture of the air and soil, and afford a shelter to the insectivorous song-birds, whose melody delights us, and who deserve on every account all the care which we can give them.

I append a list of the forest-trees best suited to ornamental purposes, among them two or three exotics (foreigners) which are among the most useful for that purpose, and the good qualities of which seem to adapt them to our ends:—

Cut-leaved weeping-birch.
Yellow-birch.
Black-birch.
White-spruce.
Norway spruce.
Sugar-maple.
Red-maple.
Black-ash.
White-ash.
Beech.
Horse-chestnut.
American larch.
Negundo or ash-leaved maple.
Butternut.
American elm.
Balsam poplar.
White-poplar.
Cotton-tree poplar.
Lombardy poplar.
Canada white-pine.
Button-wood.
Locust.
Balsam-pine.
Kilmarnock weeping-willow.
Mountain-ash.
Arbor vitæ.
Lime-tree or bass-wood.
Tulip-tree.

Almost all these have been described before: I will now give a description of the foreign species contained in the above list:—

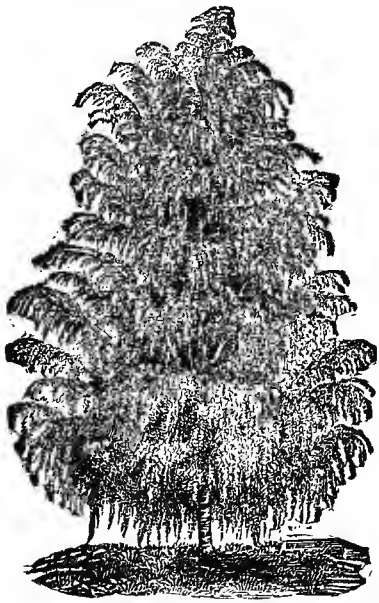
Betula pendula laciniata—Cut-leaved weeping-birch.

This variety of birch, a native of Europe, which in quality and habit of growth resembles our birch-tribe, and, like them, is perfectly hardy, is distinguished from the other birches by the pendulous growth of its branches; hence the name, *weeping*-birch. Engraving 116, p. 129, represents this tree; and eng. 117, same page, its seed.

Æsculus hippocastanea—Horse-chestnut.

This foreigner attains a height of fifty feet; and in spring is covered with the loveliest white flowers, marked with red and yellow, which have a charming effect against the dark green barkground of the leaves. The horse-chestnut forms a fine globular head, and needs no recommendation of mine. It grows freely in Quebec and Ontario. Though, in the Province of Quebec, this tree suffers a little from frost when young, it always survives its attacks, and in a few years becomes perfectly hardy, and proof against all weathers. Engraving 118, p. 130, depicts the horse-chestnut; eng. 119, p. 131,

its leaf; and eng. 120, same page the fruit, or chestnut, which is not fit for food. (1)



116.—Betula pendula laciniata—Cut-leaved weeping birch.

Populus alba—White-poplar.

Better known as the *silver-poplar;* which name it derives from the white colour of the lower side of its leaves. In its habits, cultivation, and other qualities, it is the same as the rest of the poplars. This tree should never be planted near houses; for the end would be, that its long, trailing roots would demolish the foundations. Eng. 121, same page, represents a branch of the white-poplar.



117.—Seeds and catkin of weeping-birch.

Populus pyramidalis—Lombardy-poplar.

Well known in all parts of the country. From its

(1) For human food that is, but deer and sheep like it uncommonly.—Trs

habit of growth, it makes a fair contrast to trees of an oval or globular form, and the effect is good when employed as a relief to the sturdy growth of coniferous trees. Fine avenues are made of it. Some recommend the cutting off of the head at the stump every twenty years. In this case, a number of vigorous shoots are sent out, the strongest of which is reserved, and this, in a



118.—Æsculus hippocastanea—Horse-chestnut.

short time, becomes a fine, healthy tree. After twenty years, the Lombardy-poplar begins to decay, and to show many dead branches, which completely destroy its beauty. Engraving 122, p. 132, shows the Lombardy-poplar, and engraving 123, same page, its leaf.

Robinia pseudo-acacia—Locust-tree.

The locust comes to us from the States, where it grows to a height of eighty feet. Here, it never exceeds

twenty-five feet; and, though it sometimes suffers a little from our winters, it is worth cultivating in Ontario and Quebec. Lovely white flowers cover it in spring,



119 – Leaf of horse-chestnut.



120.—Chestnut.

and its delicately traced foliage is very charming. Eng. 124, p. 133, represents a bough of the locust, with its flowers and leaves.

Salix caprea pendula—Kilmarnock weeping-willow.

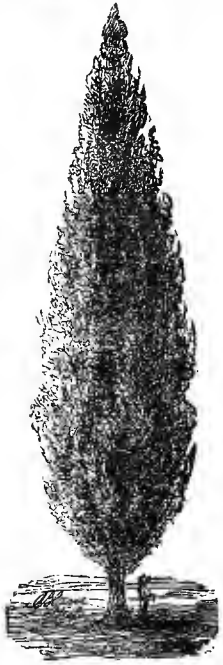
An exotic of great beauty. Hardy in Quebec and Ontario, it is well adapted to the adornment of ceme-



121.—Populus alba—Leaf of white-poplar

teries, etc. No other willow can be recommended as an ornament. The rest are utter nuisances near houses; their long, wandering roots travel here and there,

without restraint; they will quickly undermine a wall forty feet from the stem, and in a short time take entire possession of the whole land round them within a radius of thirty feet. Eng. 125, p. 134, represents the Kilmarnock weeping-willow.



122.—Populus pyramidalis—Lombardy poplar.



123.—Leaves of Lombardy poplar.

It must be well understood that the ornamental trees I have mentioned must only be planted in those spots which I have before pointed out as suitable to their cultivation.

One word as to ornamental hedges. Where snow is abundant in winter, and where field-mice are troublesome, the only hedges I can recommend are those composed of Norway spruce, of firs, of willows, and of arbor

vitæ. The same trees are useful as windguards round vineyards, orchards, etc.

Though many advise planting ornamental and other trees along the sides of the high-roads, this can only be done where the roads run over sandy or rocky soil, or

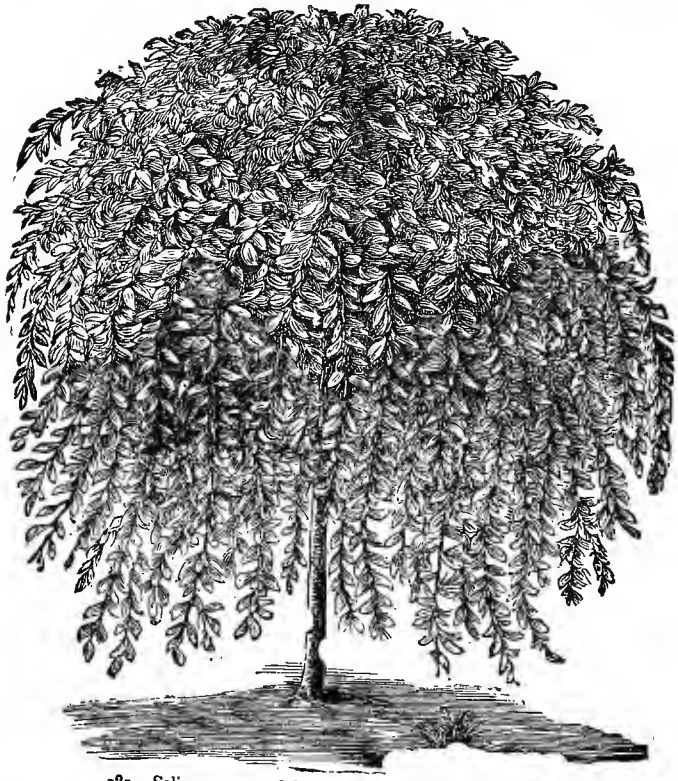


124.—Robinia pseudo-acacia—Leaves and flowers of locust-tree.

are macadamised. Otherwise, the trees become troublesome: they prevent the road from drying after rain or thaw.

Much taste, as well as discernment, is required in planting a piece of land so that it shall be really ornamental. Thus, where the house is low, with a flat roof, trees of an oval or globular form must be rejected. An

equal error in taste would be to plant Lombardy poplars, or tall conifers, near a house built in the Gothic style, with lofty gables and a high-pitched roof. The real



125.—Salix caprea pendula—Kilmarnock weeping-willow.

aim should be to mingle the different sorts of trees together, so that one may serve as a relief to the other without any confusion.

PART FOUR.

SPECIAL SUBJECTS BELONGING TO FORESTRY.

CHAPTER I.

VALUE OF WOOD AS FUEL AND FOR BUILDING, ETC.

In order to guide the planter in his task, I will here point out the value of the principal species of forest-trees mentioned in this work, whether they be intended for use as fuel, or for building, fences, and other purposes. By consulting the two following tables, the reader will see what trees, of those which suit his locality, it will be the most profitable for him to plant :—

TABLE SHOWING THE RELATIVE VALUE OF CERTAIN SPECIES OF TREES AS FUEL.

NAMES.	VALUE OF EACH SORT; WHITE-HEART HICKORY, REPRESENTED AS 100, BEING THE MOST VALUABLE.
Ash, American	77
Ash, green	77
Beech	65
Birch, canoe	48
Birch, yellow	63
Cedar, red	56
Chestnut, American	58
Elm, American	58
Hickory, shell-bark	95
Hickory, white-heart	100
Hornbeam	65
Maple, silver	54
Maple, sugar	60
Negundo—Ash-leaved maple	54
Oak, chestnut	60
Oak, post	71
Oak, red	69
Oak, white	81
Pine, white	42
Pine, yellow	54
Poplars	40
Tulip-tree	52
Walnut, black	65
Walnut, butternut	51

Though this table is pretty correct, we must not forget that wood varies very much in density, according to the land it grows on. The table having been drawn up for the middle region of the States, the figures may, doubtless, differ a little from those which the same species grown in Canada would indicate.

The next table, showing the weight of the chief sorts of fire-wood found on our markets, will give a better idea of their relative values. Indeed, considered in regard to weight, one piece of wood is as good as another as fuel, though the two may differ much in point of size. Thus, a pound of poplar is worth quite as much as a pound of hard-maple. But a piece of poplar weighing a pound is much larger than a piece of hard-maple of the same weight, and, consequently, it will take up much more room in a cord, which will, of course, weigh less than a cord of hard-maple, and be of less value, as may be seen in the next table :—

NAMES	WEIGHT PER CORD.
	lbs.
Yellow-birch	3,250
American chestnut	2,350
American elm	2,350
Sugar-maple	4,500
White-oak	3,850
Red-oak	3,250
Pines	2,000
Poplars	2,350

So much for the value of trees as fire-wood. Let us now see how trees rank when considered as materials for building, etc. :—

Oak.	Black-birch.
Walnuts.	Elm.
Hickories.	Larch.
Sugar-maple.	Yellow-birch.
Pine.	Spruce.
White-ash.	Arbor vitæ.

This order will vary according to the special service to which certain woods are affected; still, the table gives a good idea of the value of each from an ordinary point of view.

CHAPTER II.

FIRES IN THE FOREST.

Fires occur so frequently in the bush, they destroy every year such a vast quantity of timber, and lay waste such an extent of woodlands, that I have thought it right to devote a special chapter to this scourge, which menaces us with the rapid destruction of our forest-wealth.

Causes of bush-fires.—The principal causes of bush-fires are three in number: fires lighted by colonists in clearing the land; fires made by hunters, tourists, and travellers, for their daily wants; and those lighted by sparks from locomotives, which traverse now-a-days every part of the country, not excluding the forests. There may be some secondary causes, difficult of detection, but I pass them over, and proceed to study with the reader how to put an end to the fires set up by the three causes I have mentioned.

Means of preventing bush-fires.—The means of prevention of the first class are those that should be applied to the forest properly so called. For a fire is propagated with more or less ease, according to the state in which the district where it starts is found. Suppose, for example, that the fire begins in a timber-limit cut over the preceding year, the ground still encumbered with chips, shavings, branches, etc. In these *débris* the flames find fresh support, which excites them, and quickly renders them uncontrollable. I may be told that for this

there is no remedy. To which I reply, that this is a mistaken idea, for there is one, but one so radical, so energetic, and so burdensome, that some will cry out loudly against its practicability. The remedy is this: the lumbermen should be obliged to clear away from the forest all the rubbish caused by the operation. In order to insure the acceptance and the execution of this means of prevention, we must set aside the pecuniary considerations of a few hundreds of people who are interested in the exploitation of the woodlands, and we must consider the question as one of general importance from a national point of view.

Lumber merchants, to-day, sell their wood at a uniform price. If every one was obliged to increase the cost of exploitation, by clearing off the remains left by the axemen, what would happen? Only that they would be obliged to sell their wood dearer. It is all very well to say, "if we ask too high prices, we shall not be able to sell; and we shall ruin this branch of industry!" The reply is simple and irrefutable. We have now, thank God, the richest forests in the world. People must have our wood. This is so true, that our neighbours allow it to enter duty free into their ports, to induce us to send it to them, and thus, they themselves are able, in a measure, to economise the resources of their own forests. There is no indisposition among them to buy lumber from us. Even if the high prices caused by the means indicated did drive strangers from our market for a year or two, that would not last long; they would soon return. We should only risk the loss of our sales of lumber for a couple of years, a loss which, very likely, might not happen after all. On the other hand, our proposed system once established, we should have our forests perfectly free from rubbish and from brushwood,

ready to feed the fires when once started, and the bush-fires would be diminished in number by one-half. The governments of the several provinces are alone able to bring about the result, by inserting a clause enforcing the means of preventing bush-fires in the contracts for the concession of timber-limits.

And how had we best set about clearing away the wastage of the cut from the forest? There are two ways; both easy enough of application. As to resinous trees, it will suffice to have, in addition to the usual shanty-men, a gang of hands specially charged with the duty of piling up in heaps, in the clearings, the branches and chips, to be systematically burned in the winter. Resinous-wood is easily got rid of in this fashion. For other trees, the wastage can be arranged so as to be floated in spring down the rivers along the sides of which the operations are conducted. In order to avoid the blocks that the wastage might produce in the river-beds, the managers of the *drive* should be enjoined to watch its descent at the same time and as carefully as they watch that of the logs, until deep water is reached. Proprietors of firewood-lands, too, should be careful to clear away the wastage from their woods when their neighbours are clearing their bush-land.

The following are the means of prevention applicable to direct causes of fires: settlers, and others, should be forbidden to burn their brush from the first June to the first October: there is really no advantage in burning during the interval. All other fires should be strictly prohibited, except those lit by travellers of all kinds for their daily needs; and these men should be forbidden to make fires except on carefully cleared spots; they should be obliged to watch the fires day and night, and to extinguish them to the last spark before leaving the place. Every head

of a party of travellers (*voyageurs*), too, should be made responsible for bush-fires caused by his men, and punished by fine, as the direct author of the fire should be punished by imprisonment. We must also look after the locomotives, and compel railroad companies to employ wire-gauze nets, to prevent the sparks from being carried about by the wind, spreading fire far and near. The companies will, of course, be made responsible for damages caused by their negligence, and this in addition to the direct punishment, by imprisonment, of the immediate author of the fire.

Means of arresting the fire when once started.—Means must be found to combat the flames, when a fire has, in spite of all precautions, once started. The first is to draw a ditch, two feet deep by three or four wide, surrounding the fire, throwing out the earth on that side of the ditch which is next the fire. If water can be led into the ditch from a brook or river, the work will be perfect. Earth, too, should be thrown over the leaf-strown ground at the borders of the fire ; a belt of trees cut down ; and, if possible, another opposing fire should be lighted to fight the original one. Plenty of energy, plenty of men, and, above all, an eye decisive and sure. The forest-guardians should be empowered to engage as many men as may be necessary to oppose the fire, and even to compel the neighbours to assist.

This is almost all that can be done in the circumstances under consideration.

And, now, let us condense this important chapter into a few lines.

The causes of bush-fires are : the fires lighted by men engaged in clearing the land, by *voyageurs*, and by locomotives. To put a stop to them, we must begin by clearing away all the wastage of the fall of timber ; we

must prevent any brush-burning from the first of June to the first of October; and forbid all other fires, except those lighted by *voyageurs*, and these must occupy only a cleared site; they must be watched night and day, and utterly extinguished before being left. Heads of parties of *voyageurs* must be made responsible, under pain of fine, for the negligence of their men. Railroad companies must be compelled to put wire-gauze bonnets on their locomotives, to prevent the sparks from the chimneys from setting fire to the bush; and the companies, as well as the direct author of the mischief, be made answerable for any damage done. And, lastly, to arrest a conflagration already started, the forest-guardians must be authorised to hire, when necessary, a force equal to its suppression; to make ditches, and to fill them with water when practicable, to extinguish the fire by throwing earth upon it, to cut down the neighbouring trees, and to start an opposing fire when it is found advantageous to do so. The employment of some or all of these remedies cannot fail to produce good results.

CHAPTER III.

ARBOR-DAY.

For several years, a day has been set apart in the United States for planting trees all over the Union. It is called "Arbor-Day." There are years in which, at this *fête*, more than a million of trees have been planted in Minnesota alone. Every body is busy. Schools, colleges, clubs of all kinds, assemble, and, combining together, set out hundreds and thousands of trees. It is a day of popular rejoicing, and has become part of the national life.

We, too, in the Province of Quebec, have our "Arbor-Day"; and there is no reason why the good example set by the oldest of our provinces should not be followed by all her sisters of the Canadian Confederation. "Arbor-Day" would then be a day on which all the agricultural and horticultural associations would meet together; it would be a holiday for the pupils of our colleges and schools. Each participant in the *fête* would do his best to co-operate in the work of replanting, and the result would be felt from the very first year.

But, to produce the best effects from this *fête*, the people must be taught the utility of replanting, the part which the forest plays in the general economy of the country, and, above all, they must learn to practise intelligently the planting of trees according to the best known methods. To arrive at this much to be desired end, they must receive the necessary instruction, and the best way to instruct the people is to begin with the child at school. There, the first steps must be taken, the first lessons in forestry inculcated; first, that the child may appreciate the work carried out on "Arbor-Day," and then, as he increases in years, he will be fit to receive further teaching on this most important subject

---

CHAPTER IV.

EDUCATION IN FORESTRY.

That the lessons in forestry, of which I spoke at the end of the last chapter, may be profitable, they must be given in accordance with a well considered programme. For, in my opinion, it would be absurd to try to show a child how to plant a tree, before showing him the part

this tree plays in nature, and the reasons that exist for planting it.

These lessons in forestry should bear, in the first place, on the importance of our woodlands. The child should be shown that it behoves us to labour with all our strength to preserve our forests, if we wish to keep up the fertility and prosperity of our cultivated lands. Describe to him the distresses of those countries that are without wood, and he will learn to regard the trees as his friends, to guard them from injury, and to take due care for them. Next, he should be shown the methods to be pursued in restoring the forests where they have been injured, and where ruin threatens them. Once let him feel the importance of preserving the woodlands from damage, and of keeping them in good condition, and there will be no difficulty in convincing him of the necessity of re-planting the sites where wood no longer exists. Arrived at this point, the child, thus instructed, will conceive a taste for planting, and study the principles of that art of his own accord, if the elements of the study are placed in his hands. He will desire to acquire the art of forestry as a practical gain, and in two or three years, you will have made the child a devoted ally of the forest, a model forester. In after years, the generation to which he belongs will reap the benefit of the ideas you have inculcated, and will regard the planting, or management of a grove of trees on his land, as one of the indispensable parts of the scheme of every farmer.

To attain this end, the intervention of government must be secured. It should take pains to procure an elementary work on forestry for distribution among the pupils of our schools; facilitating thus the diffusion of

the principles which preside over the regular practice of a good system of forest-cultivation.

This is what must be done if we wish Canada, still abounding in forest-wealth, to avoid the lot of those countries of Europe which, having consumed the growth of their own woods, now send us their gold in exchange for our timber.

CHAPTER V.

FORESTRY ASSOCIATION.

A forestry association should be founded in every province of the Dominion. These associations, one of which already exists in the Province of Quebec, would have for a task to watch over the safety of our forests and their exploitation, and to develop a taste for sylviculture.

A certain amount should be granted them every year by the several provincial governments, which they might expend in *provincial* prizes, given to those competitors who had previously gained prizes, in the parish competions first, and afterwards in those of the counties When treating on the restoration of our woodlands, I spoke of these competitions, and of the prizes to be offered at them.

These associations would, thus, be the withes which would bind, as in a faggot, all local interests, considered from a forestry point of view. They would impart a uniform impulse to the general system of arboriculture, the plan of which I have endeavoured to trace in this work. The labours of these societies would be published in annual reports for public distribution under government auspices, and these would serve for the diffusion of the knowledge necessary for the practice of the forester's

art. They would form, in a few years, a precious series of documents, which would enable our legislators to judge of the progress made in the exploitation of the woodlands: on the one side, to put a stop to the destruction of our timber-lands, on the other, to make use of every means likely to favour their development.

Thus, we should all benefit by the knowledge of men who have devoted themselves to the earnest study of the forest-question. The meeting together of these specialists would insure the examination and solution of those complex problems which await determination before we can arrive at a perfected forest-law which shall meet all the exigences of our present position.

CONCLUSION.

My task is done. Have I done it well? The reader must be the judge. All I can say is, that I have taken every pains to make my book a sure and a safe guide. I have tried to avoid those errors which will glide into all human work, but in spite of that, I feel that some errors must have crept in. I ask, as a great service, of my readers, that if they shall discover any errors, they will kindly point them out to me, with a view to their subsequent rectification; for I desire, above every thing, that my work may be useful, and that nobody may be led into error by its perusal.

Before laying down my pen, I have a duty to perform: to render unto Cæsar the things that are Cæsar's. I will, therefore, point out the numerous sources from which I have drawn the fund of information from which my book has been condensed. The following works have all been useful to me under different heads, and to them I owe almost all there is of good in this work:

Course élémentaire de botanique ..... MOYEN.
Eléments de botanique ..... Brunet.
Elements of Forestry ..... HOUGH.
Forest-leaves ..... JOHNSON.
Forest-tree planting Manual ..... HODGES.
Illustrated Monthly Magazine ..... VICK
L'Art de planter ..... VON MANTEUFFEL.
La Flore canadienne ..... PROVANCHER.
Le livre de la ferme ..... JOIGNEAUX.
Reports of the Montreal Horticultural Society.
Returns of Forest-tree culture ..... JOLY.
Rural Affairs ..... THOMAS.
Vegetable World ..... FIGUIER.

For some of the engravings, I am indebted to the kindness of Mr. James Vick, of Rochester, who, of his own accord, most obligingly had them made for me by his engraver. Mr. Thomas Meehan, of Ph ladelphia, whose specialty is the collection and sale of the seeds of trees, most liberally put at my disposal specimens of seeds, after which I have had the illustrations which accompany this volume engraved.

The engraver, M. Blanc, of Philadelphia, who undertook this delicate work, is a specialist who has greatly aided me by giving an absolutely natural appearance to the reproductions of these seeds.

Lastly, I am not without hopes that, in publishing this work, the fruit of my rare leisure hours, hours consecrated to it as to a labour of love, I may be of some use to my country.

Let us love and venerate our forests. Where they have perished let us bid them rise again; and may we hear, for ever and aye, in every place throughout our beautiful Canada, "The diapason of our forests sighing over the mountains." (1)

(1) "Soupirer sur les monts, l'orgue de nos forêts,"

THE END.

VOCABULARY.

A

ABIES—Latin name of the spruce.

ACER—Latin name of the maple.

ÆSCULUS—Latin name of the edible chestnut.

ARBOR DAY—*Fête* of tree-planting.

ART OF FORESTRY—That which concerns the planting, pruning, etc., of forest trees.

ASH—Family of the oleaceæ—four species in Canada—all mentioned in this work.

ATMOSPHERE—The layer of air which surrounds the earth.

AUTOCHTHONES—Sprung from the soil—Greek.

B

BEECH—Family cupuliferæ; only one species in Canada.

BIRCH—Family betulaceæ—seven species in Canada, of which five (and an exotic) are mentioned in this book.

BETULA—Latin name of the birch.

BOX-ELDER—The Negundo or ash-leaved-maple.

BUTTON-WOOD—Family platanaceæ—only one species in Canada.

C

CANADA — Herein, means all the provinces of the Dominion, exeept British Columbia, which is not included in the work.

CARPINUS—Latin name of the hornbeam.

CARYA—Latin name of the hickory.

CASTANEA—Latin name of the chestnut.

COFFEE-TREE—Family leguminosæ—only one species in Canada.

CONIFERS—Botanical name of a family which bear their seeds in cones.

COPSE OR COPPICE—Woodlands cut down periodically and allowed to shoot up again.

COTTON-WOOD—Canada poplar.

CROWN-LANDS—Lands not yet conceded—public property.

D

DRIVE—In forest-language, means to float timber down the rivers to the place of sale or consumption.

E

ELM—Family ulmacées—two species in Canada.

EXPLOIT, EXPLOITATION—To prepare for sale—preparation for sale—French words, but used in English now-a-days.

EXOTIC—Foreign.

F

FIR—Family coniferæ; only two species in Canada—both mentioned in this book.

FLORA—The sylvan-flora comprises all trees, plants, etc., of the forest.

FORESTER—One who is specially occupied in the cultivation and exploitation of the forest.

FRAXINUS—Latin name of the ash.

G

GREAT-WEST—Here designates that part of Canada which lies to the North and West of the Province of Manitoba.

GYMNOCLADUS—Latin name of the coffee-tree.

H

HEMLOCK—Family coniferæ, fir tribe—only one species in Canada.

HUMUS—Earth formed from decomposed vegetable matter.

HYGIENE—The science which relates to the preservation of health.

I

INDIGENOUS—Native to the soil.

J

JUGLANS—Latin name of the walnut.

JUNIPERUS—Latin name of the juniper.

L

LARCH—Family coniferæ—only one sort in Canada

LARIX—Latin name of the larch.

LIME-TREE—Family tiliaceæ—two species in Canada, of which only one is mentioned here.

LIMITS—Timber-limits are certain districts of woodlands let on lease to people who exploit the timber.

LINDEN—The lime-tree or bass-wood.

LIRIODENDRON—Latin name of the tulip-tree.

LOCUST—Family leguminosæ, sub-fam. papilionaceæ—an exotic.

LUMBER—Timber prepared for building, etc.

M

MANITOBA—A province of Canada on the West of Quebec, and North of Ontario and the United States.

MAPLE—Family acerinæ—five species in Canada, all mentioned in this work.

MATURITY—Trees are arrived at maturity when fit for exploitation.

MOUNTAIN ASH—Family pomaceæ—only one species in Canada.

N

NEGUNDO—Family acerinæ—only one species in Canada.

NEW BRUNSWICK—A province of Canada, to the South-West of Quebec.

NOVA SCOTIA—A province of Canada, to the East of New Brunswick.

NORTH-WEST—In this work, means all the territory of the Dominion between the Provinces of Quebec and Ontario, and the Province of British Columbia.

O

OSTRYA—Latin name of the iron-wood—a cupuliferous-tree—only one species known in Canada.

P

PICKLE—Scotch for a single grain of any seed.

PINCHING BACK—Stopping a young shoot with the finger and thumb.

PINE—One of the coniferæ—four species in Canada, all mentioned in this book.

PINUS—Latin name of the pine.

PLATANUS—Latin name of the plane-tree—family platanaceæ—only one species in Canada.

POPLAR—Family salicaceæ—four species in Canada, all mentioned, with two exotic species, in this work.

POPULUS—Latin name of the poplar.

PRAIRIES—The immense tree-less plains of the North-West–literally, "meadows."

Q

QUEBEC — A province of Canada, bounded by New Brunswick, Maine, Ontario, and Manitoba.

QUERCUS—Latin name of the oak.

R

RAIL—That part of a railroad on which the wheels of the carriages run.

RESERVE OF WOOD—Part of a cultivated farm left in wood to supply the wants of the family.

ROBINIA—Latin name of the locust-tree.

S

SALIX—Latin name of the willow.

SORBUS—Latin name of the Mountain-ash.

SUGAR-BUSH—A grove of maples, kept for sugar-making.

T

THUYA—Family coniferæ—one species only in Canada.

TILIA—Latin name of the lime-tree or bass-wood.

TRELLIS—A frame-work of laths, placed at equal distances apart, and tied together.

TSUGA—Latin name of the hemlock.

TULIP-TREE—Family magnoliaceæ—only one species in Canada.

U

ULMUS—Latin name of the elm.

W

WASTAGE—The boughs, chips, rough pieces, and other stuff left by the choppers after preparing trees for market or for use.

WILLOW — Family salicaceæ — seventeen species in Canada; two only mentioned in this work. An exotic, the Kilmarnock-willow, is also spoken of.

APPENDIX.

Extracts from the Statutes of the Dominion of Canada, and of the different provinces of the Dominion, concerning the protection of the forest against fire.

The protection of the forests against fire is so important a subject that I have thought it well to extract all the legislative matter appertaining to it which appears in the statutes of the Dominion and of the different provinces. These extracts, placed as an appendix at the end of the *Canadian Forester's Guide*, in which a special chapter is devoted to bush-fires, and to the means to combat them, will serve as its complement.

Every one reading over the law on this subject, will see what is in his individual power to do to render it efficacious. Those whose mission it is to make the laws, will study those already in existence, will perceive their defects, and will thus be in a position to work with success in their improvement.

As the reader will see, certain provisions are practicable, while others can hardly bring about the intended results. The chief aim seems to be, the prevention of fire-raising ; but no one has kept in view the wisdom of managing the exploitation of the forests in such a manner that as little damage as possible may be done even when a fire does take, by compelling the districts cut over by the lumbermen to be freed

from all chips and other wastage, which are the real propagators of those disastrous fires which ruin our noble forests.

Let us hope that these laws will be revised and amended in such a fashion that they may, in the end, produce the effects which we have a right to expect from them.



DOMINION OF CANADA.

42 VICTORIA, 1879,

CHAPTER XXXI.

An Act to amend and consolidate the several Acts respecting the Public Lands of the Dominion.

(*Assented to* 15*th May*, 1879.)

SECTION 52. PARAGRAPH 3. To prevent all unnecessary destruction of growing timber on the part of his men, and to exercise strict and constant supervision to prevent the origin or spread of fires.



PROVINCE OF QUEBEC.

34 VICTORIA, 1870,

CHAPTER XIX.

An Act respecting the clearing of Lands, and the protection of Forests against Fires.

(*Assented to 24th December*, 1870.)

Whereas, it is expedient to determine the periods of the year during which fires may be lighted in forests, for the purpose of clearing or improving lands; and whereas it is further necessary to protect forests against fires; Her Majesty, by and with the advice and consent of the Legislature of Quebec, enacts, as follows:

1. No person shall, at any time, set fire to or cause to burn, any tree, shrub or other plant, growing or standing in any forest, or at a distance of less than one mile from any forest.

2. No person shall set fire to, or cause to burn, any pile of wood, branches or brushwood, or any tree, shrub, or other plant, which shall be situate or felled in the forest, or at a distance of less than a mile, or any turf, peat, stumps, fallen trees or other timber, at any period of the year, for any cause

or pretext whatsoever, except for the purpose of clearing lands, and in such latter case, only between the first day of September and the first day of July.

3. Notwithstanding the preceding provisions, it shall be lawful to make a fire in or near the forest to obtain warmth, and for cooking or other necessary objects, or for all industrial purposes, such as the manufacture of tar, turpentine, charcoal, or making of ashes, for the manufacture of pot or pearl ash, provided that the obligations and precautions imposed by the following section are observed.

4. Every person who shall, between the fifteenth of May and the fifteenth of October, make a fire in the forest or at a distance of less than half a mile therefrom, for the purposes mentioned in the preceding section, must:

1. Select the locality in the neighborhood in which there is the smallest quantity of vegetable matter, dead wood, branches, brushwood, dry leaves, or resinous trees;

2. Clear the place in which he is about to light his fire, by removing all vegetable matter, dead trees, branches, brushwood and dry leaves from the soil, within a radius of twenty-five feet, as regards fires made for the necessities of any industry, as mentioned in section three, and within a radius of four feet as regards fires made for the other necessary objects mentioned in the said section;

3. Totally extinguish the fire before quitting the place.

5. Any person who shall throw or drop on the ground, in any place whatsoever, whether in the forests, open fields, or other place, any burning match, ashes of a pipe, cigars or part of a cigar, or any other burning substance or who shall discharge any fire-arm, shall be bound, under the pains and penalties imposed by this Act for his neglect so to do, completely to extinguish, before leaving the spot, the fire of such match, ashes of a pipe, cigars or part of a cigar, or the wadding of such fire-arm.

6. Any person contravening any of the provisions of this Act, shall be liable upon conviction before any justice of the peace, to a penalty not exceeding fifty dollars, and in default of payment of the said penalty, and costs of suit, with or without delay, to be imprisoned in the common gaol of the district wherein he shall be convicted, for a period not exceeding three calendar months, unless the said penalty and costs of suit, together with the costs of apprehension and conveyance of the said offender, to the said common gaol, be sooner paid, or to be imprisoned in the said common gaol, for a period not exceeding three calendar months; or to be condemned for each such offence, to the said penalty and further to the imprisonment hereinabove mentioned, with costs of suit in all cases.

7. Any person of full age, may prosecute for any contravention of this Act, and one half of the penalty, in case of conviction, shall belong to the prosecutor, and the other half to the government of this province, to form part of the consolidated revenue fund of the same.

8. Every suit for contravention of this Act, shall be commenced within the three calendar months, immediately following such contravention, and not afterwards.

9. Any justice of the peace who shall himself view any contravention of this Act, may impose the penalty therefor without other proof, and, for the purposes of this Act, all agents for the sale of Crown lands, all employees of the departments of Crown lands, all sworn land surveyors, and all wood-rangers employed by the Department of Crown Lands, shall be *ex officio* justices of the peace.

10. The Act of the Parliament of this province, thirty-third Victoria, chapter thirty-six, is hereby repealed.



PROVINCE OF QUEBEC.

46 VICTORIA, 1883,

CHAPTER X.

An Act to provide means for the more effectual prevention of forest fires.

(*Assented to 30th March*, 1883.)

Her Majesty, by and with the advice and consent of the Legislature of Quebec, enacts as follows:

1. The Lieutenant-Governor in Council may, by proclamation, declare any portion or part of the Province of Quebec, which is included in any forest region to be a "Fire-District.' Such proclamation shall be published in the "Quebec Officia Gazette," and, from and after the date of such publication, the territory therein mentioned shall become and be known as a "fire-district," within the meaning and for the purposes of this Act.

Such territory shall cease to be a "fire-district," upon the publication of a proclamation of the Lieutenant-Governor in Council revoking the one creating it.

2. It shall not be lawful for any person to set or cause to be set or started any fire in or near the woods, within any such fire-district, between the first day of April and the first day of November in any year, except for the purpose of clearing land, in which case no fire shall be set, except between the first day of July and the first of September only.

3. Any person who shall set or cause to be set a fire, contrary to the provisions of the foregoing section, shall, in addition to his liability for all damage, become liable, upon conviction, to the payment of a penalty not exceeding fifty dollars, and in default of the payment of the said fine, with or without delay, to an imprisonment in the common gaol of the district in which the conviction takes place, for a period of not more than three months, unless the said fine and costs, together with the costs of imprisonment and conveyance of the delinquent be not sooner paid.

4. It shall be lawful for the Commissioner of Crown Lands to employ, between the first day of April and the first day of November, for the purpose of enforcing the provisions of this Act, such a number of men as he may deem necessary for that end; and in each fire-district so established he shall name an officer who shall be known and designated as "Fire Superintendent."

5. The Commissioner of Crown Lands may permit any person, holding a license in any territory, included in any such fire-district, to place at the disposal of the Fire Superintendent any number he may see fit of his employees for the purpose of aiding in the enforcement of this Act; which employees shall be under the sole and exclusive control and direction of the said Fire Superintendent and bound to execute his orders. The salaries and expenses of such employees shall be borne by the licensee.

6. All locomotive engines, used on any railway which passes through any lands comprised in any such fire-district or any part of it, shall, by the company using the same, be

provided with and have in use all the most improved and efficient means used to prevent the escape of fire from the furnace or ash-pan of such engines; and the smoke-stack of each locomotive so used shall be provided with a bonnet or screen of iron or steel wire netting; the size of the wire used in making the netting to be not less than number nineteen of the Birmingham wire guage, or three sixty-fourth parts of an inch in diameter, and shall contain, in each square inch, at least eleven wires each way at right angles to each other, that is in all twenty-two wires to the square inch.

7. It shall be the duty of every engine-driver, in charge of a locomotive-engine, passing over any such railway, to see that all such appliances above mentioned are properly used and applied, so as to prevent the unnecessary escape of fire from any such engine as far as it is reasonably possible to do so.

8. Any railway company, running or permitting any locomotive engine to be run in violation of the provisions of the preceding sections of this Act, shall be liable to a penalty of one hundred dollars for each offence, to be recovered with costs in any court of competent jurisdiction.

9. All railway companies, whose lines pass through any lands comprised in any such fire-district or any part thereof, shall be bound, under a penalty of one hundred dollars, recoverable in the manner provided in the preceding section and subject in addition to the liability for all damages caused by fires originating from sparks issuing from their locomotives, to clear off from the sides of their respective roadways all combustible materials, by carefully burning the same or otherwise. And it shall not be necessary, in any such action for penalty or damages, to prove the name or number of the locomotive or the name of the engineer or fireman in charge of the same.

10. For the purposes of this Act, all Fire Superintendents, agents for the sale of Crown lands, employees of the Depart-

ment of Crown Lands, sworn land surveyors, and wood-rangers employed by the Department of Crown Lands, shall be *ex-officio* justices of the peace; and any justice of the peace, before whom has been proved any contravention of the provisions of this Act, may impose the penalty above set forth.

11. This Act shall come into force on the day of its sanction.



PROVINCE OF ONTARIO.

41 VICTORIA, 1878,

CHAPTER XXIII.

An Act to preserve the forests from destruction by fire.

(*Assented to 7th March*, 1878.)

Whereas large quantities of valuable timber are annually destroyed by fires, which are in many instances the result of negligence and carelessness, it is therefore necessary to provide stringent regulations for the prevention of such fires.

Therefore, Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

1. The Lieutenant Governor may, by proclamation to be made by him from time to time, issued by and with the advice and consent of the Executive Council, declare any portion or part of the Province of Ontario to be a fire district.

2. Every proclamation under this Act shall be published in the Ontario Gazette; and such portion or part of the Province as is mentioned and declared to be a fire district in

and by the said proclamation, shall, from and after the said publication become a fire district within the meaning and for the purposes of this Act.

3. Every such portion or part of this Province, mentioned in such proclamation, shall cease to be a fire district upon the revocation by the Lieutenant Governor in Council of the proclamation by which it was created.

4. It shall not be lawful for any person to set out, or cause to be set out or started, any fire in or near the woods within any fire district, between the first day of April and the first day of November in any year, except for the purpose of clearing land, cooking, obtaining warmth, or for some industrial purpose; and in case of starting fires for any of the above purposes, the obligations and precautions imposed by the following sections shall be observed.

5. Every person who shall, between the first day of April and the first day of November, make or start a fire within such fire district for the purpose of clearing land, shall exercise and observe every reasonable care and precaution in the making and starting of such fire, and in the managing of and caring for the same after it has been made and started, in order to prevent such fire from spreading and burning up the timber and forests surrounding the place where it has been so made and started.

6. Every person who shall, between the first day of April and the first day of November, make or start within such fire district a fire in the forest, or at a distance of less than half-a-mile therefrom, or upon any island for cooking, obtaining warmth, or for any industrial purpose, shall:

1. Select a locality in the neighbourhood in which there is the smallest quantity of vegetable matter, dead wood, branches, brushwood, dry leaves, or resinous trees;

2. Clear the place in which he is about to light the fire by removing all vegetable matter, dead trees, branches, brush-

wood, and dry leaves from the soil within a radius of ten feet from the fire;

3. Exercise and observe every reasonable care and precaution to prevent such fire from spreading, and carefully extinguish the same before quitting the place.

7. Any person who shall throw or drop any burning match, ashes of a pipe, lighted cigar or any other burning substance, or who shall discharge any fire-arm within such fire district, shall be subject to the pains and penalties imposed by this Act, if he neglect completely to extinguish before leaving the spot the fire of such match, ashes of a pipe, cigar, wadding of the fire-arm or other burning substance.

8. Every person in charge of any drive of timber, survey or exploring party, or of any other party requiring camp-fires, for cooking or other purposes, within such fire district, shall provide himself with a copy of the Act, and shall call his men together and cause said Act to be read in their hearing and explained to them at least once in each week during the continuation of such work or service.

9. All locomotive engines used on any railway, which passes through any such fire district, or any part of it, shall by the company using the same, be provided with and have in use all the most approved and efficient means used to prevent the escape of fire from the furnace or ash-pan of such engines, and that the smoke-stack of each locomotive engine so used shall be provided with a bonnet or screen of iron or steel wire netting, the size of the wire used in making the netting, to be not less than number nineteen of the Birmingham wire gauge, or three sixty-fourth parts of an inch in diameter, and shall contain in each inch square at least eleven wires each way at right angles to each other, that is in all twenty-two wires to the inch square.

10. It shall be the duty of every engine driver in charge of a locomotive engine passing over any such railway within

the limits of any such fire district, to see that all such appliances as are above mentioned are properly used and applied, so as to prevent the unnecessary escape of fire from any such engine as far as it is reasonably possible to do so.

11. Whosoever unlawfully neglects or refuses to comply with the requirements of this Act in any manner whatsoever, shall be liable upon a conviction before any justice of the peace to a penalty not exceeding fifty dollars over and above the costs of prosecution, and in default of payment of such fine and costs, the offender shall be imprisoned in the common gaol for a period not exceeding three calendar months; and any railway company permitting any locomotive engine to be run in violation of the provisions of the ninth section of this Act shall be liable to a penalty of one hundred dollars for each offence, to be recovered with costs in any court of competent jurisdiction.

12. Every suit for any contravention of this Act shall be commenced within three calendar months immediately following such contravention.

13. All fines and penalties imposed and collected under this Act shall be paid one-half to the complainant or prosecutor and the other half to Her Majesty for the public use of the Province.

14. It shall be the special duty of every known land agent, woods and forests agent, free grant agent, and bush-ranger, to enforce the provisions and requirements of this Act, and in all cases coming within the knowledge of any such agent or bush-ranger to prosecute every person guilty of a breach of the provisions and requirements of the same.

15. Nothing in this Act contained shall be held to limit or interfere with the right of any party to bring and maintain a civil action for damages occasioned by fire, and such right shall remain and exist as though this Act has not been passed.



NEW BRUNSWICK.

CONSOLIDATED STATUTES.

CHAPTER CVII.

An Act for preventing and investigating the causes of fires.

SECTION 16.—Any person who shall kindle a fire in any wood or open place, and leave the same burning without being properly secured, whereby damage may be caused to the property of any other person, shall forfeit a sum not exceeding eighty dollars; and be liable to an action for the damages sustained in addition thereto.

INDEX.

A

PAGE

Abies 149
Abies alba ..... list, 56, 88, 91, 94, 96, 99
Abies Americana ..... list, 56, 58, 88, 91, 94, 96, 99
Abies balsamifera ..... list, 56, 58, 88, 91, 94, 96, 99
Abies excelsa ..... list, 56, 60, 88, 91, 95, 96, 99
Abies nigra ..... list, 56, 62, 88, 91, 95, 96, 99
Acacia ..... list
Acer 149
Acer dasycarpum ..... list, 68, 88, 91
Acer Pennsylvanicum ..... list, 37, 88, 91, 95, 96, 99
Acer rubrum ..... list, 37, 38, 88, 91, 95, 96, 99
Acer saccharinum ..... list, 37, 39, 88, 91, 95, 96
Acer spicatum ..... list, 37, 40, 91, 95, 96, 99
Acorns 108
Æsculus 149
Æsculus hippocastanea ..... list, 128
Agricultural clubs 21, 22
Agricultural societies 21, 22
American ash 93, 135
American aspen ..... list, 37, 48, 89, 92, 95, 96, 100
American elm ..... list, 89, 92, 93, 95, 96, 100, 128, 135, 136
American larch ..... list, 56, 63, 89, 91, 92, 95, 96, 100, 128
Appendix 155
Arbor-vitæ ..... list, 84, 86, 89, 92, 93, 95, 97, 128, 136
Art of forestry 149
Ash 149

PAGE
Ash, black ..... list
Ash, green ..... list
Ash-leaved maple ..... list, 93, 98, 128, 135
Ash, mountain ..... list
Ash, red ..... list
Ash, white ..... list
Aspen, American ..... list
Aspen, large toothed ..... list
Atmosphere 149
Averruncator 119

B.

Balsam fir ..... list, 56, 58, 88, 91, 93, 94, 96, 99, 128
Balsam poplar ..... list, 37, 48, 89, 91, 92, 95, 96, 100, 128
Banksian pine ..... list, 64
Bare spots 25, 30
Baumier ..... list
Bark canoes 45
Bass-wood ..... list, 68, 83, 89, 92, 95, 100. 128
Beech ..... list, 68, 73, 89, 91, 93, 95, 96, 128, 135, 149
Betula 149
Betula excelsa ..... list, 37, 42, 88, 91, 95, 96, 99
Betula lenta ..... list, 37, 42, 88, 91, 95, 96, 99
Betula nigra ..... list, 37, 42, 88, 91, 95, 96, 99
Betula papyrifera ..... list, 37, 42, 88, 91, 95, 96, 99
Betula pendula laciniata ..... list, 128
Betula populifolia ..... list, 37, 42, 88, 91, 95, 96, 99
Birch 149
Birch, black ..... list
Birch, canoe ..... list
Birch, cut leaved weeping ..... list
Birch, poplar-leaved ..... list
Birch, red ..... list
Birch sugar 43
Birch, yellow ..... list
Bitter hickory ..... list, 68, 70, 89, 91, 93

PAGE
Black ash..... list, 37, 45, 89. 91, 93, 95, 96 100, 128
Black birch..... ..... list, 37, 42, 88, 91, 93, 95, 96, 99, 128, 136
Black walnut..... list, 68, 75, 89, 93, 135
Bogs..... 32
Bois barré..... list
Boughs..... 12
Bouleau à canot..... list
Bouleau à feuille de peuplier..... list
Bouleau à papier..... list
Bouleau blanc européen..... list
Bouleau élancé..... list
Bouleau merisier..... list
Bouleau noir..... list
Bouleau pleureur..... list
Bouleau rouge..... list
Box-elder..... 97, 100, 149
British Columbia..... 8
Broom handles..... 9
Brushwood..... 24
Burning time..... 15
Burr oak..... list, 97, 100
Butternut..... list, 68, 75, 81, 91, 93, 94, 95, 128, 135
Button-wood..... list, 68, 79, 89, 91, 93, 128, 149

C

Canada..... 149
Canada white pine..... 128
Canoe-birch..... list, 37, 42, 88, 91, 92, 95, 96, 99, 135
Care of seedlings..... 111
Care of trees after planting..... 119
Carpinus..... 149
Carpinus Americana..... list, 68, 69, 88, 91, 95, 96
Carya..... 149
Carya alba..... list, 68, 70, 88, 91
Carya amara..... list, 68, 70, 89, 91
Carya glabra..... list, 68, 70, 89

PAGE
Carya microcarpa..... list, 68, 70, 89
Carya tomentosa ..... list, 68, 70, 89, 91
Caryer amer..... list
Caryer à petits fruits..... list
Caryer blanc..... list
Caryer glabre..... list
Caryer tomenteux..... list
Castanea..... 150
Castanea vesca..... list, 68, 72, 89
Causes of bush fires 137
Cedars..... 23
Cedar, red..... list
Cèdre blanc..... list
Cèdre rouge..... list
Charme..... list
Charme d'Amérique..... list
Chataignier..... list
Chataignier d'Amérique..... list
Chêne à gros fruits..... list
Chêne blanc..... list
Chêne chataignier..... list
Chêne des marais..... list
Chêne des teinturiers..... list
Chêne écarlate..... list
Chêne étoilé..... list
Chêne gris..... list
Chêne jaune..... list
Chêne noir..... list
Chêne prin..... list
Chêne rouge..... list
Chesnut..... list, 68, 72, 89, 115, 135, 136
Chesnut, horse..... list
Chesnut-oak 35, 89
Chicot..... list
Chicot du Canada..... list
Chips..... 12

PAGE
Clearings 19, 26, 30, 139
Coffee-tree..... list, 68, 74, 89, 91, 93, 150
Collecting tree-leaves..... 122
Colonists..... 137
Conifers..... 36, 103, 115, 150
Coniferous seeds..... 108, 109
Coniferous trees..... 56, 84
Coppice..... 150
Copse..... 9, 150
Contraventions..... 13
Cormier..... list
Cotton-tree poplar..... 128
Cotton-wood..... list, 37, 48, 89, 92, 93, 96, 100, 150
Couples ; or shackles..... 84
Crown lands..... 26, 150
Cultivation of ornamental trees..... 126
Cut-leaved weeping birch..... list, 128
Cuttings..... 112
Cypress..... 56, 89, 91, 95, 96

D

Deciduous trees..... 36, 37, 68, 103
Deciduous trees, seeds of..... 108
Denudation of wood..... 27
Dominion of Canada..... 100, 102, 103, 157
Double balsam fir..... list, 56, 58, 88, 91, 93, 94, 96, 99
Drainage..... 116
Drive..... 139, 150

E

Education in forestry..... 142
Elm..... 136, 150
Elm, American..... list
Elm, red..... list
Elm, slippery..... list
Elm, white..... list

PAGE
Epinette blanche..... list
Epinette noire..... list
Epinette de Norvège..... list
Epinette rouge..... list
Erable à épis..... list
Erable à fruits laineux..... list
Erable à Giguère..... list
Erable à sucre..... list
Erable bâtarde..... list
Erable blanche..... list
Erable jaspé..... list
Erable rouge..... list
Exploitations..... 150
Exploits..... 150
Extracts from the statutes of the Dominion and of the different provinces of the Dominion..... 155
Evergreen trees..... 36, 103

F.

Fagus sylvatica..... list, 68, 73, 89, 91, 95, 96
Farmers..... 23
Fences..... 24, 32, 135
Fence posts..... 86
Final planting out..... 113
Fine..... 13
Fir..... 23, 150
Fir, balsam..... list
Fir, double balsam..... list
Fires..... 15, 16
Fires in the forest..... 137
Firewood..... 136
Firewood lands..... 139
Floods..... 30, 31
Flora..... 150
Foresters..... 13, 26, 150
Forest fires..... 17

PAGE
Forestry Associations. 22, 143
Forest guardian..... 14, 140, 141
Forest lines..... 22
Fraxinus..... 15
Fraxinus Americana..... list, 37, 45, 89, 91, 95, 96, 99
Fraxinus pubescens..... list, 68, 74, 89, 91, 95, 96
Fraxinus sambucifolia..... list, 37, 46, 89, 91, 95, 96, 100
Fraxinus viridis..... list, 97, 98, 99
Frêne à feuille de sureau ..... list
Frêne blanc..... list
Frêne d'Amérique..... list
Frêne noir..... list
Frêne pubescent..... list
Frêne rouge..... list
Frêne vert..... list
Frost..... 19
Fuel 135

G.

Génevrier de Virginie..... list
Grasshoppers 35
Great West..... 150
Green ash..... list, 97, 98, 135
Groves..... 24
Gymnocladus 150
Gymnocladus Canadensis..... list, 68, 74, 89, 91

H.

Hard maples..... 136
Hard seeds..... 108
Hemlock..... 151
Hemlock bark..... 87, 93, 95
Hemlock spruce 84, 87, 89, 92, 96
Hêtre ..... list
Hêtre commun..... list
Hickories..... 4, 115, 136

PAGE
Hickory, bitter..... list
Hickory, pignut..... list
Hickory, shell-bark..... list
Hickory, small fruit..... list
Hickory, white-heart..... list
Holm-oak..... 89
Hop-poles..... 9, 73
Hornbeam..... list, 68, 69, 88, 91, 93, 95, 96, 135
Horse-chesnut..... list, 128
Horticultural Societies..... 21
Humus..... 151
Hunters..... 10, 14, 17, 137
Hurdles..... 9
Hygiène..... 35, 151

I.

Imprisonment..... 13
Indigenous trees..... 35, 151
Insects injurious to trees..... 123
Iron-wood..... list, 68, 78, 89, 91, 93, 95, 96

J.

Juglans..... 151
Juglans cinerea..... list, 68, 75, 89, 91, 95
Juglans nigra..... list, 68, 75, 89
Juniperus..... 151
Juniperus Virginiana..... list, 84, 89

K.

Kilmarnock weeping-willow..... list, 128, 131

L.

Larch..... 23, 29, 36, 106, 136, 151
Larch, American..... list
Large toothed aspen..... list, 68, 79, 89, 92, 93, 95, 96
Larix..... 151
Larix Americana..... list, 56, 63, 89, 91, 95. 96, 100

PAGE
Lessons in forestry 142, 143
Liard ..... list
Liriodendron 151
Liriodendron tulipiferum ..... list, 68, 77, 89
Lime-tree ..... list, 89, 92, 93, 95, 100, 128, 151
Limits 14, 151
Limit-owners 10, 14
Linden 151
Local Societies 22
Locomotives 137, 140, 141
Locust 128, 151
Locust-tree ..... list, 130
Lombardy poplar ..... list, 128, 129
Lumber 151
Lumberman 9
Lumbermen 14, 15, 25
Lumber merchants 14
Lumber trade 14

M.

Manitoba 33, 97, 102, 103, 151
Maple 28, 100, 151
Maple, ash-leaved ..... list
Maple, mountain ..... list
Maple, red ..... list
Maple, silver ..... list
Maple, striped ..... list
Maple, sugar ..... list, 39
Marker 110
Maskouabina ..... list
Marronnier ..... list
Marronnier d'Inde ..... list
Maturity 152
Means of arresting fires when once started 140
Means of preventing bush fires 137
Mélèze d'Amérique ..... list

PAGE
Merisier blanc..... list
Merisier rouge..... list
Mice..... 30, 108
Mound-planting..... 116
Mountain ash..... list, 37, 54, 89, 92, 95, 96, 100, 128, 152
Mountain maple..... list, 37, 40, 88, 91, 93, 95, 96, 99
Mountain slopes..... 116

N

Naked spots..... 25
Natural restoration of the forests..... 105
Natural re-wooding..... 106
Negundo..... 29, 93, 94, 118, 128, 135, 152
Negundo à feuille de frêne..... list
Negundo fraxinifolium..... list, 97, 98, 100
Negundo sugar..... 98
New Brunswick..... 94, 102, 103, 152, 171
Noix blanche..... list
North-West..... 33, 116, 152
Norway pine..... list, 56
Norway spruce..... list, 56, 60, 88, 91, 92. 95, 96, 99, 128
Nova Scotia..... 94, 102, 103, 152
Noyer brun..... list
Noyer cendré..... list
Noyer dur..... list
Noyer noir..... list
Noyer tendre..... list
Nurseries..... 109, 111
Nursery-bed..... 57

O

Oaks..... 48, 61, 115, 136
Oak, burr..... list
Oak, post..... list
Oak, quercitron..... list
Oak, red..... list

PAGE
Oak, scarlet ..... list
Oak, swamp chesnut ..... list
Oak, white ..... list
Oak, yellow chesnut ..... list
Offenders 13
Ontario 67, 68, 84, 101, 103, 167
Orme d'Amérique ..... list
Orme blanc ..... list
Orme rouge ..... list
Orme roux ..... list
Ornamental trees 126
Ostrya 152
Ostrya Virginica ..... llst, 68, 78, 89, 91, 95, 96
Ostryer de Virginie ..... list

P

Paper pulp 45
Peach-stones 108
Peeps 103
Penal clause 13
Petite épinette ..... list
Peuplier ..... list
Peuplier argenté ..... list
Peuplier à grandes dents ..... list
Peuplier baumier ..... list
Peuplier blanc ..... list
Peuplier de Lombardie ..... list
Peuplier du Canada ..... list
Peuplier faux-tremble ..... list
Peuplier pyramidal ..... list
Pickles 46, 152
Pignut ..... list, 68, 70, 89
Pinching off 119, 152
Pin blanc ..... list
Pin des rochers ..... list
Pin blanc du Canada ..... list

PAGE
Pin doux ..... list
Pin gris ..... list
Pin jaune ..... list
Pin résineux ..... list
Pin rouge ..... list
Pines 136, 152
Pine, Banksian ..... list
Pine, Norway ..... list
Pine, Weymouth ..... list
Pine, white ..... list
Pine, yellow ..... list
Pinus 152
Pinus Banksiana ..... list, 56, 64, 89, 91, 95, 96, 100
Pinus mitis ..... list, 84, 85, 89, 91
Pinus resinosa ..... list, 56, 64, 89, 91, 95, 96, 100
Pinus strobus ..... list, 56, 64, 89, 91, 95, 96, 100
Plaine ..... list
Platane d'occident, ... list, 152
Platane de Virginie ..... list
Platanus 152
Platanus occidentalis ..... list, 68, 79, 89, 91
Plantation of cuttings 113
Planting new forests 27
Planting season 115
Planting special soils 115
Pollarding 123
Pollard willows 53
Police 13
Poplar 29, 152
Poplar, balsam ..... list
Poplar cuttings 48, 112
Poplar, Lombardy ..... list
Poplar, white ..... list
Poplar-leaved birch ..... list, 37, 42, 88, 91, 93, 95, 96, 99
Poplars 23, 118, 135, 136
Populus 152

PAGE
Populus alba 129
Populus balsamifera ..... list, 37, 48, 89, 91, 95, 96, 100
Populus Canadensis ..... list, 37, 48, 89, 92, 95, 96, 100
Populus grandidentata ..... list, 68, 79, 89, 92, 95, 96
Populus pyramidalis ..... list, 129
Populus tremuloïdes ..... list, 37, 48, 89, 92, 95, 96, 100
Post-oak ..... list, 68, 80, 89, 92, 93, 135
Prairies 33, 116, 152
Prairie soils 118
Preservation of forests 9, 11, 14, 15, 17
Province of Manitoba 97, 102, 103
Province of New Brunswick 94, 102, 103, 171
Province of Nova Scotsa 94, 102, 103
Province of Ontario 67, 101, 103, 167
Province of Prince Edward's Island 96, 102, 103
Province of Quebec 21, 91, 101, 103, 159
Propagation by cuttings 112
Protection to insectivorous birds 126
Provincial prizes 144
Pruche ..... list
Pruche du Canada ..... list
Pruning of large branches 120
Pruning season 121
Pruning of trees 25, 119
Pruning tools 119

Q

Quebec 21, 91, 101, 103, 153, 159
Quercitron oak 68, 80, 89
Quercus 153
Quercus alba ..... list, 68, 80, 89, 92, 95
Quercus castanea ..... list, 68, 80, 89
Quercus coccinea ..... list, 68, 80, 89
Quercus macrocarpa ..... list, 97, 100
Quercus prinus ..... list, 68, 80, 89
Quercus rubra ..... list, 68, 80, 89, 92, 95

PAGE
Quercus stellata..... list, 68, 80, 89, 92
Quercus tinctoria..... list, 68, 80, 89

R

Rails..... 86, 153
Railroad companies..... 32, 140, 141
Railroad timber..... 32
Railways..... 32
Rains..... 19, 31
Red ash..... list, 68, 74, 89, 91, 93, 95, 96
Red birch..... list, 37, 42, 88, 91, 93, 95, 96, 99
Red cedar..... list, 84, 89, 135
Red elm..... list, 68, 83, 89, 92, 93
Red oak..... list, 68, 80, 89, 92, 93, 95, 135, 136
Red maple..... list, 37, 38, 88, 91, 93, 95, 96, 99, 128
Relative value of certain species of trees as fuel..... 135
Remedies against insects..... 124, 125
Red pine..... list, 64, 89, 91, 93, 95, 96, 100
Reports of "Forestry Associations,"..... 144
Re-planting..... 25, 27
Reserve of wood..... 16, 153
Restoration of the forests..... 19, 20, 22, 23
Robberies..... 15
Robinia..... 153
Robinia pseudo-acacia..... list, 130
Robinier faux acacia..... list
Rock pine..... 93
Rocky soils..... 116

S

Salix..... 153
Salix alba..... list, 37, 50, 89, 92, 95, 96, 100
Salix caprea pendula..... list, 131
Salix vitellina..... list, 37, 50, 89, 92, 95, 96, 100
Samarre..... 40
Sapin baumier..... list

PAGE
Sapin blanc ..... list
Sapin d'Amérique ..... list
Sapin rouge ..... list
Saule ..... list
Saule blanc ..... list
Saule jaune ..... list
Saule pleureur ..... list
Saule pleureur de Kilmarnock ..... list
Savannahs 32
Scarlet oak ..... list, 68, 80, 89
Seeds 107
Seed-beds 109, 110
Seed-sowing 110
Settler 12, 13
Settlers 10, 11, 15, 16, 139
Shackles 84
Shell-bark hickory ..... list, 68, 70, 88, 91, 93, 135
Shingles 86
Silver maple ..... list, 68, 88, 91, 93, 135
Silver poplar 129
Sleepers 32, 87
Slippery elm ..... list.
Slopes of mountains 19, 31
Small fruit hickory ..... list, 68, 70, 89
Soft maples 23, 29
Soils unfit for cultivation 31
Sorbus 153
Sorbier d'Amérique ..... list
Sorbus Americana ..... list, 37, 54, 89, 92, 95, 96, 100
Special soils 115
Special subjects belonging to forestry 135
Sportmen 13
Spruces 106, 136
Spruce, black ..... list
Spruce, hemlock ..... list
Spruce, Norway ..... list

PAGE
Spruce, white..... list
Squirrels..... 108
Sterile lands..... 32
Striped maple..... list, 37, 88, 91, 93, 95, 96, 99
Sugar bush..... 153
Sugar maple.... list, 23, 37, 39, 88, 91, 93, 95, 96, 128, 135, 136
Swamp chesnut-oak..... list, 68, 80, 89

T

Table showing the relative value of certain species of trees as fuel..... 135
Table showing the weight of the chief sorts of firewood.. 136
Taillis..... 9
Tamarac..... list, 23
Tap-root cutting..... 81
Telegraph posts..... 32
Thickets..... 23
Thuya..... 153
Thuya d'occident..... list
Thuya occidentalis..... list, 84, 86, 89, 92, 95, 96, 100
Ties..... 32, 87
Tilia..... 153
Tilia Americana..... list, 68, 83, 89, 92, 95, 100
Tilleul d'Amérique..... list
Tourists..... 10, 13, 17, 137
Travellers..... 137, 139, 140
Trellis..... 57, 153
Tremble..... list
Tsuga..... 153
Tsuga Canadensis..... list, 84, 87, 89, 92, 95, 96
Tulipier..... list
Tulipier de Virginie..... list
Tulip-tree..... list, 68, 77, 89, 128, 135, 153

U

Ulmus..... 153

PAGE
Ulmus Americana..... list, 37, 55, 89, 92, 95, 96, 100
Ulmus fulva..... list, 68, 83, 89, 92
Underwood..... 9

V

Value of wood as fuel, for building, etc..... 135
Vocabulary..... 149

W

Walnuts..... 43, 61, 108, 115, 136
Walnut black..... list
Wastage..... 12, 138, 139, 140, 153
Weight of the chief sorts of firewood..... 136
Wet soils..... 116
Weymouth pine..... list
Weymouth or white pine..... list, 56, 64, 89, 91, 95, 96, 100
White ash..... list, 39, 45, 89, 95, 96, 99, 128, 136
White cedar..... 86
White cedar cuttings..... 86
White elm..... list, 39, 55
White heart hickory..... list, 68, 70, 89, 91, 93, 135
White oak..... list, 68, 80, 89, 92, 93, 95, 135, 136
White or silver maple..... 68
White pine..... list, 56, 64, 89, 91, 93, 95, 96, 100, 135
White poplar..... list, 128, 129
White spruce..... list, 56, 88, 91, 92, 94, 96, 99, 128
White willow..... list, 39, 50, 89, 92, 93, 95, 96, 100
Willow..... 29, 118, 153
Willow cuttings..... 53, 112
Willow hedges..... 53
Willow, Kilmarnock weeping..... list
Willow, pruning..... 122
Willow, white..... list
Willow, yellow..... list
Wind breaks..... 61
Windguard..... 86

PAGE
Wire-gauze net..... 140, 141
Wood as fuel..... 135
Wood dealers..... 10
Wood for building purposes..... 135
Woodlands..... 10, 11
Woodman..... 15
Woodmen..... 12

Y

Yellow birch... list, 37, 42, 88, 91, 93, 95, 96, 99, 128, 135, 136
Yellow chesnut oak..... list, 68, 80
Yellow pine..... list, 84, 85, 89, 91, 93, 135
Yellow willow..... list, 37, 50, 89, 92, 93, 95, 96, 100

TABLE OF ENGRAVINGS.

A

PAGE

Abies alba—White spruce-tree 57
Abies alba—Leaves and cone of white spruce 58
Abies alba—Winged seed of white spruce 58
Abies balsamifera—Balsam fir-tree 59
Abies balsamifera—Leaves and cone of balsam fir 60
Abies balsamifera—Winged seed of balsam fir in the husk of the cone 60
Abies excelsa—Norway spruce-tree 61
Abies excelsa—Leaves and cone of Norway spruce 62
Abies excelsa—Seed of Norway spruce 62
Abies nigra—Leaves, cone and seed of black spruce 63
Acer dasycarpum—Silver maple tree 69
Acer Pennsylvanicum—Leaf of striped maple 38
Acer Pennsylvanicum—Seed of striped maple 38
Acer rubrum—Red maple-tree 38
Acer rubrum—Leaf of red maple 39
Acer rubrum—Seed of red maple 39
Acer saccharinum—Sugar maple 39
Acer saccharinum—Leaf of sugar maple 40
Acer saccharinum—Seed of sugar maple 40
Acer spicatum—Seed of mountain-maple 40
Acorn 94
Acorn of quercitron-oak 91
Acorn of scarlet-oak 94
Acorns of white oak 88
Æsculus hippocastanea - Horse chesnut-tree 130
Æsculus hippocastanea—Leaf of horse chesnut 131
Æsculus hippocastanea—Chesnut 131
A tree well and badly pruned 124

B

PAGE
Badly pruned tree 123
Beech mast 76
Betula excelsa—Yellow birch 41
Betula excelsa—Leaves, branch and catkin of yellow birch 42
Betula lenta—Black birch. Branch, leaves and seed— 43
Betula pendula laciniata—Cut-leaved weeping-birch 129
Betula pendula laciniata—seeds and catkin of weeping birch 129
Branch pruner 120

C

Carpinus Americana—Leaves and seeds of hornbeam 70
Carya alba—Leaves and nuts of shell bark hickory 72
Carya amara—Nut of bitter hickory. 71
Carya glabra—Nut of pignut 73
Carya tomentosa—Nut of the white heart hickory 73
Castanea vesca—Chesnut 73
Castanea vesca—Leaves of the chesnut and fruit 74

F

Fagus sylvatica – Beech tree 75
Fagus sylvatica – Leaf and flowers of beech 76
Formation of new bark 121
Fraxinus Americana—White ash tree 44
Fraxinus Americana—Leaf of white ash 45
Fraxinus Americana—Seed of white ash 45
Fraxinus pubescens—Red ash-tree 77
Fraxinus pubescens—Leaf of red ash 78
Fraxinus nigra—Leaf of black ash 45
Fraxinus nigra—Seed of black ash 45
Fraxinus viridis—Seed of green ash 107

G

Gymnocladus Canadensis—Coffee-tree 78

H

PAGE
How to cut off long branches..... 122

J

Juglans cinerea—Butternut tree..... 78
Juglans cinerea—Leaf and nut of butternut..... 79
Juglans nigra—Black walnut tree..... 80
Juglans nigra—Leaf and nuts of black walnut..... 81
Juniperus Virginiana—Red cedar tree..... 101
Juniperus Virginiana—Leaves and seed of red cedar..... 102

L

Larix Americana—American larch 64
Leaves and cone of red pine... 67
Liriodendron tulipifera—Tulip-tree..... 81
Liriodendron tulipifera—Seed of tulip-tree..... 81
Long-handled branch-pruner... 120

N

Negundo fraxinifolium—Ash-leaved maple..... 108
Negundo fraxinifolium—Seed of ash-leaved maple..... 109

O

Oak with tap-root cut off—a year after the operation..... 87
Ostrya Virginiana—Iron-wood tree..... 82
Ostrya Virginiana—Seed of iron-wood..... 82

P

Pinus mitis—Leaves of yellow pine..... 103
Pinus mitis—Seeds of yellow pine..... 103
Pinus strobus—Weymouth or white pine..... 65
Pinus strobus—Leaves and cone of white pine..... 66
Pinus strobus—Seed of white pine in husk of cone..... 67
Platanus Occidentalis—Leaf and capsule of button-wood 83
Platanus Occidentalis—Seed and capsule of button-wood, natural size..... 84
Pollard willows..... 125
Populus alba—Leaf of white poplar..... 131

PAGE

Populus Canadensis—Cotton-wood leaves 46
Populus Canadensis—Seed of cotton-wood, tuft of down. 47
Populus pyramidalis—Lombardy poplar tree..... 132
Populus pyramidalis—Leaves of the Lombardy poplar... 132
Populus tremuloïdes—Leaves of the aspen..... 47
Pruning large branches 121

Q

Quercus alba—White oak tree 88
Quercus alba—Leaves of white oak..... 88
Quercus castanea—Yellow chesnut oak..... 90
Quercus castanea—Leaf of yellow chesnut oak 91
Quercus coccinea—Leaf of scarlet oak 94
Quercus macrocarpa—Acorn of burr oak. 107
Quercus prinus—Leaf of swamp chesnut oak..... 94
Quercus rubra—Leaf of red oak..... 94
Quercus tinctoria—Leaf of quercitron oak..... 91

R

Robinia pseudo-acacia—Leaves and flowers of locust tree 133

S

Salix alba—White willow-tree 49
Salix alba—Leaves of the white willow..... 50
Salix vitellina—Leaves of the yellow willow..... 51
Salix caprea pendula—Kilmarnock weeping-willow-tree.. 134
Sorbus Americana—Mountain-ash with seeds..... 52

T

Thuya occidentalis—Arbor vitæ-tree..... 104
Tilia Americana—Lime, bass wood..... 97
Tilia Americana—Leaves of American lime..... 98
Tilia Americana—Seed of American lime..... 98
Tsuga Canadensis—Hemlock-tree 105
Tsuga Canadensis—Leaves and cone of hemlock..... 106
Tree planted *en butte*..... 117

U

PAGE
Ulmus Americana—American elm-tree 54
Ulmus Americana—Leaves and seed of American elm.... 55
Ulmus fulva—Red elm leaves..... 99
Ulmus fulva—Seed of red elm..... 100

W

Wound healed over..... 122
Willow hedge..... 48

Y

Year old oak, with its tap-root 85
Year old oak without its tap root..... 86

Missing Page

Missing Page

PAGE

THIRD PART—Planting new forests..... 27
CHAPTER I—General considerations..... 27
CHAPTER II—The places in which to plant 30
CHAPTER III—What trees to plant..... 35
CHAPTER IV—A short description of the forest trees common to all the provinces of the Dominion..... 35
SECTION I—Deciduous trees..... 37
SECTION II—Coniferous trees 56
CHAPTER V—Summary description of the forest trees which inhabit the province of Ontario..... 67
SECTION I—Deciduous trees 68
SECTION II—Coniferous trees..... 84
CHAPTER VI—Forest trees indigenous in the province of Quebec..... 91
CHAPTER VII—Forest trees indigenous in New-Brunswick, and Nova Scotia..... 94
CHAPTER VIII—Forest trees indigenous in Prince Edward's Island..... 96
CHAPTER IX—A short description and a list of the species indigenous in Manitoba..... 97
CHAPTER X—Recapitulation of the seven last chapters..... 100
CHAPTER XI—Natural restoration of the forests..... 105
CHAPTER XII—A word about seeds 107
CHAPTER XIII—Seed-beds and nurseries..... 109
CHAPTER XIV—Propagation by cuttings..... 112
CHAPTER XV—Final planting out..... 113
CHAPTER XVI—Planting certain special soils..... 115
CHAPTER XVII—Care of trees after planting, pruning, etc..... 119
CHAPTER XVIII—Insects injurious to trees..... 123
CHAPTER XIX—Cultivation of ornamental trees..... 126
FOURTH PART—Special subjects belonging to forestry 135

PAGE

CHAPTER I—Value of wood as fuel and for building, etc..... 135
CHAPTER II—Fires in the forests 137
CHAPTER III—Arbor day. 141
CHAPTER IV—Education in forestry..... 142
CHAPTER V—Forestry Associations 143
CONCLUSION..... 146
APPENDIX..... 151
EXTRACTS from the Statutes of the Dominion of Canada.. 157
EXTRACTS from the Statutes of the Province of Quebec... 159
EXTRACTS from the Statutes of the Province of Ontario... 167
EXTRACTS from the Statutes of the Province of New-Brunswick..... 171
INDEX.
TABLE OF ENGRAVINGS.
TABLE OF CONTENTS.