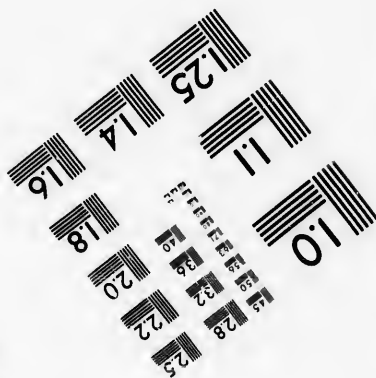
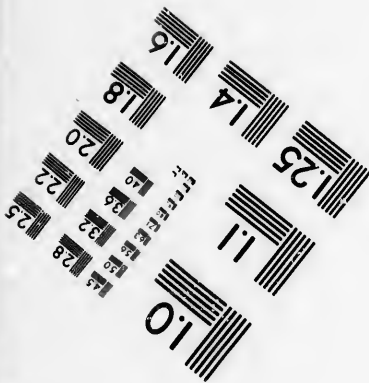
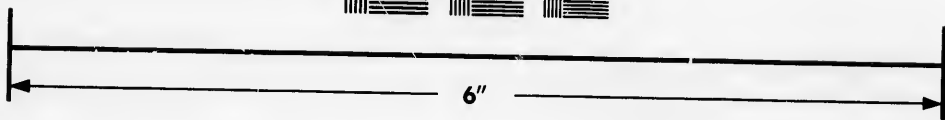
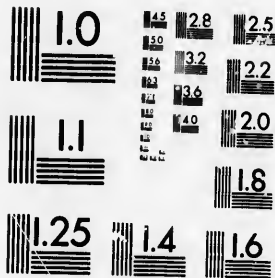


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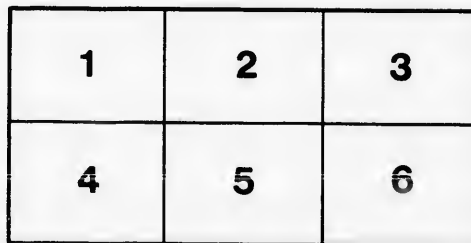
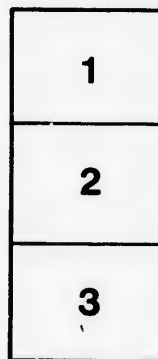
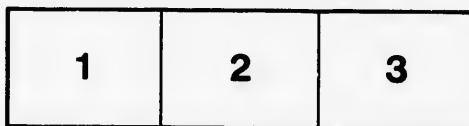
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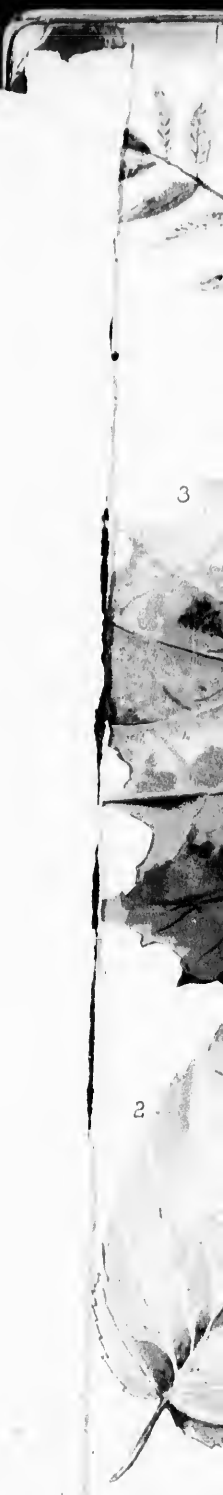
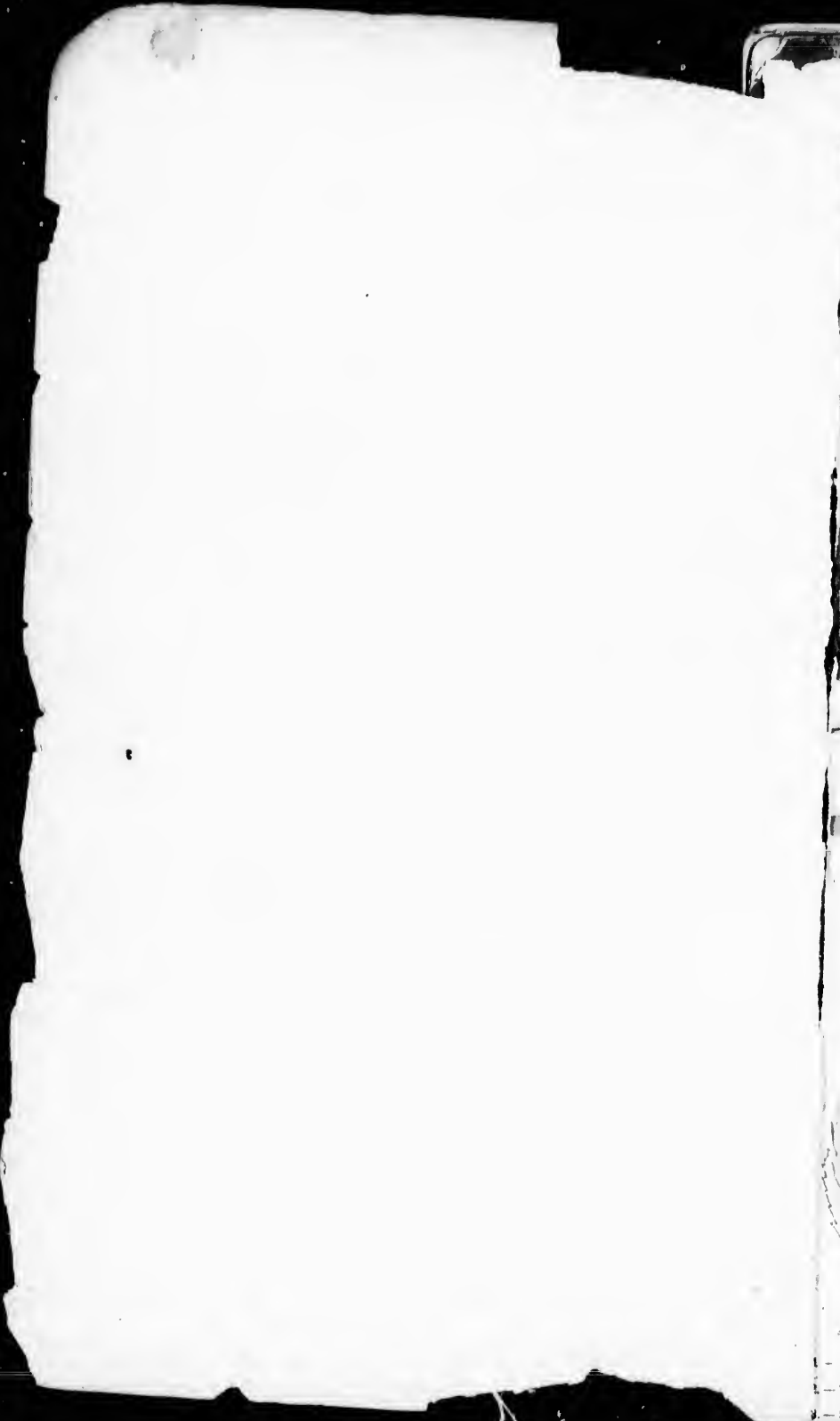
FOREST LEAVES

(BY)  
W.W. JOHNSON  
W.W. SNOWFLAKE  
MICH.

ARMISTEAD & CO. BOSTON

M. C. R. E.

M. A. N. S. S.



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1 - SILVER LEAF  
2 - YELLOW BIRCH  
3 - SYCAMORE.



1 - SILVER LEAF POPLAR  
2 - YELLOW BIRCH.  
3 - SYCAMORE.

4 - WIS. WEEPING WILLOW  
5. - BALSAM POPLAR.  
6. - AM. WHITE BIRCH.

7 - EU. WHITE BIRCH  
8. - HONEY LOCUST.

6



5



1. - LA  
2. - TU  
3. - NO





1. -- LARGE WHITE POPLAR  
2. -- TULIP TREE.  
3. -- NORWAY MAPLE

4. -- SCARLET MAPLE  
5. -- FU. BEECH.

6. -- BALM OF GILEAD  
7. -- RUSSIAN MULBERRY

F

PRO

# FOREST LEAVES.

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SECOND EDITION.

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A PRACTICAL WORK  
ON THE  
PROPAGATION AND MANAGEMENT OF TREES

FOR  
FOREST AND ORNAMENTAL PLANTING.

WITH A  
DESCRIPTIVE LIST OF VARIETIES.

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By W. W. JOHNSON,

AUTHOR AND PUBLISHER,

*SNOWFLAKE, ANTRIM CO., MICHIGAN.*

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# FOREST LEAVES.

## PROPAGATION.

The two methods most commonly employed in the propagation of the different varieties of trees used in forest and ornamental planting are, firstly, *seed*, which may properly be termed the natural method, and secondly, *cuttings of the wood*.

## SEEDS.

As a rule, the different kinds of forest trees are perpetuated from seed without perceptible variation from the parent type, while the reverse is true of nearly all of the cultivated varieties of fruit trees and plants.

In learning to grow trees from seed, it is necessary to observe their natural conditions and surroundings in any given case, the character of the seed, its period of ripening, its exposure to the action of the weather after ripening, the degree of moisture and temperature at which it starts into growth, the character of the soil it occupies, and the various conditions under which the young shoot grows and thrives after germination. For example: The beech nut ripens late in the fall, is released from its cup, which has been opened by the action of the frost, and falls to the ground, to be immediately imbedded in the damp fallen leaves, where it starts into germination the ensuing spring at a low temperature, only a few degrees above the freezing point, Nature having thus kept it perfectly fresh, without any exposure to a drying atmosphere. After germination, only those specimens which are favored with shade and moisture during the summer months are apt to survive. Then, a few years later, we find these survivors in need of more air and sunshine, and ready to start into vigorous growth at the removal of the superabundant shade. Another example: The catalpa seed, which also ripens in the fall, is contained in a long, smooth pod, which during the process of growth and ripening gradually parts with its moisture, the outside shell becoming hard and glazed, so as to exclude dampness, the whole remaining on the tree in a dry condition during the winter months, and not until the sun's hot rays have warmed the soil do the drying winds of spring burst the pods asunder and carry the light-winged seeds through the air, finally depositing them on the surface in a thoroughly dry condition, perhaps strewing a little sand, dust or other light covering over them. Two or three weeks later the young seedlings come forth in full exposure to the sunlight, and thrive and flourish without shade of any kind. Hence it will be observed that while certain general directions may be given concerning the prepara-

tion of the soil, sowing the seed, transplanting, etc., that will be applicable in most cases, it will also be necessary to note the peculiarities of each, and the treatment required to insure success. This will be done further on, in connection with the descriptive list.

In undertaking to grow a general assortment of varieties from seed, at least four different plats of ground will be needed, which we will designate respectively as the Seed Bed, the Seedling Nursery, the Nursery, and the Forest, all of which should be in a good state of cultivation, all stones, litter and rubbish of every kind removed, and the ground thoroughly and deeply plowed, reseeded and leveled down, just previous to sowing, planting, or transplanting, as the case may be. The following described tools will be needed in addition to those commonly in use on the farm :

A wooden rake, with a head about three feet wide, and teeth made broad at the base, and tapering to a point, and set six inches apart. This is for use on the seed bed as a marker, with which to open the rows, and also to cover the seed.

Two iron planting stakes eighteen inches long, with sharp point at lower end, and a horizontal bar eight inches long inserted near the top, in the form of a cross.

A planting line, to be attached to the stakes, which is stretched tightly when needed by inserting the stakes in the ground and winding up, turning them by means of the horizontal bar.

A large wooden marker, in the form of a rake, with a heavy head about six feet wide, and teeth set about fifteen inches apart. They should be nine inches long, made wide at the base, and sharpened to a point.

One Ruhlman's wheel hoe,—a tool which is indispensable in any garden. They are on sale at all the leading seed stores, and cost at retail \$5.50 each.

### THE SEED BED

is necessary for certain varieties which require careful nursing, shading, or other special treatment, or which are adapted to being grown very closely together at the start. Only a small piece of ground is needed for this purpose, and a portion of it should be covered with open lattice work, or in some other way prepared so as to partially exclude the sun's rays, and also admit the rain; to be devoted to those varieties which require shade the first season from seed, and also those small seedlings which need shade the first season from transplanting.

After the bed has been made smooth and level, take the small marker above described and open the rows by drawing it across the bed. Sow the seed thickly in the rows; then, by placing the marker so that the teeth will pass half way between the rows, and drawing it across the bed, the seed will be nicely covered. Regulate the depth to which the seeds are covered, by drawing the rake lightly or heavily as needed. Tree seeds, as a rule, should be covered very lightly—just sufficient to hide them from view. This will apply to all small seeds, and most large ones. If the ground seems to be too dry at the surface, better take pains to keep it moist with the sprinkler, than

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to bury the seeds so deep that they can never reach the light. The distance to which a shoot can push upward through the soil before its vitality is exhausted, varies usually according to the size of the seeds, but in all cases it is very limited, excepting the walnuts, oaks, and a few other kinds which grow strong tap roots. The time for sowing most varieties is late fall or early spring, either according to convenience. Those seeds which are liable to be injured by drying can be kept fresh through the winter by mixing them with sand and placing them in the cellar, or they can be boxed up and buried in the ground. Some varieties, not affected by frost, can be left on the surface of the ground, and covered with a litter of leaves or straw. All the seeds of coniferous varieties are greatly benefited by being soaked in warm water for four or five days previous to sowing, changing the water daily to prevent souring or fermentation. After having been soaked, as above recommended, to facilitate sowing, they may be rubbed in dry sand to remove the surface moisture, and the sand sifted out with a fine sieve. The seed bed should be gone over several times during the summer, and all weeds and grass carefully removed. In doing this, frequent use of the knife should be made, to remove weeds that cannot be pulled up without disturbing the roots of the young seedlings. Many varieties of tree seeds do not germinate until the second season from sowing. In such cases, small stakes should be stuck at intervals along the rows, so that their location may be known at time of weeding, and care taken not to displace the dormant seed. All varieties planted in the seed bed which do not attain a growth of, say five inches the first season, should be allowed to remain there until after the next season's growth. This will include about all of the evergreen varieties, and some of the others. Those which exceed five inches should be transplanted into the seedling nursery after the first year's growth, and all the others after two years' growth.

### THE SEEDLING NURSERY.

In this should be sown or planted the seed of those varieties which make a rapid growth at the start, and which do not require shading the first season; also all the evergreens and other small seedlings, on their removal from the seed bed, should be transplanted here. Thus the seedling nursery will consist of two separate departments,—one for sowing or planting seed, the other for transplanting young seedlings.

For the seed open the rows fifteen inches apart by drawing the large marker across the ground. Sow as closely as the size of the seed will permit. Cover with a garden rake or hoe, or by using the wheel hoe with the blades reversed, they can be covered as fast as a man can walk.

For transplanting open the trenches fifteen inches apart, using the stakes and line. Set the stakes with line attached one at each end of the row. Draw the line tightly by winding on one of the stakes. Open the trench with a spade to whatever depth may be necessary to admit the roots, cutting it perpendicularly on the side next to the line. Place the seedlings in the trench as closely as the roots will permit. Secure them in an upright position close to the line by packing the soil firmly against the roots, then fill up the trench and tramp each side of the row firmly with the feet. Proceed

in like manner with each row, being careful while putting in the seedlings to keep them from actual contact with the line, or the result will be a crooked row. Crowding the line is a very common fault with beginners. In handling seedlings that have been grown in the seed-bed or purchased from a distance great care should be taken to prevent the roots from drying. Keep them constantly covered with soil or wrapped in moistened sacks. A few minutes' exposure of the roots of evergreens to the dry air is sure death and is very damaging to most deciduous varieties.

The seedling nursery should have good clean cultivation, and for this purpose Ruhlman's wheel hoe is recommended as being a very economical and effective tool.

All the seedlings in the seedling nursery should be removed after one season's growth. A few of the most rapid growing varieties should then be set in the forest, while all the evergreens and most of the others should be transplanted into

### THE NURSERY.

In the nursery the rows should be three feet apart and the trees six and twelve inches apart in the row. The former being the distance for deciduous varieties and the latter for evergreens. Plant with stake and line, exercise the same care in handling and give the same cultivation as recommended above. The evergreens should be removed from the nursery to their permanent place in the forest or elsewhere when they have attained a height of from two to three feet, the smaller size being preferable; and the deciduous varieties when from four to five feet high.

### THE FOREST.

It is a matter of common observation that whenever any tree grows in an isolated position in the open field it will form a very short trunk and a large, spreading top, and that while trees grown for their fruit yield the best returns when of this character, quite the reverse is true when the object is the production of timber. By observation of natural forests, and from the experience of planters in Europe and elsewhere, we learn that the best timber results are produced by planting the trees closely enough at the start so that after a year or two of cultivation a constant shading of the surface will be maintained during the growing season, and at the same time each individual tree will have room enough to make a healthy growth, thinning out by removing alternate trees from time to time as more space is required. Hence the following directions are given, *viz.*: Set the rows four feet apart and the trees two feet apart in the rows. Cultivate the ground for two years. At the close of the third season remove every alternate tree in the rows. At six years from planting remove every alternate row. At nine years from planting remove every alternate tree in the rows then standing. At twelve years from planting remove every alternate row. At fifteen years from planting remove every alternate tree in the rows then standing.

On this plan the stand would be as follows, *viz.*:



1st to 4th year	2 by 4 feet	5445 trees per acre
4th to 7th year	4 by 4 feet	2722 trees per acre
7th to 10th year	4 by 8 feet	1361 trees per acre
10th to 13th year	8 by 8 feet	680 trees per acre
13th to 16th year	8 by 16 feet	340 trees per acre
16th year and thereafter	16 by 16 feet	170 trees per acre

It will be seen from the foregoing that after three years the forest plantation commences to be a source of revenue in the way of poles and fuel from the necessary thinnings, and that this supply is constantly increasing with each year's growth.

### THE UNITED STATES LAW

for the encouragement of timber planting, as amended in 1878, is given in full at the close of this volume. Below is a partial abstract of the same which will serve as a guide to planters operating under this law.

In case of a one hundred and sixty acre claim:

**FIRST YEAR.** Break or plow five acres.

**SECOND YEAR.** Break or plow another five acres, and cultivate to crop or otherwise the five acres broken the first year.

**THIRD YEAR.** Cultivate to crop or otherwise the five acres broken the second year, and plant in timber, seeds, or cuttings the five acres broken the first year, with not less than twenty-seven hundred trees to each acre.

**FOURTH YEAR.** Plant in timber, seeds, or cuttings the five acres broken the second year, with not less than twenty-seven hundred trees to each acre. Cultivate and protect for eight years (counting from first year above mentioned), and have growing on each acre at time of making proof, not less than six hundred and seventy-five living and thrifty trees.

If the entry be for less than one hundred and sixty acres, one-sixteenth of the number of acres entered must be planted in the same manner and in the same proportions as stated above. In regard to the kind of trees which may be planted, any variety will do which is recognized in the neighborhood as being of value for timber or commercial purposes, or for firewood and domestic use. This is in accordance with a decision given February 10th, 1882. Previous to this time a list had been specified by the department which omitted several varieties of recognized value, thus causing considerable dissatisfaction among planters.

As already indicated, the principal supply of trees for the forest plantation should consist of transplanted stock from the nursery, or seedlings from the seedling nursery, but there are some varieties of such rapid and vigorous growth and so easy to manage that they do not need the care of the nursery, and the seed may be planted directly in the forest; these will be mentioned in the descriptive list. The poplar and willow cuttings will also do very well, if planted at once in the forest or other permanent location. The principal objection to planting seeds and small seedlings of many of the

slower growing varieties at once in the forest is, that they require careful cultivation until they have attained sufficient growth to shade the ground and take care of themselves, and this can be more cheaply and effectively done in the nurseries than in the forest, as a great deal less ground is occupied. For instance: the space required in the seedling nursery for twenty thousand seedlings the first year from seed would contain about three hundred as planted in the nursery and only fifty as planted in the forest.

Various plans have been adopted to facilitate the work of making forest plantations, but probably the most economical and expeditious way is to open the trenches with a plow, going twice in the same furrow where the length of roots requires it, setting the trees in the middle of the trench thus made. It requires one man to distribute the trees and hold them in an upright position, while another packs the soil closely around the roots; then after a quantity have been placed in position in this way, the trenches can be leveled up with spades and tramped firmly with the feet. The depth to which trees should be set varies somewhat with the soil and climate. Where the soil is good and the climate favorable they should be set no deeper than they stood before removal; but in light soils with a climate subject to extremes of heat and drouth it is advisable to set them about two inches deeper.

### SEEDLINGS.

It will be evident, by this time, to the reader who has carefully studied the foregoing general instructions for growing trees from seed, and who will also note further the particulars concerning the management of seeds of the several varieties in the descriptive list, that a great deal of patient, persevering study and work are necessary to insure success. Whoever undertakes it will also learn that, with all the theoretical knowledge that can be had upon the subject, there is still much to be learned from actual experience. Those who are not familiar with the process of growing from seed, and who attempt to produce a general assortment of trees in this way, thinking it cheaper than to buy young seedlings, will probably be disappointed at the result. Hence, from a business standpoint, that is, with a view to getting the best returns for the money invested, it is recommended that planters who have not had the necessary experience should buy young seedlings, or transplanted stock from seedling nurseries.

These may be procured at any time after the wood ripens in the fall, and before growth commences in the spring. The nurserymen who make a specialty of growing and shipping these seedlings are men who understand how to do it, and planters can usually depend upon them to properly dig, handle and ship.

### SHIPPING BY FREIGHT.

Seedlings are classed as perishable property, and transportation companies require that freight charges shall be prepaid, or that the shipper shall guarantee their payment at end of route. In shipping long dis-

tances, they are liable to pass through the hands of several different companies, and where the charges have not been prepaid, they are sometimes stopped and held at some place of transfer until after they start into growth, and thus become a total loss, or else are greatly damaged. On this account it is best, in ordering them sent by freight, to provide for having the charges prepaid.

### BY EXPRESS.

The express companies do not require prepayment of charges, and on small bills the rates are often less than by freight. On bills of fifty pounds weight or more, the charges would be more than by ordinary freight, but as there is seldom any delay on the route, it is better to pay the extra expense and have them sent through by express.

### BY MAIL.

All small seedlings can be sent safely to any part of the country in the mail, and this is the cheapest way to send small quantities. It is often the case, where the distance is great, that the expense on large bills is less than by express. When sent in this way, the roots are carefully packed in damp moss, and then wrapped in oiled paper to secure them from drying out. The limit of weight allowed by law to a single package is four pounds, but any number of packages may be sent to the same address. The present rate of postage is sixteen cents per pound, and packages can be sent by registered mail on payment of a registry fee of ten cents additional on each package.

*A table showing average weight of seedlings per 1,000, as packed ready for shipping:*

Size.	By Express or Freight.	By Mail.
Under 4 inches,	5 pounds,	2 pounds.
4 to 6 "	8 "	3 "
6 to 9 "	10 "	5 "
9 to 12 "	20 "	10 "
12 to 18 "	30 "	
18 to 24 "	40 "	
2 to 3 feet,	60 "	
3 to 4 "	150 "	

As soon as the seedlings arrive, they should be taken out of the package, or box, the bundles opened, and the roots buried in moist soil, in a shady place, from which they will be removed as wanted for planting, being careful not to allow the roots to become dry at any time when taking them from the boxes, or afterwards in transplanting. The name of the variety, and the size of the seedlings, will indicate where they should

be placed and their future treatment, which should be the same as previously stated under the head of growing trees from seed.

### CUTTINGS.

A few varieties of forest trees, notably the poplars and willows, are very easily grown from cuttings of the wood, and are commonly propagated in this way. The new wood is used for this purpose,—that is, the wood of the previous season's growth. It should be cut in November or December, before any extreme cold weather occurs, and during mild weather, when there is no frost in the wood. Keep fresh by putting it away in sand, in the cellar, and work up into cuttings during stormy weather in winter. They are made by simply cutting the wood with a sharp knife, into sections of about eight inches in length; then pack them away in sand or earth, in shallow boxes, so that the upper ends will be exposed to the air. Kept in this way until spring, the callous forms on the lower end, and they will start more quickly into growth than if cut in spring, just before setting them in the ground.

In planting them out, it is important that the lower ends should have the earth packed tightly against them, and to do this successfully it is necessary, if planting them in the nursery, to open a trench by stake and line, as recommended for seedlings; or, if in the forest, to throw out a spadeful of earth at each place where the cuttings are to be inserted. They should be set deep enough so as to cover up to the terminal bud.

### DESCRIPTION OF VARIETIES.

This list is not intended to include all varieties native to America, nor all those of foreign introduction, but simply such of the more commonly known sorts as are being planted for timber and ornamental purposes, and such others as are believed to be of especial value for the aforesaid uses. They are all hardy, unless otherwise noted.

## DECIDUOUS VARIETIES.

## THE MAPLES.

The maples as a class are justly celebrated for their luxuriant shade, their beauty and brilliancy of foliage in autumn, and timber of great value for fuel and manufacturing purposes. They are all very easy to transplant, and adapted to a great variety of soils and climate. As they start very early into leaf the transplanting should be attended to in the fall or early in the spring. They will live if moved after the leaves start, but will not make as good a growth the first season as they otherwise would.

ASH-LEAVED MAPLE, BOX ELDER. *Acer negundo*, *Negundo aceroides*.—A native of the Middle and Western States, reaching North to Minnesota and the British possessions. It is a medium sized tree of extremely rapid growth, usually about thirty feet high at maturity, though in some localities it attains a height of sixty or seventy feet. It is common along river bottoms and other moist locations, but succeeds well in cultivation in dry soils, rooting deep and enduring severe drouths. Its wood is close and fine-grained, and is useful in cabinet work. It makes excellent fuel. Its sap is sweet and is utilized in some sections for making sugar and syrup.

The seeds ripen in October, and can be kept dry until ready for sowing. Sow in fall or spring: any time during the spring will do, but early sowing is best. Sow in the seedling nursery and transplant into the forest, or sow in the forest.

NORWAY MAPLE. *Acer platanoides*.—A variety of foreign introduction. It is a stout, healthy, vigorous grower and attains a large size in the forest. Its wood is hard, excellent for fuel and lumber. The seeds sold in this country are obtained from Europe, and by careful handling can be furnished here in early spring in good germinating condition. They should be partially dried, just enough to prevent moulding, then kept in that condition without exposure to heat, moisture or dry air. They should be sown early in spring while the weather is cool and moist. Sow in seedling nursery, transplant into nursery, and from thence into the forest.

SYCAMORE MAPLE, PLANE TREE. *Acer pseudo-platanus*.—Introduced from Europe. In growth it resembles our sugar maple, and seems to be equally at home here, showing no signs of disease nor lack of hardiness. The seeds are handled the same as Norway maple, and the directions for sowing and transplanting are the same.

SUGAR MAPLE, HARD MAPLE. *Acer saccharinum*.—This is one of our most highly prized native trees. It is common in the forests of the

Atlantic coast from New Foundland to the Carolinas, and in the interior as far west as the Mississippi river, and northward to Manitoba, attaining its greatest size and perfection in the region of the great lakes. In the forests of the Grand Traverse region in Michigan specimens can be seen which measure twenty feet in circumference and over one hundred feet high, having trunks extending upward a distance of seventy feet without a limb. The congenial soil and favorable climatic influences of this region seem to have accomplished a wonderful improvement in this variety by natural selection; so much so that seedlings of these giant trees sent out from here are noticeably more vigorous and rapid in growth than ordinary sugar maple seedlings, and are in many cases believed by nurserymen and planters to be of some new variety.

The wood of the sugar maple is hard and compact, and is noted for its beauty and durability when used for furniture and ornamental finishing work. The lumber is extensively used in building and manufacturing, and always commands a high price in the market. It is the great sugar tree of America, and its yearly product of sugar and syrup amounts to over ten million dollars in value. The following, in reference to it, is taken from Wood's Class Book of Botany:

"The branches become numerous and finely ramified in open situations, and in summer are clothed with a foliage of uncommon luxuriance and beauty, on which account it is more extensively cultivated as a shade tree than any other, not even excepting the majestic and favorite elm. Maple sugar, perhaps the most delicious of all sweets, is mostly the product of this species. An ordinary tree will yield from five to ten pounds in a season. The wood is very strong and compact, and makes the best of fuel. It is sometimes curled like the red maple, but oftener presents that beautiful arrangement of fiber called bird's-eye maple, which is so highly esteemed in cabinet work. The flowers are exceedingly abundant, and, suspended on long, thread-like pedicels, are most delicately beautiful."

The seeds ripen in September, and can be kept fresh by simply spreading them in a thin layer on the surface of the ground until ready for sowing, if sown in the fall. If to be kept until spring, they should be taken up before cold weather sets in, and dried a little to remove the outside moisture, then put away in a cool cellar, in boxes or barrels. If they commence sprouting before the ground can be got ready in the spring, they should be spread out and dried a little. Sow as early in the spring as possible. Sow in the seedling nursery, transplant into the nursery, and from thence into the forest.

SILVER-LEAF MAPLE, SOFT MAPLE, WHITE MAPLE. *Acer dasycarpum*.—One of the most beautiful of maples. It has been quite a favorite for prairie planting in some parts of the west, owing to its rapid growth at the start, and the ease with which the seeds can be secured. Its wood is quite soft and light, and the branches are often broken down by the action of wind and storm. The seed ripens in May, and cannot be kept over until fall and retain its vitality; hence, it should be sown as soon as pos-

sible after it is taken from the tree; cover one inch deep. Sow in seedling nursery, and transplant to nursery or forest.

RED MAPLE, SCARLET MAPLE, SOFT MAPLE, WATER MAPLE. *Acer rubrum*.—This tree is common in the forests of the east, from Canada to Florida, and extends westward to Nebraska. It is a beautiful tree for street planting, and its lumber is highly prized for cabinet work and other manufacturing purposes. Its scarlet blossoms in the early spring have a rare beauty, and its gorgeous autumn colors are unsurpassed by any other variety. In fact, nature produces nothing else at that season of the year that will compare with it for magnificence of color and showy array. The seeds ripen in May, and may be sown at once, or dried and kept over until fall or spring; but, if not sown as soon as gathered, they will come up unevenly, many of them lying dormant in the ground until the next spring. Sow in the seed bed, under shade, transplant into seedling nursery, thence to nursery, and thence to forest.

STRIPED MAPLE, WATER MAPLE. *Acer Pennsylvanicum*.—A very unique and pretty variety for ornamental purposes; a native of Michigan, Pennsylvania, and some other eastern states. It is a small tree, of very rapid growth, but never attains timber dimensions, and is useful only for ornamental purposes. It makes a fine display of flowers and seeds, commencing about the fifth year from seed. The seeds ripen in September, and keep well in a dry condition. Sow in fall or early spring, in the seed bed, under shade, transplant into nursery, and from there to the forest or other permanent location.

#### THE HORSE CHESTNUTS.

AMERICAN HORSE CHESTNUT, BUCK EYE. *Aesculus glabra*.—A native of Ohio, Indiana, Kentucky, and some of the other states east of the Mississippi river; usually found growing along the river bottoms. It is a small tree, of but little value, except for ornamental purposes. The seed is a round nut about one inch in diameter, smooth and black, with a hard shell; ripens in October. Keep fresh, and sow in the spring; cover one to two inches deep. Sow in nursery, and transplant into forest.

EUROPEAN HORSE CHESTNUT. *Aesculus hippocastanum*.—A native of Asia, but succeeds well here, and is more desirable as an ornamental tree than the American variety, as it holds its foliage better, and is a more healthy, vigorous grower. Flowers are very showy; usually white. Seeds like the buckeye, only larger, and require the same treatment.

#### AILANTHUS.

TREE OF HEAVEN. *Allanthus glandulosa*.—A native of China. It has been in cultivation in the United States as an ornamental and timber

tree for over twenty-five years, and is a variety which has some very strong points in its favor for timber planting. It is reasonably hardy, but might not be able to endure the extreme cold of Minnesota and other states on our northern border. It will produce more weight of timber in a year than any other variety, making a stout, heavy growth of about four feet the first year from seed, and at two years old it is often ten feet high and two inches in diameter. The small seedlings offered by nurserymen are got by sowing very closely, thus keeping them small the first season. It attains large dimensions in the forest, and the wood is hard, compact and durable, making excellent fuel and lumber. It is liable to throw up suckers from the roots, but this does not render it particularly objectionable in timber plantations. The foliage has a rich tropical appearance, the main leaf stalks being about three feet long. The seeds ripen in the fall, and will retain their vitality for several years in a dry condition. Keep the seeds dry, and sow at corn-planting time; cover one-half inch. They come up quickly, and are as easy to grow from seed as corn or beans. Sow in seedling nursery, and transplant into forest, or sow in forest. Transplant any time during spring; even with careless handling they are almost sure to live.

#### EUROPEAN ALDER.

*Alnus glutinosa*.—A native of the continent of Europe, and for several centuries past it has been in cultivation in England, where it has attained a high state of perfection and is held in great esteem by land owners. Specimens are there growing which are eighty feet high and over three feet in diameter. Since its introduction into the United States it has grown rapidly in favor, on account of its rapidity of growth, its general thriftiness, and the beauty of its form and foliage. Its wood is soft and is valuable for cabinet and furniture work, and for stave timber. The charcoal is used in making gunpowder, and the bark for tanning. The seeds ripen in September, and can be kept dry for several years. Sow in fall or spring. Sow in the seed bed, under shade, transplant into the nursery, and from there into the forest. Very easy to transplant.

#### PAWPAW.

*Asimina triloba*.—A small tree, common from Pennsylvania south to Florida, west to the Mississippi river, and northward to Michigan. It is too small to be of any value for timber but makes a fine ornamental tree, and is also cultivated for its fruit, which resembles the Banana in form and color, and, when fully ripe, is very delicious. They ripen in October, and the seeds should be sown then, or kept fresh and sown in the spring. They come up slowly, along during the summer, making three or four inches growth the first season and about six inches the next, after which they grow quite rapidly. Sow in the seed bed, transplant into the seedling nursery, from there to the nursery, and thence to the forest or other permanent location.



## BERBERRY.

BARBERRY. *Berberis Canadensis*.—A native shrub of great value for defensive hedges and also for its fruit. Its points of excellence as a hedge plant are as follows: It is perfectly hardy, thrifty and free from disease, enduring our severest winters without injury. It is a shrub, and does not have to be cut back every year or two to prevent it from growing into a tree. Its thorns are abundant and sharp. It stools out at the crown, forming an impenetrable wall, but never suckers from the roots.

Its appearance is ornamental, the blossoms being quite showy in summer, and its luxuriant display of fruit during the fall and winter forms an attractive feature of the landscape, and is of recognized value in the markets. The seeds are ripe in October, and can be sown then or kept fresh in the berry until spring. In either case it is best to remove them from the berry before sowing. Sow in the seed bed, under shade. Transplant into seedling nursery and from there into the hedge row, setting them about one foot apart. Cultivate a strip a few feet each side of the row, for two or three years, until they become thoroughly established, and after that they will require no further attention.

## THE BIRCHES.

These are all noted for their graceful form and foliage. The seeds ripen in September, are very small, are dry when ripe, and will keep in that condition a year or more without losing their vitality. They are difficult to grow from seed unless great care is used and the following directions strictly adhered to: Sow in the seed bed under shade in the spring, cover very lightly, sprinkling just enough fine earth over them to hide them from view. Water the ground where they are sown with a fine sprinkler to keep it moist until the young plants begin to show, and occasionally after this if the ground becomes very dry. The growth is feeble the first year but very rapid after that, being often as much as three or four feet the second year. Transplant from seed bed to nursery, and from there to the forest. Easy to transplant.

EUROPEAN WHITE BIRCH. *Betula alba*.—A native of Europe. Noted for its beautiful appearance as an ornamental tree. The bark is smooth and of a snowy whiteness, and the branches and foliage are very graceful and pretty. Its wood is quite hard and is used for pegs and lasts and a variety of other purposes, but is not durable when exposed to the weather.

AMERICAN WHITE BIRCH. *Betula papyracea*.—This tree, on account of its rare grace and loveliness, has very justly been named "The Lady of the Woods." Wherever seen, either in its native state or under cultivation, it is an object of general admiration. The bark is smooth and snowy white, and is much used for making canoes and also for baskets and various ornamental work. The wood is hard, and of much value for manufacturing purposes,

but decays quickly when exposed to the action of the weather. It is common in the forests of the New England states and Canada, and in the region of the great lakes, extending northward to Hudson's Bay.

**YELLOW BIRCH.** *Betula lutea*.—A native of northeastern and northern United States and Canada. It attains a large size in the forest; some of the largest specimens being three feet in diameter. Its wood is hard, and of a beautiful reddish cast, being more highly esteemed for cabinet work than cherry. It is called yellow birch from the beautiful yellowish color of the bark, which is also very smooth and ornamental. Its rapid growth, and the great value of its wood for fuel and manufacturing purposes, together with its extreme hardiness, should make it a general favorite with forest planters.

#### EUROPEAN HORNBEAM.

*Carpinus betulus*.—A native of Europe, where it is much used for screens and hedges. It is a small tree of slow growth. As a hedge plant it bears pruning well, and makes a very compact hedge. The roots run deep and do not sucker or sprout. It is hardy and healthy, being a success in nearly all soils and locations. Seeds ripen in the fall, and do not come up until the second year from sowing. Sow either in fall or spring. They can be kept through the winter in a dry condition. Sow in the seed bed under shade, transplant into seedling nursery, and from there to the hedge row or other permanent location.

#### SHELL BARK HICKORY.

*Carya alba*.—A native of the northern states, extending westward to Nebraska, and south to Tennessee. It attains a size of two feet in diameter and about one hundred feet high. Its wood is noted for its hardness, strength and elasticity, and is very extensively employed in the manufacture of wagons, carriages, etc., and also for ax helms and ox bows. It is better than hard maple for fuel, and always commands the highest market price. The seed is a nut from three-fourths of an inch to an inch in diameter, and has a hard shell. It ripens in October, and should be planted in the fall or packed away in sand and wintered in the cellar. If so treated, they will germinate the first season. They will keep dry and retain their vitality several years, but when so kept they lie dormant in the ground from one to three years before commencing to grow. Cover one inch. The growth for the first two or three years is slow, not more than three or four inches a year, but after that they increase more rapidly in size and vigor, sending down a strong tap-root very deep into the earth, and hence, should be transplanted to their permanent location the first or second year, for if done later they are apt to die or suffer severe injury from loss of the main root. Plant in seedling nursery, and transplant into forest, or plant at once in the forest. Transplant either in fall or spring.

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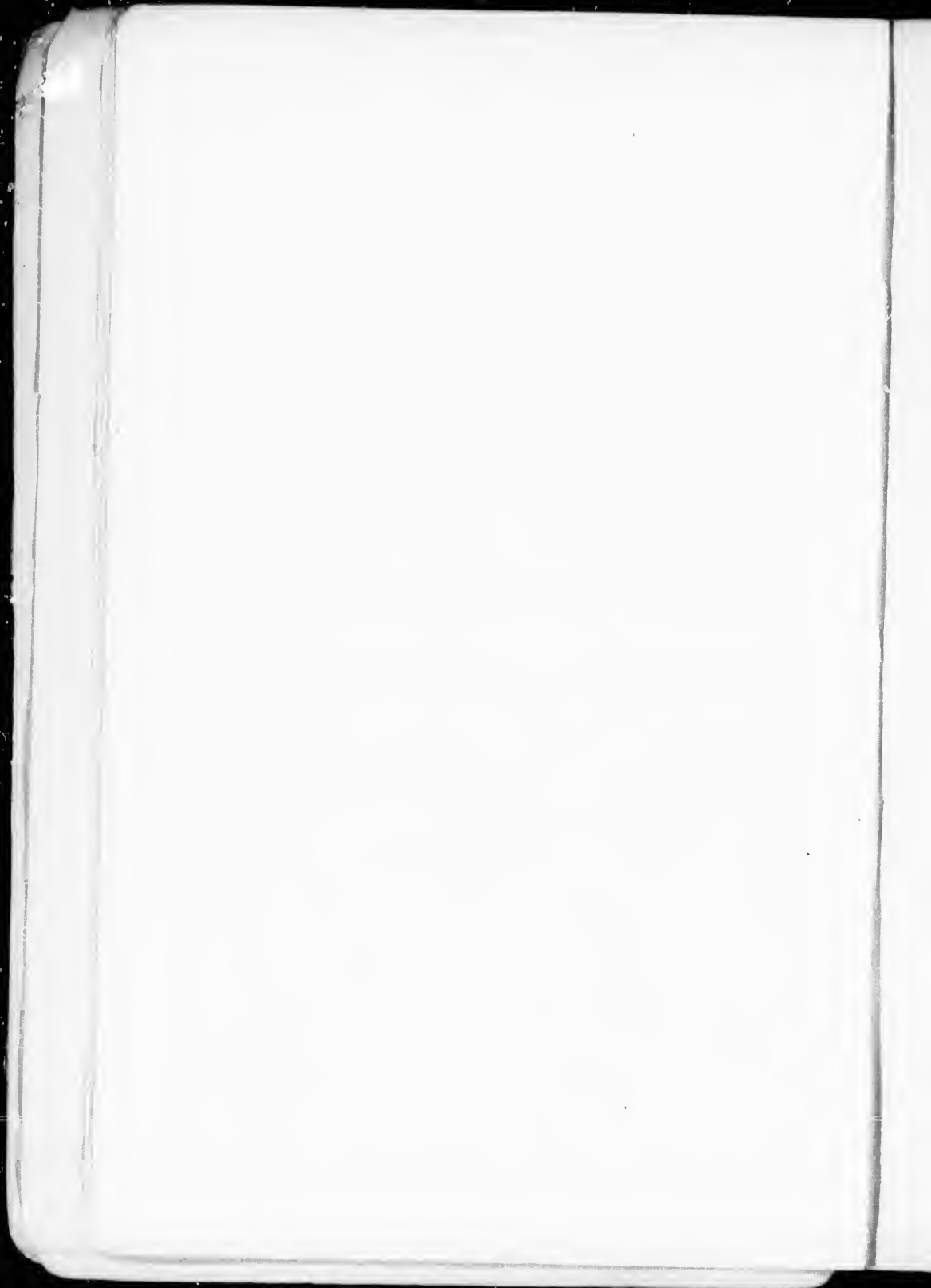
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1 - BOX ELDER  
2 - EU. ASH

3 - WITCH HAZEL  
4 - STRIPED MAPLE



## THE CATALPAS.

The four varieties described in this list are quite similar in foliage and in the appearance of the bark and wood, and also in their time of starting into growth, which is quite late in the spring and after many other trees are in full leaf. They vary materially in size at maturity, also in time of blossoming, color of blossoms, length of seed pods, and especially in point of hardness. The seeds also vary much in size, but have the same general characteristics in other respects, and require the same treatment. They ripen in October, and are securely enclosed in long pods of a glossy brown color, appearing to have been varnished. These pods remain on the trees all winter, and retain the seeds until spring in a dry condition. The seeds can be gathered at any time during the fall and winter months, and should be kept dry until they are sown. They will keep several years without losing their vitality. The proper time to sow these seeds is in the spring after the ground becomes warm, say about corn-planting time. If sown too early they will rot in the ground, or damp off soon after coming up. Cover not more than one-half inch deep. Sow in seedling nursery, transplant into nursery or forest, or sow at once in the forest.

**HARDY CATALPA.** *Catalpa speciosa*.—A native of the Mississippi Valley and its tributaries in Illinois, Indiana, Missouri, Kentucky, Arkansas, Tennessee, and further south. Its growth in the forest is upright and vigorous, and at maturity is about three feet in diameter and one hundred feet tall. The wood is quite soft and light, but exceedingly durable, and is of the greatest value for timber and manufacturing purposes, and for all uses where great durability is required when exposed to the action of the weather. It is especially valuable for fence posts, telegraph poles, bridge timbers, ties, shingles, lumber, etc. It takes a fine polish, the grain presenting a beautiful appearance when finished in oil, and there is no tendency of the lumber to warp or spring, hence it is highly esteemed for cabinet work and for inside finishing of houses, railway carriages, etc. As a variety for forest planting, it stands at the head of the list, being at the present time more extensively employed for this purpose than any other tree in existence. One of the largest plantations of this variety is being made by the Missouri River, Fort Scott and Gulf R. R. Co., near Farlington, Kansas. It was commenced in the fall of 1878, at which time 100,000 were planted, 217,000 more were planted the next season, and large quantities were also planted in the fall of 1881 and the year following. At the present time their plantation contains about one million trees of this *catalpa speciosa*, which are in a flourishing condition. Though subjected to a very severe drouth in 1881, which ruined the grain crop, they showed no signs of injury, but made a strong and vigorous growth.

It would be well here to note some of the characteristics of this tree, which account for its great popularity with tree planters.

1. It is the easiest of all trees to transplant, there being scarcely one in a thousand which fails to grow, even after being shipped across the continent and subjected to great exposure and careless handling.

2. Its freedom from disease and the attack of insects.

3. Its adaptability to all soils in which any tree will grow, being equally at home on our moist, rich bottom lands and dry sandy plains.

4. Its hardiness. The question of hardiness is frequently raised in regard to it from the fact that the *catalpa bignonioides* resembles it quite closely, and is not hardy enough to withstand the severity of our northern winters, being of about the same degree of hardiness as the peach, while the *catalpa speciosa* is a hardy tree, having repeatedly stood the test of thirty-five degrees below zero without injury. Until quite recently, it has not been generally known that there were two distinct varieties of *catalpa*, native to the United States. To illustrate the lack of knowledge which has prevailed among scientists on this *catalpa* question, the attention of the reader is asked to the following extracts from the report of the Commissioner of Agriculture of the United States for the year 1875. See pages 151 and 167.

"By an act of the last Congress an appropriation was made to enable the different departments of the Government to participate in the Centennial Exposition of 1876. In pursuance of this object, the Botanist of the Department of Agriculture undertook to make a collection to represent the trees of the United States. The aim was to represent every important tree by botanical specimens. \* \* \* Well knowing that the chief value of such a collection would depend upon its *scientific accuracy*, arrangements were made to engage competent persons in the different fields of labor. \* \*

"No. 194. *Catalpa bignonioides*. Walt.

"*Catalpa*—Southern States. A tree well known in cultivation, and hardy as far north as latitude 41 degrees. It is a native in the southern and southwestern states, and in southern Illinois and Indiana. It attains a height of 50 or 60 feet, and a diameter of  $1\frac{1}{2}$  to 2 feet. The leaves are large and the flowers showy, and when in bloom the tree is extremely ornamental. The wood is light, but of a fine texture, and capable of receiving a fine polish. It is said to be very durable."

Now the facts are that the *catalpa bignonioides* is a native of the southern states, being common in Georgia, and other locations near the southern Atlantic coast, but that not a single tree of this variety has ever been found growing native in the Mississippi valley and its tributaries north of the Gulf region, and that the native *catalpas* of southern Illinois and Indiana, referred to in the above quotation, are of the hardy *speciosa* variety.

Prof. J. C. Teas, of Carthage, Mo., an experienced horticulturist, and one who has given this matter a careful and thorough investigation, says:

"Of the two kinds of this tree which are natives of North America, the species common in cultivation is called by botanists *catalpa bignonioides*, and is well known as a native of the southeast coast of the United States, abounding in Georgia and adjoining states. It was discovered by the early explorers, pretty soon after the first European settlements, and, according to Loudon, was introduced into England in 1726, and, we presume, into culti-

vation in the colonies north of its original home, not far from the same time. Grown in eastern nurseries, and sold as an ornamental tree, it soon worked its way west. It produces seed so freely, and is so easily grown, and withal so handsome in bloom, that it is no wonder it kept pace with the ever-advancing 'westward bound' wave of civilization. It is indeed most unfortunate that this tree from Georgia and Florida should have occupied the attention of planters, and spread over America and Europe, while the infinitely superior kind, growing in the forests of the great Valley of the Mississippi, has been so strangely overlooked and neglected.

"The first published account of this new catalpa, as it was then called, appeared in the *Western Horticultural Review*, Vol. iii., No. xi., August, 1853. It was afterwards named 'Speciosa,' by Dr. Warder and myself, and that name was first published in my nursery catalogue at Raysville, Ind., about the year 1856. We were not then certain whether it was a separate species or merely a strongly marked variety of catalpa bignonioides. We are glad to learn that it has recently been ranked as a distinct botanical species, and described under the name 'Speciosa' by Dr. Englemann. It has also been called 'Hardy' by Suel Foster, and others in Iowa. It has proved quite hardy in the severe winters of northern Illinois, Iowa and Nebraska, and has grown and bloomed even in Minnesota, while the common or Georgia kind has been killed down in cold winters, even south of the latitude of Indianapolis (40 degrees).

"This superior hardiness is a matter of immense importance, especially to the great northwest, where the winters are very cold, and the natural supply of timber is meagre and altogether inadequate. The fine upright and very rapid growth of the speciosa, seems as if determined to make tall straight trees, while the common or Georgia kind usually grows low and sprawling, with short and often crooked trunks. So that even where the winters are mild, and hardiness no object, the superior habit of growth of the speciosa is a matter of the utmost importance in its favor.

"I found the catalpa speciosa more or less abundant, wild, in the forests along the lower Wabash river and its various tributaries in Indiana and Illinois, the lower Ohio, the Mississippi in Kentucky, Tennessee, Missouri and Arkansas, and west of the Mississippi along the Black, St. Francis and Little rivers, and in smaller numbers along the Arkansas and Red rivers. From a careful examination and study of the catalpa in the territory gone over, it seems clear that all the native trees in these forests are of the early blooming hardy 'speciosa' catalpa. This is its native home. And not a single wild tree of 'common catalpa' was seen or heard of, though I found plenty that had been planted or grown from scattered seed of planted trees. It affords me not a little satisfaction to know that since my investigations were made, a considerable portion of the same ground has been gone over by my friends, Dr. John A. Warder of Ohio and Robert Douglas of Illinois, both eminent tree men, the one President of our American Forestry Association, and the other an extensive nurseryman, of life-long experience, both looking up the same subject, and each separately arriving at the same conclusions."

The seeds of the catalpa speciosa are a little larger and noticeably wider than the catalpa bignonioides, and there is a marked difference in the

time of blossoming, the *speciosa* being about two weeks earlier than the other.

5. Its remarkable durability in exposed situations. General Harrison, in an address at an agricultural fair near Cincinnati over fifty years ago, told of a catalpa foot-log over a small stream in the Wabash country which had been in use for one hundred years and was still sound, showing no signs of decay. There are many well authenticated reports of catalpa fence posts which have been set fifty years or more and still show no signs of decay. It is generally believed by those who have had a life-long experience with it that it will outlast any other timber in use, not even excepting red cedar.

Prof. Teas gives the following account of the old dead catalpas near New Madrid, which is in confirmation of their great durability:

"Such marvellous statements have been made in regard to these old trees that I determined to visit them and see for myself. I found a vast tract of country known as 'The Sunken Lands,' varying in width from eight to twenty miles and extending a long distance north and south nearly parallel with the Mississippi river, and a few miles west of it, in southeast Missouri and northeast Arkansas. The area of this great swamp and lake is put down in Lippincott's Gazetteer at 3,000 square miles, nearly 20,000,000 acres. It was originally part of an immense forest on nearly level rich bottom land, probably subject to overflow in time of very high water in the Mississippi, and covered with a heavy growth of oaks, cypress, sweet and black gum, catalpa, hickory, ash, elm, cottonwood, sycamore, sassafras, honey locust, maple, pecan, etc., etc., with innumerable undergrowth and clambering vines. It had never been molested by the hand of civilized man, when the terrible convulsions of the winter of 1811 and 1812 shook the very foundations of the earth, and sunk this great tract a few feet below the level of the surrounding forests, enough to cause it to become overflowed from ten feet deep in places to mere swampiness at the edges. The trees on this overflowed land were all killed by the water on their roots or other causes not understood. The other trees decayed in course of time, as is their nature, and there is now nothing to show that they ever existed, except a few stumps and logs preserved by having been under the water. The catalpas in like manner died, but did not decay, for that is not their nature, and they stand there yet, firm and erect as on the great earthquake day, though dead for two-thirds of a century. In that sixty-seven years there have been many severe storms, and as all the other trees are long since gone and the old catalpas left standing alone and unprotected, it is not strange that their tops should have been blown off, leaving only the trunks or stumps. The tallest one of the old trunks I saw, measured eighty feet high to where its top was broken off. They are of every length from that down to three feet or less above the water. In diameter they are mostly one to two feet, though some are considerably larger, and some mere poles of six or eight inches. Many of the best of these old trees have been cut and used for posts, etc., and the hunters and fishermen use them for fuel. There are thousands and thousands of them still standing alone in that dreary waste, bleached and battered by the storms, their tops worn to a ragged feather-edge, pecked in



holes by the birds, and every crack, windshake and knot-hole enlarged by the unsparing hand of time. Many of them are hollow in the upper part, where squirrels and birds build their nests and rear their young with little fear of molestation. Often as we glided among them in the trapper's canoe, we could see clear through where the cracks and holes were on opposite sides. But the wood that is left is as sound as ever, though that towards the tops may be not quite so tough, yet would work well into anything it is large enough to make, and I believe bear as fine a polish as new wood. The lower part is very tough and strong, apparently just as good as ever, and is much used for posts. It seems remarkable that the old catalpas killed on dry land, have long since fallen and lie sound on or in the ground (many of them half buried in the mud), while those around which the water came, are still standing, silent yet eloquent witnesses of the wonderful endurance of the catalpa wood."

6. Its rapidity of growth. Under ordinary circumstances its annual growth is nearly an inch in diameter and two to three feet in height. Some of these trees planted in Illinois forty years ago have averaged an inch in diameter a year for the whole time and are still growing vigorously.

COMMON CATALPA. *Catalpa bignonioides*.—So much has already been said about this variety in comparison with the preceding that it is only necessary to add that it is a small tree, not usually attaining a sufficient size for timber, and that it seeds more abundantly than the speciosa variety.

JAPANESE CATALPA. *Catalpa Koempferi*.—This variety has yellow flowers and is very desirable as an ornamental tree. My experience with it is limited, and I am not prepared to say what its value is as a timber tree, but so far it appears to be hardy and a rapid grower. The seeds are very small but grow as readily as any of the other catalpas.

TEAS' HYBRID CATALPA. Originated by John C. Teas, of Carthage, Mo., from seed of the catalpa Koempferi, hybridized with catalpa speciosa. The following statements in reference to it are his, as given in a paper read at the joint meeting of the Missouri and Kansas State Horticultural Societies at Kansas City, Mo., December 16th, 1880:

"The characteristics of the new variety are very marked and partake largely of those of both its parents. In its vigorous upright growth, it even surpasses them both. Its foliage is large and luxuriant and often though not always lobed, something like a tulip poplar leaf—in which we plainly see the Japan influence in its parentage, while the American is unmistakably shown in the profusion of its large and handsome white flowers. The seed pods and seeds are very distinct, and are intermediate between those of the speciosa, which are the largest of all, and those of the yellow-flowering Japan species, which are the smallest. It is the most profuse bloomer of all the catalpas,

being literally loaded with flowers and remaining in bloom for several weeks—a much longer period than the others. The individual flowers are the size of those of the common, not so large as the *speciosa*, but this is more than made up by their greater abundance. They are white, with small purple dots and a touch of yellow around the throat, which last is a mark from the Japan side. The flowers are borne in clusters of extraordinary size, sometimes numbering as high as three and even four hundred buds and blooms in one great panicle. They do not all open at once, but keep up a succession of bloom for a long time. The flowers have a very pleasant and delicate fragrance, and a tree in bloom not only presents a magnificent spectacle to the eye, but also fills the air for quite a distance with its agreeable odor.

"The past spring (1880) I sent Prof. Geo. Husmann, at the Missouri State University, one thousand very small trees, culled out of the one-year-old's—many of them no larger than small straws. They were set in nursery rows late in May, and though it was a dry and unfavorable season, they made a surprising growth—many of them reaching a height of six feet or more, and from one to one and a half inches in diameter, and straight as young Lombardy poplars. I also sent a dozen larger trees of the same, which were delayed on the way, and he wrote me were as dry as sticks when received, and he thought, ruined. However, he planted them, and every one not only lived, but made a good growth. Some years ago I sent him scions of this catalpa, which he grafted upon the common, and they made a wonderful growth, some of the leaves reaching the enormous size of eighteen inches across. Small trees planted in village lots grew without cultivation in five years to be twenty-five feet high, and twenty-four inches in circumference at one foot from the ground, and I measured one shoot in the top of one of these trees which had grown eight feet in a single season. They have made double the growth of other catalpas alongside, under exactly the same conditions, though the last have made a fair growth. As a timber tree it must be of the greatest value and take a place in the very front rank, on account of the wonderful rapidity of its growth, which equals that of the most luxuriant trees of temperate climates, while its hardiness has been repeatedly demonstrated by its standing uninjured, with the thermometer at more than twenty degrees below zero.

"The well known character of the catalpa for durability, and the close resemblance between the wood of this and that of its parent, the *speciosa*, leave little room to doubt its being similar to the others in its power to resist decay. The leaves are very large and handsome—of a pleasant shade of green, and present quite a diversity of form on the same tree, many being heart-shaped, and some having lobes on one side, or both, terminating in sharp points. We have grown several thousands of these seedlings, and it seems like being a well established variety, though, of course, there are slight variations among the seedlings. While its vigor, hardiness, freedom from insects, etc., recommend this new tree so strongly for timber plantations—the same qualities, added to its stately habit, the magnificence of its bloom, its fragrance, and the beauty of its ample and diversely shaped foliage, cannot fail to make it popular as a tree for shade and ornament."

## ENGLISH HAWTHORN.

**WHITE THORN.** *Crataegus oxyacantha*.—This tree, in its native country, is highly esteemed for defensive hedges, and it is found to succeed well here in most localities where it has had a fair trial. The seeds are contained in a small apple and are enclosed in a hard shell. As usually handled, they do not germinate until the second season after sowing. The seeds are imported from Europe and do not arrive in time for fall sowing. Sow in early spring in the seedling nursery and transplant in the hedge row, or other permanent location.

## HACKBERRY.

*Celtis Occidentalis*.—A native of the United States, widely distributed, but most common in the south. It attains a large size and the wood is very hard. Its growth is slow at the start but quite rapid after the roots become well established in the soil. It is at present but little known among tree planters, but as it has been found to succeed well on the western plains, it will be apt to receive more attention in the future.

## JAPAN QUINCE.

*Cydonia Japonica*.—A thorny shrub, which is used for a defensive hedge and also for ornamental purposes. Its blossoms, of a bright crimson color, appearing in early spring, are very profuse and showy, and produce a brilliant effect on the lawn or in the hedge row. Its growth is rather slow for a hedge. Introduced from Japan.

## PERSIMMON.

*Diospyrus Virginiana*.—A native of the United States, extending from the Atlantic to Iowa and south to the Gulf of Mexico, being common in the southern states, where it attains a height of sixty or seventy feet. The wood is very hard and fine grained. It bears a plum-shaped fruit which is very astringent when green, but edible when fully ripe. The seeds ripen in the fall and may be sown then, or layered in sand, and sown in the spring. They come up the first season, making a growth of about nine inches. Sow in seedling nursery, transplant into nursery and from there to forest.

## THE BEECHES.

They delight in a cool, moist climate, and do not succeed well in a climate subject to extremes of heat, cold or drouth.

They are noted for their hard wood, smooth bark, and clean, graceful foliage.

The seed is a small three-cornered nut, with a thin shell, which opens readily as soon as the germ commences to sprout. They ripen in October,

and require to be kept fresh until time for sowing, which is late in fall or very early in the spring. Sow in the seed bed under shade. Transplant into seedling nursery and from there to the forest. This plan puts them into the forest at small size, but it is necessary, as they are difficult to transplant, unless attended to when small.

**AMERICAN BEECH.** *Fagus ferruginea*.—This tree is common in the forests of our northern frontier, where it attains its greatest development. It also occurs, more or less common, in the middle and southern states. Timber men designate different specimens as red and yellow, the red wooded trees furnishing timber of great durability, and the yellow decaying quickly in exposed situations. The wood is hard, close grained and heavy, and is of great value for fuel and manufacturing purposes. Its growth is slow for the first two or three years, but after that it gains rapidly and becomes a stout, vigorous grower. It commences bearing nuts at about ten years from seed, and in a climate not too cold for the peach, it produces abundantly every alternate season, but in very cold climates it seeds sparingly. The seedlings, as above indicated, are not very easy to transplant, but if proper care is taken to keep the roots moist in handling and give a partial shade the first year, there need be very few failures.

**EUROPEAN BEECH.** *Fagus sylvatica*.—A native of Europe, where it is extensively planted in forests, and is considered an important timber tree, and would, no doubt, prove a valuable addition to our list of trees for forest planting. It has already become very popular as an ornamental tree, and is noted for its rich foliage and luxuriant shade. The seedlings are more compact in growth than the American variety and are easier to transplant.

### THE ASH.

The different varieties of ash are all of great value for timber, the American white ash being probably the best. Many western planters, however, who are acquainted with the green ash, claim it to be equally as good, and the latter variety often goes by the name of white ash. The seeds of these two varieties bear a very close resemblance, but the green ash is more easily grown from seed, as it usually comes up the first season, while the white ash, and also the other varieties mentioned below, do not germinate freely until the second season from planting.

The ash trees of all varieties are noted for their beauty and symmetry, and are highly prized for ornamental purposes.

The seed of ash ripens in September and October, becomes dry on the tree and can be kept alive in this condition for several years, but the best results come from seed kept as fresh as possible. They can be layered on the ground and covered with litter, or layered in sand in a pit or cellar. Sow in fall or spring in the seedling nursery, and transplant into the forest.

The ash wood is strong in alkali, and would probably do well in soils impregnated with it if other conditions are favorable.

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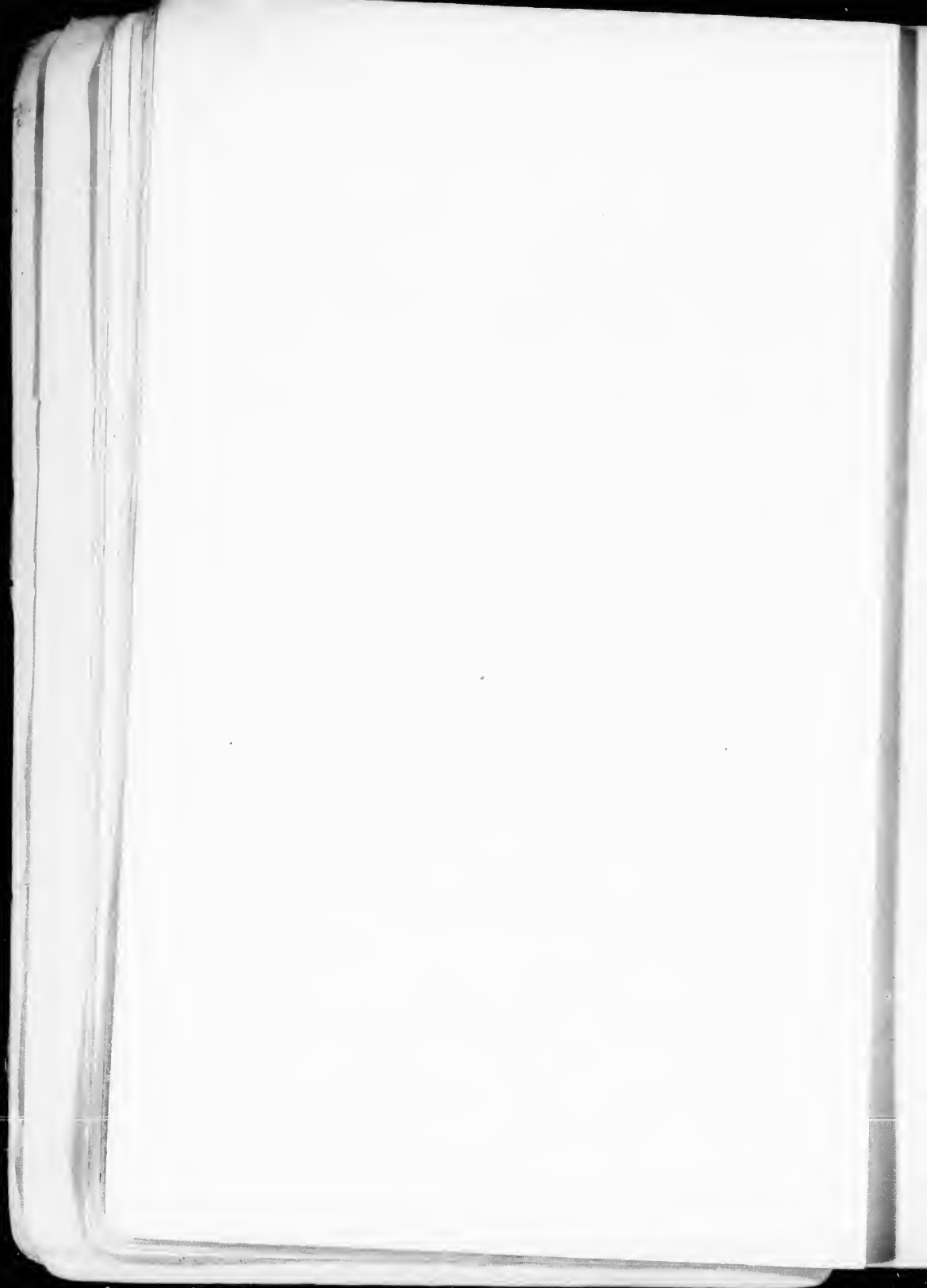
1. PRYPAW

2. BLACK LOCUST

3. RED ELM

4. SUGAR MAPLE

5. AM. HORSE CHESTNUT



**AMERICAN WHITE ASH.** *Fraxinus Americana*.—A native of the eastern United States, extending from Canada to Florida, and west to the Mississippi river. Its growth is very rapid, often making from six to nine feet in height in two years from seed. It attains a large size in the forest, sometimes exceeding three feet in diameter, with long trunk and beautiful spreading top. Its timber is of the greatest value, being much used in the manufacture of tools, implements, wagons, etc., also for floors, cabinet work, and inside finishing of houses, railway carriages, etc. It is excellent for fuel, being one of the few varieties which burn readily in the stove without seasoning. The thinnings of this variety as well as of the other ashes from the young forest, have especial value for hoop poles, handles, etc. It attains its greatest development in a cool climate, and a rich, fertile soil, and does not succeed very well in poor soils.

In a paper read at the Montreal Meeting of the American Forestry Congress, Mr. Arthur Bryant, of Princeton, Ill., says in speaking of the different varieties of ash: "Of these the white ash is undoubtedly the most important and valuable. There is, in fact, no other of our native trees which could supply its place in the manufacture of farming implements, or for all purposes where lightness, strength, and elasticity are required." He also says of the seed: "The seed of the white ash is round without margin, the wing attached to the apex; in the green ash the wing is continued as a margin nearly to the base of the seed, which is acute."

**GREEN ASH.** *Fraxinus viridis*.—The general characteristics of this variety are much like the preceding. It differs in the following points, viz.: It is a smaller tree at maturity. It grows more rapidly at the start, say for two or three years. Its seed germinates readily the first year and is slightly different in form, as shown above. It is a great favorite with western planters, and is perhaps more especially adapted to prairie planting than the other. Its home is in the west, where it is very common along the river bottoms.

**BLACK ASH.** *Fraxinus sambucifolia*.—A native of the United States, being found common in low, moist soils in the forests of our northern border and in Canada. At maturity it is about two feet in diameter, and one hundred feet tall. It grows very rapidly, requires a rich soil, but not necessarily a wet one. Its timber is used for the same purposes as white ash, and is also in demand for split stuff, for barrel hoops, and splints for baskets and chair bottoms. The seeds of black ash are long and flat, and winged all the way round, being quite distinct in appearance from the two preceding varieties.

**EUROPEAN WHITE ASH.** *Fraxinus excelsior*.—A variety of foreign introduction, resembling in the shape of the seed and general appearance of the tree our native black ash, but, unlike it, it is especially adapted to a warm climate and succeeds well in a dry location.

#### HONEY LOCUST.

*Gleditsia triacanthos*.—A native tree common in the southern states, where it attains a large size. It is also more or less common further north

and extends from the Atlantic to the Rocky mountains. It is common in cultivation in European countries, where it is highly esteemed as a timber and ornamental tree, and for hedges. Its timber is hard, close grained, and durable, and is of great value for fence posts and rails, and is very useful for manufacturing purposes. The young seedlings are sometimes injured in a cold climate, but the roots survive, and after a year or two the wood becomes hardy and able to resist the severity of our northern winters. The objection sometimes made to the black locust that it sprouts from the roots will not apply to this, as it is entirely free from any tendency in this direction. It is noted for its long, sharp thorns, and is often used as a hedge to turn stock, for which purpose it is well adapted. The seedlings vary greatly in respect to thorns; some being very thorny and others almost entirely free from them. I have seen native trees of this variety with their trunks so thickly set with three branched thorns that a squirrel could not climb them. The seed grows in large pods and is bean-shaped, being a little smaller than ordinary white beans. They ripen in October, and may be gathered any time during the fall or winter. Sow in the spring. When ready to put them in, scald them by pouring on boiling water, letting them remain in the water until it cools off. Cover one-half inch. The most of them will come up in a few days, but some will linger along and show themselves during the summer and for the next year or two after. Sow in the seedling nursery, transplant into nursery and from there to the forest, hedge row or other permanent place. They are very easy to transplant.

#### KENTUCKY COFFEE TREE.

*Gymnocladus Canadensis*.—A native of Kentucky and neighboring states, being found occasionally in New York and northward into Canada, and west as far as Nebraska. It sometimes grows to a diameter of two feet, and sixty feet tall. Its wood is heavy, and fine grained; valuable for manufacturing purposes. The seeds grow in large bean-like pods, and are nearly as large as chestnuts. They keep well when dry, but should be scalded in hot water and soaked a few hours before sowing. It grows readily from seed and transplants very easily. Sow in the spring in the seedling nursery, transplant to nursery and thence to the forest.



## THE NUT-BEARING TREES.

The beech and hickory have already been described, and under this head will be treated the black walnut, butternut and American sweet chestnut. The seed (*i. e.*, the nuts) of these varieties require similar treatment, and also to a great extent the seedlings. The seed should be kept fresh from the time they are taken from the tree in October until they are planted, which may be either in the fall or early in the spring before the sprouts commence to grow. They may be pitted in the ground or layered in sand in the cellar. It is quite commonly understood that black walnuts and butternuts must be frozen in order to make them sprout. This is incorrect: no freezing is needed, and they are better without it, and the same remark applies to chestnuts and hickory nuts. As soon as spring opens prepare the ground and plant the nuts either in the nursery or forest, covering them about an inch deep. These trees root deeply, growing a heavy tap root the first season, and they can be easily transplanted by taking pains to save most of this root. The transplanting should be attended to not later than the second year, excepting the chestnut, which being of slow growth at the start, can be safely removed a year or two later.

**BLACK WALNUT.** *Juglans nigra*.—A native of the United States, extending northward into Canada, and occurring more or less common in the Atlantic states and west beyond the Mississippi river. It reaches its greatest development in the valley of the Mississippi and its tributaries. The value of its timber is well known, and probably exceeds that of any other native tree. So great has been the demand in recent years that the supply is nearly exhausted, and fabulous prices have been paid for fine specimens for veneering and other purposes. Manufacturers will have to look for their future supplies to the new forests of this variety, which are now being planted in the west. This tree needs a rich, deep soil, and will not thrive in a poor one. It succeeds well on the rich prairie soils of the west where not subject to protracted drouths. It is also being successfully planted to some extent in the older settled portions of the country, where the original timber growth has been destroyed. As seedlings of the black walnut are quite expensive compared to most other varieties, it is advisable in planting a forest to place them sixteen feet apart, and fill up the plantation with cheaper trees, which will necessarily be removed in the process of thinning. It commences to bear nuts in about ten years from seed.

**BUTTERNUT.** *Juglans cinerea*.—A native of the eastern and middle States, extending westward to Nebraska. Its timber is of great value for manufacturing purposes. It is extremely rapid in growth and adapted to a great variety of soils. Thriving well in light soils, where the black walnut refuses to grow, it produces nuts at five years from seed, and the price real-

ized for the nuts alone will pay well for the money invested, to say nothing about the value of the timber. This tree at its best seldom exceeds two feet in diameter, and in favorable locations attains a height of sixty feet.

**AMERICAN SWEET CHESTNUT.** *Castanea vesca*.—This tree is a native of the Atlantic states, from Massachusetts to Georgia, is common in Tennessee and Kentucky, and northward to Michigan. It attains a large size in the forests, often exceeding three feet in diameter and a hundred feet tall. Its growth is slow at the start, and at three or four years old it should be cut back to the ground, when it will throw up a straight shoot three or four feet high the first season and continue to grow rapidly, increasing very much in growth and vigor. It commences bearing at about ten years of age. The chestnut is not adapted to all locations, and on this account is not a general favorite with tree planters. Numerous failures are reported on prairie soils, and it succeeds best on gravelly soils, on ridges, or on rocky hills and mountainous districts.

Planters in some parts of Iowa and other western States, have succeeded in growing chestnut groves, and report the best results from planting the nuts where the trees are to remain, giving some winter protection the first year or two. They claim that the tree is materially injured by transplanting, which is not the case here.

#### SWEET GUM.

*Liquidamber styraciflua*.—A native of the United States, extending from New York to Indiana, and south to the gulf of Mexico. It grows to a large size. The wood is compact and fine grained. Tree a rapid grower. Valuable for timber, and a beautiful variety for ornamental purposes. It prefers a deep moist soil, and is not hardy north of latitude 40° north. Seed keeps well in a dry state. Sow in spring in the seed bed, transplant in seedling nursery, then nursery and thence to forest.

#### TULIP TREE.

**WHITE WOOD, YELLOW POPLAR.** *Liriodendron tulipifera*.—A native of Ohio, Indiana, and adjoining states, and more or less common in other parts of the United States. It attains an immense size in the forest, sometimes reaching ten feet in diameter and one hundred and thirty feet tall. It is highly prized as an ornamental tree on account of its regular form, its peculiar foliage and its abundant flowers. Its lumber is of great value, and is much used for inside work in houses, and for cabinet work also in various manufactured articles.

The tree is a rapid grower, and would be more extensively planted if it were not for the fact that it is very slowly disseminated from seed. Very few of the many seeds sown grow at all, and those which do usually lie dormant a year before coming up. The seeds ripen in the fall. Sow at once,

or keep fresh and sow in the spring. Sow in the seed bed and transplant into the nursery and from there to the forest.

### OSAGE ORANGE.

*Maclura aurantiaca*.—A native of Texas, Arkansas, and Indian Territory, but found in cultivation as far north as Iowa. It is a large tree of timber dimensions in its native forests, but in cultivation it is principally grown for hedges. The wood is very heavy and hard, and is extremely durable. It grows slowly at first, but increases rapidly in size as it becomes older. The seeds ripen in the fall, and are left in the oranges until spring. When the oranges have become rotten, the seeds are separated from the pomace by washing out, and are then ready for sowing. In shipping to a distance they are liable to become somewhat dried, and should be soaked in warm water a few days before sowing. Sow in the seedling nursery and transplant into the hedge row, sorting them so that plants of equal vigor will come together in the row. For the hedge row a strip about twelve feet wide should be in a state of good cultivation, and requires to be worked for several years after the row is set. The plants should be set one foot apart in the row. The Osage orange never suckers or sprouts from the root, is very easily and cheaply grown from seed, and makes a perfect hedge. Hence its popularity. It is not quite hardy enough for our northern border.

### SOUR GUM.

TUPELO. *Nyssa multiflora*. PEPPERIDGE.—A native tree, extending from New England to Florida, and west to Michigan. It is usually a medium sized tree at maturity, but in favored localities grows to a large size. The wood is hard and very tough, the fibers being so crossed and interwoven that it is almost impossible to split it. It is used for wagon hubs, and also for box boards.

The seeds ripen in the fall, and may be kept dry until spring. Sow in spring in seed bed, transplant to nursery, and from there to forest.

### SYCAMORE.

BUTTONWOOD. *Platanus Occidentalis*.—A native tree, extending over a large portion of the United States. It is chiefly found growing along river bottoms, where it attains a magnificent size. Specimens are often found having a diameter of six feet or more. The large trees are always hollow, but the younger trees furnish a good quality of lumber for cabinet work and other manufacturing purposes. The sycamore comes easily from the seed, makes a very rapid growth, and is easy to transplant. Thrives best in a rich moist soil. The seed remains on the tree until spring; it forms a round ball about an inch and a half in diameter which contains an immense number of seeds. This falls from the tree when the new buds begin to swell and is scattered by the winds. Sow in the seed bed under shade and transplant into nursery, from thence to forest.

## BLACK CHERRY.

*Prunus serotina*.—A native common in the forests in various localities east of the Mississippi river, attaining in some favored regions a diameter of three feet, and eighty feet in height. Its lumber is of the greatest value for manufacturing purposes. Its growth is extremely rapid, and it succeeds well in a great variety of soils and climate. It is one of those varieties especially suited to the timberless regions of the west, and ought to become a leading variety in prairie planting. Like the white ash, the green poles make excellent fuel for the stove without seasoning. Its rapid growth is illustrated by a specimen tree, near Elgin, Ill., which measured sixty inches in circumference, one foot above the ground, when twenty-six years old. The cherries ripen in August, and the seeds should be washed out and layered in sand, and sown in the fall or early spring. If not kept perfectly fresh they will lie dormant a year before sprouting. Sow in the seedling nursery and transplant to forest, or sow in the forest where wanted.

## PEAR.

*Pyrus communis*.—Introduced from Europe. In some parts of the country, especially on the Pacific coast, the pear tree is used to a certain extent for forest planting. In moist clay soils it grows with great vigor, and attains a large size and a height of eighty to a hundred feet. The seed is mostly obtained from France and Germany. If it can be kept fresh and sown in the fall, or layered in sand and sown in early spring, it will grow the first season. If not, it is sure to show the next. Sow in the seedling nursery, transplant into nursery, thence to forest.

## RED OAK.

*Quercus rubrum*.—A well known native variety, common over a large portion of the United States. It is especially adapted to a cold climate. Its growth in the forest is very rapid, and at maturity is about three feet in diameter. Its timber is of great value for barrel staves, also for rails and posts. It makes excellent fuel when seasoned. The bark is of the highest quality for tanning purposes, and on this account it ought to receive more general attention from forest planters. The acorns ripen in the fall, and must be kept fresh until planted. Plant in fall or spring in the seedling nursery, and transplant into the forest.

## BLACK LOCUST.

YELLOW LOCUST. *Robinia pseudacacia*.—A native of the United States, occurring in Pennsylvania and other states south and west. It is found in cultivation in all parts of this country, and has for a long time been a favorite tree for forest planting in Europe. Its growth is extremely

rapid, and the wood is solid and noted for its great durability when exposed to the weather. In some localities it has been seriously injured by borers, and its cultivation discontinued on that account. On the whole, however, it is rapidly increasing in popularity, and is being extensively planted. It is especially adapted to light, sandy soils, but succeeds well in any good soil not too moist. The seeds grow in pods like beans. They ripen in the fall, and keep well in a dry condition. Sow in the spring, in the seedling nursery, and transplant into the forest. Very easy to grow from seed, or to transplant.

Its blossoms are very showy and fragrant, and hence it is highly prized for ornamental purposes.

#### THE MOUNTAIN ASH.

AMERICAN MOUNTAIN ASH. *Pyrus Americana*.—A native of British America and northern United States. It is noted for extreme hardiness, and its beautiful appearance as an ornamental tree. Its fruit is a red berry, growing in large clusters, and remaining on the tree during the winter. It is a small tree at maturity, not large enough to be of much value for timber. Seeds should be kept fresh, and sown in the fall or spring. Sow in the seed bed, under shade; transplant in seedling nursery, thence to nursery, and from there to forest, or other permanent location. Seeds do not germinate until second season.

EUROPEAN MOUNTAIN ASH. *Sorbus aucuparia*.—This tree much resembles our native variety, but grows to a larger size. It succeeds well here in the northern states in cultivation, and is highly ornamental. Directions for sowing, planting, etc., same as above.

#### THE BASSWOOD.

AMERICAN BASSWOOD, LYNN, LINDEN. *Tilia Americana*.—A well known native tree, common in the forests of the United States and Canada. It is a very rapid growing tree, and attains a large size in the forest. The wood is very soft, but makes excellent lumber for many uses in building and manufacturing. Seed ripens in September, and keeps well dry. Sow in fall or spring in the seed bed, under shade. Does not germinate until the second spring. Transplant respectively into seedling nursery, nursery and forest.

SMALL-LEAVED EUROPEAN BASSWOOD, LIME, LINDEN. *Tilia Europaea*.—Very closely resembles the preceding in appearance, quality of the wood, etc. Succeeds well here, and requires the same treatment.

LARGE-LEAVED EUROPEAN BASSWOOD. *Tilia Europaea grandifolia*.—A variety with leaves and seeds much larger than the preceding. Directions same as for the American variety above described. The basswoods

are all noted for their beautiful foliage and luxuriant shade, and are in great favor with bee-keepers on account of the great abundance and fine quality of the honey produced from their blossoms.

### THE ELMS.

The varieties described below vary much in size and quality of timber, but are all very rapid growing trees; easy to transplant, and adapted to a wide range of soils and climate. The first three are native varieties. They all ripen their seeds in May or June, and the seeds should be sown immediately on coming from the tree. If this is done, no tree is easier grown from seed than the elm. Where the seeds have to be shipped long distances, especially in the summer season, it is difficult to handle them so as to retain their germinating qualities. I have known cases, however, where the seed had been kept dry a year and then sown, and, after lying dormant another year in the ground, it came up thickly and did well. Sow the seeds in the seedling nursery, and transplant into the forest, or sow in the forest where wanted. If they germinate at all, they are almost sure to succeed, as they take deep root into the earth, and will fight their way upward in spite of any amount of abuse and ill-treatment.

**AMERICAN WHITE ELM.** *Ulmus Americana*.—This is the largest of our native elms, and the one which has been most commonly planted for shade and ornament. It is a tree of gigantic proportions, often attaining a diameter of six feet; with beautiful spreading top, graceful, drooping branches, and fine foliage. As a timber tree its lumber is in great demand on account of its strength and elasticity. It is used in manufacturing for a great variety of purposes.

**ROCK ELM.** *Ulmus racemosa*.—Not so large as the preceding, seldom being over two feet in diameter at maturity. It grows long and straight trunks of great strength and durability. The larger sizes are much sought after for ship-building, and the smaller ones are used for bridge timbers, piles, etc. A great deal of this lumber is used in manufacturing, in place of second growth white oak and hickory. The young trees have coarse, corky-barked twigs, which are very curious and beautiful. The seeds are a great deal larger than the other elms, and ripen about two weeks later.

**RED ELM, SLIPPERY ELM.** *Ulmus fulva*.—This variety grows to about the same size as the rock elm. Its timber is of great value for various manufacturing purposes. It is highly esteemed by prairie planters on account of its rapid growth, hardness, freedom from disease, and the value of the young trees for fuel, posts, etc. The inner bark of this tree is mucilaginous, and has great value for medicinal purposes.

**ENGLISH ELM, CAMPERDOWN ELM.** *Ulmus campestris*.—This is a favorite tree for ornamental planting in England, and since its introduction here has gained rapidly in favor for that purpose, and also for forest planting. It

shade, and are in abundance and fine

quality of timber, and adapted to a variety of varieties. They should be sown immediately after harvest, as it is easier grown than other species. They are shipped long distances, and should be handled them so as to avoid injury. They are, however, where they are lying dormant. Sow the seeds in the forest, and they will grow, as they are sure to succeed, as they grow upward in spite

of the largest of our trees, and are planted for shade, often attaining a height of 100 feet. They are graceful, drooping trees, and in great demand for manufacturing for a

preceding, seldom have straight trunks, and are not sought after for timber, piles, etc. A second growth of young growth, with corky-barked twigs, is a great deal larger

grows to about 100 feet, and is of great value for various uses. It is planted in various places, and the value of the tree is much

This is a favorite tree for planting. It



1. - EU. HORSE-CHESTNUT.

4. - SOFT MAPLE.





is claimed to be better adapted to planting in cities, where there is a great deal of smoke and dust, than any of our native species.

#### VARIETIES PROPAGATED FROM CUTTINGS.

**SILVER-LEAF POPLAR, ABELE, WHITE POPLAR.** *Populus alba*.—This tree is of foreign introduction, but has been a long time in cultivation here for ornamental purposes, and is being employed to some extent in timber plantations. It is very highly spoken of in the west as a timber tree, Bryant regarding it as superior to any of our native poplars, while Prof. Watson, of Cambridge, Mass., is confident that our native species are better in every respect and for any purpose than any foreign ones that can be introduced. This tree, like all the poplars, is of remarkably rapid growth. It shows a strong tendency to send up shoots from the roots, which renders it troublesome in cultivated grounds, but is not an objectionable feature in woodlands.

**THE LOMBARDY POPLAR.** *Populus dilatata*.—A tree of foreign introduction, which has been very generally diffused throughout the United States, having been usually planted for ornamental purposes. It grows straight and very tall, even when standing alone. The wood is soft and of but little value. It is a very pretty tree in contrast with other varieties, and when in full vigor; but it is objected to as being short-lived, and after it commences to die at the top its beauty is gone. It is very useful in timber plantations to fill in between the trees that are intended to remain permanently.

**THE LARGE WHITE POPLAR.** *Populus grandidentata*.—A native tree of large size. The wood is valuable for lumber. It works smoothly, takes a good polish, and is not liable to shrink. It outgrows any other variety I know of, attains a larger size, and produces better lumber than any other.

**BALSAM POPLAR.** *Populus balsamifera*.—This native variety also attains to timber proportions, and is a desirable sort for forest planting, although not so valuable as the preceding. They are both northern trees, and will endure any amount of cold without injury. They will also thrive and grow in our lightest soils, and in many western localities where it is difficult to get other trees to grow.

**BALM OF GILEAD.** *Populus candicans*.—A small native tree common in some parts of our northern forests, and well known in cultivation. It is not large enough to be of much value for timber planting, but as a shade tree it is very popular on account of its rapid growth and beautiful form and foliage. Its buds contain a resinous substance of an agreeable odor, which pervades the atmosphere in the vicinity of the tree, and is supposed to counteract malarial influences.

## THE WISCONSIN WEeping WILLOW.

*Salix Wisconsiniana*.—A native of Wisconsin, where it has long been known as one of the most beautiful weeping trees in cultivation. It has recently become very popular with tree planters on account of its exceedingly rapid growth, its thrift and vigor in all soils and locations, its extreme hardiness, and the ease with which it can be propagated from cuttings. Cuttings six inches in length, inserted in the spring, frequently attain a growth of eight feet the same season. It is extremely hardy and will grow in any soil, wet or dry, light or heavy. Reports of the most favorable character have been received from all parts of the country wherever it has had a trial. From the bleak Atlantic coast, from the rich prairie soils of Illinois and Iowa, from the sandy plains of western Kansas, from the alkali impregnated soils of Colorado and Utah, from Idaho and the Pacific coast, and from the cold northern climate of British Columbia the testimony is uniformly to the effect that this willow is succeeding beyond all expectations and making a wonderful growth. Notwithstanding its remarkably rapid growth it proves to be tough and hardy, and does not break down from the action of wind and storm. Twenty-two years ago the writer planted a cutting of this variety in the vicinity of Milwaukee, and last fall it measured over sixty inches in circumference. The ground where it stands was into grass at the time it was planted, and has been most of the time since. A tree at this place started five years ago from a cutting now measures thirty-two inches in circumference, is growing in a dry, sandy location, and has had no attention whatever since the first year. Its persistent weeping tendency prevents it from becoming very tall, but it grows tall enough to make saw logs, and the wood is excellent for fuel. It makes a very effective barrier against the wind when planted for this purpose, and a windbreak can be produced more quickly with this than any other known variety. It is very useful in mixed forestry as a nurse for other trees. The cheapness with which it can be grown from cuttings renders it of especial value for this purpose. It is a good neighbor, deriving most of its substance from the atmosphere and taking very little from the soil.

## EVERGREENS.

Sow seed of all varieties of evergreens herein described in the seed bed, under shade, and when two years old transplant to seedling nursery. After one year more remove to the nursery. When about two feet high set them in the forest or elsewhere in their permanent location. Select cool, cloudy or rainy weather in the spring if possible, for transplanting, and exercise the greatest care in keeping the roots cool and damp during the process of removal. When seedling evergreens are purchased from a distance, they should be planted in the seed bed, under shade one year, then successively transplanted into the seedling nursery, nursery and forest as recommended above. If the seed of evergreens is fresh, that is, not more than one or two years old, and has been properly cared for it is very sure to grow the first season; but if the soil is very dry, the seed old, or if from any cause they do not come up the first year they should remain undisturbed, as they will probably germinate the next season.

## THE SPRUCES AND FIRS.

**NORWAY SPRUCE.** *Abies excelsa*.—A tree of foreign introduction which has for a long time been grown in this country for ornamental purposes, hedges and shelter belts. It is also quite extensively employed in mixed forests. It succeeds well in a great variety of soils and locations, being a rapid and vigorous grower, and is greatly admired as an ornamental tree on account of its symmetrical form and rich, green foliage. It is better known and more extensively planted than any of the other spruces.

**WHITE SPRUCE.** *Abies alba*.—A small tree native to the northern states and Canada, extending to the northern limits of vegetation. It is a beautiful ornamental tree, noted for its fine silvery foliage and graceful form.

**BLACK SPRUCE.** *Abies nigra*.—Native to the northern states and Canada, and extending south along the Alleghany mountains. In favored situations it grows to a large size and produces a very good quality of lumber. The foliage is coarser and tree of more rapid growth than the preceding variety. Highly prized for ornamental planting.

**HEMLOCK SPRUCE.** *Abies Canadensis*.—A well known tree of the northern states, from Maine to Wisconsin, extending northward to Hudson's Bay and southward to North Carolina. The old trees in the forest often have a rough, unsightly appearance, but as grown in the nurseries and open situations, with its fine graceful foliage, drooping branches and color of living green, it is the most attractive and beautiful of all the spruces. It is extensively employed for ornamental hedges, and no variety is better adapted for this purpose. It grows to a large size in the forest, often exceeding five feet in diameter and a hundred feet tall. Its lumber is much used in building for rough work and where great strength and durability are required. The bark is used in large quantities for tanning.

**BALSAM FIR.** *Abies balsamea*.—A small tree native to our northern border and Canada. It is in great demand for ornamental purposes. Its growth is regular and symmetrical, assuming the conical form when very young. It grows rapidly and succeeds in a great variety of soils. Its foliage of a beautiful rich green retains its color during the severest winters. A medicinal substance known as Canada balsam is obtained in large quantities from this tree.

**SILVER FIR.** *Abies pectinata*.—A European variety of large size and rapid growth. The timber is soft and is much used for lumber, shingles, etc. It is adapted to a more southern latitude than the balsam fir, although hardy enough to succeed well in most of the northern states.

**DOUGLAS FIR.** *Abies Douglasii*.—A native of the Pacific coast from Mexico to British America. It sometimes reaches the enormous size of fifteen feet in diameter and two hundred and fifty feet high. Its growth is extremely rapid and it succeeds in a variety of soils, but is best adapted to a

rich heavy soil, and a cool climate. It was introduced into Scotland in 1826 and has become a great favorite there for timber and ornamental planting. Its timber is of great value for ship building, and also for ordinary building and manufacturing purposes.

#### THE JUNIPERS.

**IRISH JUNIPER.** *Juniperus communis*.—A foreign variety which is used only for ornamental purposes, being a small tree of slow growth. The foliage is very compact and fine, with a silvery glaucous appearance. The form of the tree is very distinct, being slender and upright. It is a beautiful tree for ornamental planting but rather difficult to transplant, as the roots are very fine and fibrous and dry up quickly when exposed to the atmosphere.

**RED CEDAR.** *Juniperus Virginiana*.—A native tree widely distributed, being found from Canada to the Gulf of Mexico, and from the Atlantic to the Rocky mountains. It attains its greatest perfection in Tennessee, where the trees are often over two feet in diameter and eighty feet tall. Its timber is noted for its great durability but is of such slow growth that it seems hardly advisable to plant it for this purpose. It is a very fine ornamental tree, and is perfectly hardy. Difficult to transplant for the same reason stated above. The seeds of this and the preceding variety are inclosed in a berry whose pulp is very gummy and resinous. They need to be mixed with wet wood ashes for two weeks or more and then they can be washed clean from the pulp and kept fresh until ready for sowing.

#### THE LARCHES.

**EUROPEAN LARCH.** *Larix Europæa*.—This foreign variety has been extensively planted in the United States for timber, and is still very popular in many localities. It grows very rapidly after the first three or four years from seed. It starts slow and needs transplanting before setting out permanently. It is included in this list of evergreens and requires the same treatment. It is a conifer and has many other characteristics of evergreens, but is deciduous after the first two or three years. In Scotland, where it has long been successfully cultivated, it has recently suffered from a disease which has thrown it into disrepute, and has led to the substitution of other more healthy varieties. Hough in his "Elements of Forestry" also says "Experience in the northwestern states has somewhat disappointed expectations with reference to the European larch; not as to the rapidity of its growth but as to the durability of its timber." In transplanting this tree it must be done very early in the spring, as it starts early into leaf and is difficult to move after that.

**AMERICAN LARCH, TAMARACK, HACKMATAK.** *Larix Americana*.—A native tree, common in the swamps of Canada and the northern states though frequently found doing well in cultivation on upland soils. Closely

resembles the preceding variety in form and foliage. The timber from the native forests is hard and very durable, and is used for a variety of purposes in building and manufacturing. A very fine tree for ornamental planting.

#### THE PINES.

**WHITE PINE, WEYMOUTH PINE.** *Pinus strobus*.—A well known native tree, producing lumber of the greatest value for building purposes. The pine lumber of commerce is mostly the product of this species. Immense tracts of land in the northern states and Canada were originally covered with dense forests of this variety, notably in Maine, New York, Pennsylvania, Michigan, Wisconsin and Minnesota. The demands of commerce and the greed of land owners for present gains, have led to the wholesale destruction of these valuable forests, and it is now only a question of a few years' time, at the present rate of consumption, before they will be entirely destroyed, and that without any adequate provision having been made for a future supply. With the disappearance of the white pine, all other varieties of timber suitable for building purposes will rapidly follow. Hence, those who are now actively engaged in the planting of forests for timber, may reasonably expect that their efforts will be richly rewarded.

The white pine at maturity is a tree of gigantic proportions, often attaining a diameter of six feet, and a height of one hundred and fifty feet or more. It succeeds in a great variety of soils, from very light sand to heavy clay, and will thrive in either wet or dry locations. In Europe it is being extensively planted, where it is prized above any of their native varieties. The pines are all of great value for ornamental purposes and are more easily transplanted than most other evergreen trees.

**AUSTRIAN PINE.** *Pinus Austriaca*.—This tree is a native of Austria. It was introduced into England in 1835, and into this country a few years later. It was at first planted as an ornamental tree, for which purpose it is especially desirable. Its stout, rapid growth, and general health and vigor in a great variety of soils, attracted the attention of forest planters, and for several years past it has been growing rapidly in favor. Its growth from the start is rapid and stocky, not shooting ahead quite so fast as the Scotch pine for the first few years, but having a more hardy, robust and healthy appearance.

**SCOTCH PINE.** *Pinus sylvestris*.—One of the most valuable of European varieties. It is tough and hardy, of very rapid growth, and adapted to a great variety of soils and climate. Valuable for forest planting, especially in poor soils where many of the other varieties will not flourish.

**RED PINE, NORWAY PINE.** *Pinus resinosa*.—This variety is destined to occupy a very conspicuous position in the future of forestry in the United States. It is a native of this country, and many of our most careful experimenters believe it to be of greater value for forest planting than any other conifer, native or foreign. It grows and flourishes in exposed situations on the Atlantic coast, is equally at home in the rich alluvial soils of the Missis-

sippi valley, the dry sandy plains of western Kansas, or the extreme cold winters of Wisconsin and Minnesota. In our poorest, driest soils, it makes a more rapid growth of hard and durable timber than any other evergreen. Its timber is of great value, and its foliage is very dense and heavy, equal to, and closely resembling that of the Scotch and Austrian pines.

**MARITIME PINE.** A variety from southern Europe, of extremely rapid growth, and well suited to light soils in a southern climate, but not quite hardy enough for successful cultivation in the northern states.

#### THE ARBOR VITÆS.

**AMERICAN ARBOR VITÆ, WHITE CEDAR.** *Thuja occidentalis.*—A native of the northern states and Canada, usually found growing along the margin of lakes and rivers and in swamps. It grows to a large size, sometimes five feet in diameter. Its timber is exceedingly durable and of great value for building and manufacturing purposes. It is extensively used for railroad ties, telegraph poles, bridge and building timber, fence posts, shingles and lumber.

Row boats constructed of this lumber are almost imperishable and command fancy prices in the market. This variety makes a beautiful lawn tree, and is extensively used for ornamental hedges. It is easily transplanted and bears pruning well. Though usually found in moist soils in its native state, it succeeds well in dry situations, growing quite rapidly.

**CHINESE ARBOR VITÆ.** *Thuja orientalis.*—A very beautiful tree for lawns and ornamental hedges, for which purpose it has been for a long time in cultivation in our leading nurseries.

**GOLDEN ARBOR VITÆ.** *Thuja orientalis aurea.*—A variety of the preceding species with foliage of a golden hue. Very pretty.

**TOM THUMB ARBOR VITÆ.** *Thuja Ellwangeriana.*—A dwarf variety of great value for ornamental planting in small yards, cemetery lots, etc., where larger trees would not be suitable.

**CALIFORNIA WHITE CEDAR.** *Thuja Craigiana.*—A native of California and Oregon, which is recommended for cultivation in the eastern states. It grows to a large size, and its wood is soft and very durable. Its symmetrical form and beautiful foliage make it very desirable as an ornamental tree.

**GIANT ARBOR VITÆ.** *Thuja gigantea.*—A native of the Pacific coast in Oregon, Washington Territory and northward. It attains an immense size in its native forests, sometimes exceeding ten feet in diameter and two hundred feet high. This is also recommended for cultivation further east, and will probably prove to be of great value for forest and ornamental planting.

### RELATIVE SIZE OF TREE SEEDS.

In a work of this character it is difficult to give accurate descriptions of the different varieties of seeds without illustrations. These I have been unable to procure in time for this volume, and they have necessarily been deferred for insertion in the next edition.

The following table will give an idea of the relative size or weight of seeds and aid the planter in forming a conclusion as to the amount required for any given purpose. It must be borne in mind, however, that there are always a great many of the seeds in any given variety which do not grow. The number of poor or false seeds being usually less among large seeds than small ones. Maple seed lobes grow in pairs and in some varieties, notably the sugar maple, one lobe contains a seed, while the opposite one is sterile, so that one-half of what appear to be seeds are nothing but empty shells.

## NUMBER OF SEEDS TO THE POUND,

Ascertained by actual count:

Common Name.	Botanical Name.	No. in a lb.
European White Birch,	<i>Betula alba</i> ,	511,689
American White Birch,	<i>Betula papyracea</i> ,	594,576
American Arbor Vitæ,	<i>Thuja occidentalis</i> ,	305,289
Yellow Birch,	<i>Betula lutea</i> ,	287,622
Black Spruce,	<i>Abies nigra</i> ,	209,088
White Spruce,	<i>Abies alba</i> ,	197,563
Sycamore,	<i>Platanus occidentalis</i> ,	160,704
Scrub Pine,	<i>Pinus Banksiana</i> ,	141,237
Hemlock Spruce,	<i>Abies Canadensis</i> ,	120,632
White Alder,	<i>Alnus incana</i> ,	118,678
European Alder,	<i>Alnus glutinosa</i> ,	115,218
Tamarack,	<i>Larix Americana</i> ,	112,323
American Mountain Ash,	<i>Pyrus Americana</i> ,	108,327
European Mountain Ash,	<i>Sorbus aucuparia</i> ,	107,180
European Larch,	<i>Larix Europæa</i> ,	97,535
Japanese Catalpa,	<i>Catalpa Koenigferi</i> ,	93,215
American White Elm,	<i>Ulmus Americana</i> ,	92,352
Balsam Fir,	<i>Abies balsamea</i> ,	78,527
Teas' Hybrid Catalpa,		74,627
Norway Spruce,	<i>Abies excelsa</i> ,	74,112
Scotch Pine,	<i>Pinus Sylvestris</i> ,	72,575
Red Pine,	<i>Pinus resinosa</i> ,	61,955
Red Elm,	<i>Ulmus fulva</i> ,	54,359
Chinese Arbor Vitæ,	<i>Thuja orientalis</i> ,	41,383
Corsican Pine,	<i>Pinus Laricio</i> ,	38,976
Camperdown Elm,	<i>Ulmus campestris</i> ,	36,864
Black Locust,	<i>Robinia pseudacacia</i> ,	28,992
Common Catalpa,	<i>Catalpa bignonioides</i> ,	28,891
Austrian Pine,	<i>Pinus Austriaca</i> ,	26,464
Green Ash,	<i>Fraxinus viridis</i> ,	22,656
Scarlet Maple,	<i>Acer rubra</i> ,	22,464
White Pine,	<i>Pinus strobus</i> ,	21,440
Striped Maple,	<i>Acer Pennsylvanicum</i> ,	20,480
Ailanthus,	<i>Ailanthus glandulosa</i> ,	20,161
Hardy Catalpa,	<i>Catalpa speciosa</i> ,	19,776
Sweet Gum,	<i>Liquidamber styraciflua</i> ,	18,721
Tulip Tree,	<i>Liriodendron tulipifera</i> ,	18,047
Pear,	<i>Pyrus communis</i> ,	15,680
Box Elder,	<i>Acer negundo</i> ,	14,784
European Basswood,	<i>Tilia Europæa</i> ,	13,024
Silver Fir,	<i>Abies pectinata</i> ,	12,000



## FOREST LEAVES.

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No. in a lb.	Common Name.	Botanical Name.	No. in a lb.
	Osage Orange,	<i>Maclura aurantiaca,</i>	10,656
	European Hornbeam,	<i>Carpinus betulus,</i>	10,112
	American White Ash,	<i>Fraxinus Americana,</i>	9,858
	Irish Juniper,	<i>Juniperus communis,</i>	9,654
	Maritime Pine,	<i>Pinus maritimus,</i>	9,184
	Rock Elm,	<i>Ulmus racemosa,</i>	8,352
	Red Cedar,	<i>Juniperus Virginiana,</i>	8,321
	Berberry,	<i>Berberis Canadensis,</i>	8,183
	Sugar Maple,	<i>Acer saccharinum,</i>	7,488
	Norway Maple,	<i>Acer platanoides,</i>	7,231
	English Hawthorn,	<i>Crataegus oxyacantha,</i>	6,400
	Sycamore Maple,	<i>Acer pseudo-platanus,</i>	6,386
	American Basswood,	<i>Tilia Americana,</i>	6,337
	European Ash,	<i>Fraxinus excelsior,</i>	5,824
	Black Ash,	<i>Fraxinus sambucifolia,</i>	5,629
	European Basswood (large-leaved),	<i>Tilia Europea grandifolia,</i>	5,563
	Black Cherry,	<i>Prunus serotina,</i>	4,311
	Sour Gum,	<i>Nyssa multiflora,</i>	3,238
	Honey Locust,	<i>Gleditschia triacanthos,</i>	2,496
	Silver-leaf Maple,	<i>Acer dasycarpum,</i>	2,421
	American Beech,	<i>Fagus ferruginea,</i>	1,050
	European Beech,	<i>Fagus sylvatica,</i>	1,038
	Italian Stone Pine,	<i>Pinus pinea,</i>	513
	Pawpaw,	<i>Asimina triloba,</i>	417
	Kentucky Coffee Tree,	<i>Gymnocladus Canadensis,</i>	177
	American Sweet Chestnut,	<i>Castanea vesca,</i>	90
	Hickory (shell-bark),	<i>Carya alba,</i>	78
	American Horse Chestnut,	<i>Esculus glabra,</i>	36
	European Horse Chestnut,	<i>Esculus hippocastanum,</i>	26
	Black Walnut,	<i>Juglans nigra,</i>	25
	Butternut,	<i>Juglans cinerea,</i>	15
511,689			
504,576			
305,289			
287,622			
209,088			
197,563			
160,704			
141,237			
120,632			
118,678			
115,218			
112,323			
108,327			
107,180			
97,535			
93,215			
92,352			
78,527			
74,627			
74,112			
72,575			
61,055			
54,359			
41,383			
38,976			
36,864			
28,992			
28,891			
26,464			
22,656			
22,464			
21,440			
20,480			
20,161			
19,776			
18,721			
18,047			
15,680			
14,784			
13,024			
12,000			

### ABOUT ADVERTISERS.

As I am constantly in receipt of letters from tree-planters, inquiring where they can obtain farm implements, fruit trees, garden seeds, etc., and as information on these subjects is believed to be of general interest to the patrons of this book, it has been decided to admit the advertisements of a few of the most reliable and successful firms in the different lines indicated. The following is a list of those whose advertisements appear in this book. They are all old, well known and reliable firms, with untarnished reputations for honesty and fair dealing with their customers. In writing to any of these firms, you will confer a special favor by mentioning "Forest Leaves."

Name and Address of Advertiser.	Stock Offered.
Ellwanger & Barry,	Rochester, N. Y., Nursery Stock.
Nash & Brother,	Millington, N. J., Acme Harrow.
Powell & Douglas,	Waukegan, Ills., Windmills and Boats.
John T. Lovett,	Little Silver, N. J., Nursery Stock.
Robert Clarke & Co.,	Cincinnati, O., Hough's Elements of Forestry.
Fisher & Norris,	Trenton, N. J., Saw-makers' Anvils.
Peter Henderson & Co.,	New York, N. Y., Seeds.
Cornish & Curtis,	Fort Atkinson, Wis., Churn.
Wilson Bros.,	Easton, Penn., Bone Mills.
James Vick,	Rochester, N. Y., Seeds.
Livingston & Co.,	Pittsburgh, Penn., Farm Mills and Corn Shellers.
G. & C. Merriam,	Springfield, Mass., Webster's Dictionary.
Henry S. Iselin,	Sheldon, Iowa, Land.
A. P. Griffith,	Smyrna, Del., Land.

### MIXING FOREST TREES.

The following, by C. F. Clarkson, was read before the Iowa State Horticultural Society at its annual meeting in 1877, and was published in the Society's volume of transactions for that year :

There are vital questions to be considered in planting groves. It is probable that the pioneers and advanced men in grove planting in our state have overlooked one important matter. In trees, grasses, vegetables and grains, nature inclines to variety, and they are all so constituted that, no matter how densely crowded, the different species seldom hybridize, whilst the different varieties of the same species frequently do. It has been found only in extreme cases that different species hybridize, but in no case do the different species of timbers, grains or vegetables. This is a provision in nature evidently for a greater purpose, that of a better growth of mixed forestry.

Lately, some of the best farmers contend that a mixture of the various varieties of wheat produce a larger quantity and a better quality of grain per acre. But all hybrids, whether of the vegetable or animal kingdom, are sterile, nature thereby providing against further admixture or adulteration.

In Europe, where tree planting is more of a science, and to which our National Horticultural Society proposes sending learned men to take lessons in tree planting, it is one of their rules not to confine a grove to any one species; but the greater the mixture, the better the success. One species of tree obtains from the soil all the elements suitable for its growth, while it leaves or rejects that which is suitable for another species. The different writers upon the subject have not settled the exact reason why a heavier growth and longer life were guaranteed to trees when there is a general mixture of the species of forestry, yet experiment and observation have established the fact.

Prof. Aughey, of Nebraska, a scientific man on forestry, strongly urges the vital importance of mixing groves. He says he "has observed many of the exclusively cottonwood groves decay, from various causes, when from four to twenty years of age." This, he claims, is only what would naturally be expected by a European forester. If they had been mingled with other trees, such as maples, walnuts, box-elders and lindens, it would probably have preserved them intact, besides making them intrinsically more valuable. The vast forests of beech in Denmark are known by reputation the world over. Years ago they showed signs of rapid decay, and the authorities had other species of trees planted in all the open spaces, such as aspen, willow, oak, birch, maple and fir, and Naupel concedes that this probably saved the forests.

And the forest of Fontainebleau, the Queen's most valuable timber lands, and the one of all her vast domains which shows the most vigor in growth, is a mixture of all the species suitable to that climate. Clave speaks of it in his report as follows: "Oaks mingled with beeches, in due proportion, may arrive at the age of five hundred to six hundred years in full vigor, and attain

dimensions which I have never seen surpassed; when, however, they are wholly unmixed with other trees, they begin to decay and die at the top, at the age of forty or fifty years, like men old before their time, weary of the world and longing to quit it. It was then proposed to introduce the pine and plant it in the vacancies and glades. By this means the forest was saved from the ruin which threatened it, and now more than ten thousand acres of pines, from fifteen to thirty years old, are disseminated at various points, intermixed with broad-leaved trees, and sometimes forming groves by themselves."

Prof. Agassiz, after having visited all the best artificial groves of this country, as well as the dense sylvas of Central and South America, was convinced that the mixture of such a great variety of species as he found in the south, instead of exhausting the soil, added largely to its wealth of fertility. He found over one hundred species to the acre. And he was of the opinion that when nature's method was violated, it tended to dwarf and shorten the age of the trees.

And the Hon. John J. Thomas, a New York horticulturist of note, says in some of his official publications that "it is the opinion of some planters that a heavier growth may be obtained from a given extent of land by intermingling different kinds, each of which may draw different ingredients from the soil, or extend their roots into the earth at different depths."

"The ash," says C. W. Johnson, "and more particularly the locust, are very obnoxious to most trees. Then, again, the grouping together of certain trees is particularly grateful to them all. Thus, the larch is a very good neighbor; the Scotch fir, the birch and the Spanish chestnut grow very luxuriantly together; the oak, the elm, the hazel and the hornbeam are very good neighbors."

In various places in the United States where men of mind and scientific skill have directed in planting groves, for ornament or utility, they have invariably followed the teachings of nature, and intermixed very liberally the various species of parent growth. In laying out the grounds of the Illinois Industrial University, all the science and experience of the age was brought into requisition to start a grove on the college grounds. Twenty acres were set apart for an experimental forest tree plantation, in the grounds of the university, and planted with green ash, white ash, catalpa, chestnut, white elm, European larch, white maple, Osage orange, Austrian pine, Scotch pine, white walnut, white pine, Norway spruce and sugar maple. The writer has noticed particularly the effect of isolation on the Lombardy poplar (*Populus dilatata*). It is a tree of rapid growth, and is peculiarly adapted to be used as shade trees along public and private highways. But when thus planted it soon begins to fail and die at the top, and soon becomes unsightly. But when it is mixed with other rapidly growing trees, which keep pace with it, its health and greenness are longer perpetuated. There is a slight disposition among fruit growers to believe that if pine trees are mixed through an orchard it will have a beneficial influence in driving away the moth of many of the destructive insects which prey upon apples and apple trees. It is supposed to be the strong effluvia issuing from the turpentine of the pine.

And others contend that the pine (all its varieties) throws off in the grove constantly in cold weather a large amount of warmth or caloric, which has a favorable influence on surrounding trees during our boreal winters. In fact, it is contended by some scientific men that all live trees have this influence, besides the protection which they impart as wind-breaks. And, besides these benefits, some medical writers claim that the influence of the turpentine in pine groves is highly beneficial to the health of the human race, as well as to animals which dwell in well ventilated pine groves.

Nearly all the groves in Iowa, unfortunately, have a wearisome sameness. They are either all cottonwood, soft maple, or willow, with an occasional highly redeeming exception in cases of walnut, oak, ash, etc. It is sincerely to be hoped that more wisdom will be exercised in the future, and that the lessons of the Great Teacher will be heeded in having groves of the greatest possible number of acceptable varieties. These things are worthy of further demonstration by experiment, especially as it will cost nothing, but will add largely to the beauty and utility of our groves.

### THE BLACK OR YELLOW LOCUST.

The following from the *American Journal of Forestry*, by John S. Hicks, of Roslyn, L. I., was read at the Cincinnati meeting of the American Forestry Congress:

The Locust takes its common name from a resemblance to the ancient locust, mainly in the form of its leaf, "*Robinia Pseudacacia*," from its being introduced into France by either John Robin, gardener to Henry IV. of France, or his son Vespasian, about 1601. All evidence seems to point to Virginia as being the place of its most natural growth.

There are locust trees on the lawn of Daniel Bogart, at Roslyn, L. I., that were brought by Capt. Sands from Virginia over a hundred years ago. I think there are but two kinds of the locust generally known: the black or yellow locust and the white locust.

The white locust, the bark of which is much smoother, has more sap wood, and the heart is of a silvery whiteness. It is of little value, either for strength or durability, and I think, as this variety is more easily grown from seed than the yellow, that it is often planted by mistake for that variety.

The yellow locust varies much in different localities and soils, some being darker in color than others, and this fact has also, undoubtedly, given the name of "green locust" to a variety of this species. The yellow locust is the only one of value. Though it occasionally attains the height of 90 feet, yet, beyond 40 or 50 feet, the growth is very slow and unprofitable. It is better to cut them down at that height and plant anew.

The young trees have sharp and strong prickles; but these disappear largely after the tree has a growth of three or four inches in diameter, although the smaller branches always have some. The locust does very well on yellow, sandy soils, and in yellow sand banks, with no alluvial soil covering the sand, it will often grow spontaneously, but in heavy clay soils it often proves a failure. The fact that it will grow profitably upon soil that will not produce pasture, or grow other trees of value, and that after the trees have grown a few years they induce, by their shade and rich falling leaves, a good growth of pasture, makes it, in many places, the most valuable tree that is grown for profit. It thus makes many unsightly spots beautiful, and heavy hill-sides profitable. The roots usually run near the surface of the ground, and extend to a great distance.

It is now being largely used in reforesting the desolate regions of Austria and Hungary—localities that have been made desolate by the destruction of their former forests. It thrives well in these countries, growing in thirty years to twelve inches in diameter. It grows well in portions of all the middle states, the southern parts of the northern states, and the northern portions of the southern states.

In some localities attempts were made to introduce its growth; but, after the appearance of the borers, they abandoned it, although it often survives

them, and sometimes, when cut off after the borers had attacked it, the second growth thrived well.

When dry, the wood weighs fifty-four pounds to the cubic foot, and when green it weighs sixty-two pounds, as shown by tests made at Brest, and in the Woolwich ship-yards it was found to be of about twice the strength of British oak. It is used largely in the making of tree-nails for fastening planks to wooden ships, and for top timbers and beams of vessels in exposed places.

The most important use, however, is for fence posts and beams of cellars, or sills of exposed buildings. It has been known to last from forty to sixty years as fence posts: and the writer knows of posts, not over three inches in diameter, that have been in use for thirty years. Hough's Report on Forestry mentions instances of its lasting fifteen to twenty years as railroad ties, in conditions where the oak had lasted from five to ten years, and the chestnut from six to eight years. The timber is used very extensively by carriage builders, and in some instances in preference to hickory. The firm of Brewster & Co., of Broome street, New York City, are using it, and paying higher prices than for hickory.

The delicacy and lightness of its foliage distinguish this from all other trees in our cultivated woodlands, while the color of its leaves, so different from others, makes its presence known at a long distance. The rugged character of its rough bark, and its singularly light and graceful foliage, render it a tree of peculiar beauty. Its leaflets are arranged in opposite pairs, along the mid-stem, somewhat similar to the mountain ash.

It is late in coming into leaf, and it sheds its foliage early in autumn: but in the perfection of its verdure no other tree rivals it. The foliage, as it decays, becomes very fertilizing to the soil, causing the grass beneath to be always green and luxuriant.

Its white and fragrant flowers appear in May and June. Tradition says the American Indian made the gift of a branch of its flowers a declaration of love. The nightingale and other small birds resort to the protection of its thorny branches.

On Long Island, near New York City, this tree proves to be the most valuable one that has been grown. When thirty years old they will make posts from ten to twelve feet in length and from three to five inches in diameter at the small end. Such posts are worth, in the city, at wholesale prices:

When 8 feet long and 4	inches in diameter	-----	48 cents.
" 10 " " " 4½	" " " "	-----	77 "
" 12 " " " 4¾	" " " "	-----	95 "

Fencing posts 6½ feet long, and 4 inches in diameter, are worth 28 cents each. The tree will often cut one post that is 10 feet long, one that is 8 feet, and one that is 6½ feet in length, making the total amount \$2.48 per tree.

In the most famed localities, and with five to ten years more of growth, the tree will make, say one piece 16 feet long and 36 inches in girth, one piece 12 feet long, with 30 inches girth, and one piece 10 feet long, 25 inches in

girth, making the tree worth from \$5 to \$7 on the basis of 60 cents per cubic foot; it has sold in the past as high as \$1.50 per cubic foot. As to value in other localities, Dr. Warder states that he is cutting trees having a growth of 24 years, averaging 12 inches in diameter and 60 feet in height, making eight to ten good fence posts seven feet in length, with from six to eight inches face at the top end, the trees standing 400 to the acre.

Mr. Ezra Sherman, of Preston, Ohio, mentions the following results from locust seed planted in 1830: Three years after sowing, the trees were planted in a grove of 15 acres, and also in an avenue of 200 rods. In 1870, two-thirds of these last were cut. They furnished 180 trees, 1500 posts, worth 35 cents each, or \$525. The fifteen acres will furnish fencing for the farm of 1500 acres for all time. The pasture, with stakes and poles for fencing, furnished from time to time, will pay as good a rate of interest as the open land would.

Mr. Waldo F. Brown, of Oxford, Ohio, states that the planting of locust trees is the best investment a young man can make. He advises that the seeds should be planted in rows—transplanted into rows four feet apart when one year old—and when large enough for fence stakes and bean poles, three-fourths of them should be cut out, leaving them, when five to seven years old, at the distance of eight feet apart. As soon as the trees are out of the way of cattle, blue grass should be sown, as this does not injure the trees, and grows well, the pasture paying interest on the investment after five years.

As the trees send up suckers as well as sprouts from the stumps and roots, the growth is always increasing, and is thicker after each cutting.

In France it is much grown for vine supports, and is sometimes cut every four years, the leaves being used for forage.

In 1826, premiums were offered by the Massachusetts Society for Promotion of Agriculture for the promotion of its growth and the extirpation of the borer.

The *New England Farmer* states the growth to be 300 to 600 posts to the acre, worth 50 cents each, besides the growth of pasture, and that the government was paying 75 cents per cubic foot at that time.

The *New York Cultivator* says 1210 trees will grow to the acre; that trees grown 28 years produce two to four posts each, and that trees grown from suckers, or shoots, are not as much inclined to seed, nor do the borers affect them as severely.

Mr. Allen Furnas, of Danville, Indiana, states that he has grown the black locust over twenty years, and that he has had very little trouble with the borers; that it grows thriftily, making good fence posts in ten or twelve years, and from three to six posts in eighteen to twenty years. It grows 1000 to the acre, and at eighteen years the trees are worth 75 cents each. The timber will last an average of 35 years, and it grows well on poor soil.

In the years of 1828 to 1838, Joseph Hicks planted, at Westbay, Long Island, on each side of the highway leading through his farm, for about a quarter of a mile, locust trees about eight to ten feet apart. The trees were gathered from different parts of the farm, where they had grown up from





1. — SYCAMORE MAPLE  
2. — ROCK ELM.

4. — HARDY CATALPA  
5. — AM WHITE ELM.

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the roots of other trees, and, being thus grown, they were planted with but little expense. When first planted the tops were cut off, and it was found that they grew much better from this treatment. After thirty years of growth, and at least fifteen years of the most beautiful shade in the heat of summer, and an abundant growth of grass beneath, they were sold for \$500 as they stood, and now three trees are growing in the place of one, and as thriftily as the first crop.

It is thus seen that this tree will grow in most of our middle and western states, and in many sections where it is not now known. In some places, where it has once been condemned, the second trial will prove its value, as the borers trouble it in some seasons and not in others. It is worth a thorough trial anywhere. Being among the most valuable of our timber trees for durability, growing on poor soil where no other tree will thrive, nourishing an abundant growth of grass, and finally, when cut, sending up twice or thrice the number of young trees, what tree can be of more value than this for forest culture?

## A TIMBER FAMINE

WITHIN SEVEN YEARS OF THE END OF OUR WHITE PINE AND SPRUCE.

[From the Chicago Inter Ocean.]

Attention has frequently been called to the fact that, at the rate at which the destruction of forests is going on in the United States, we are within seven years of the end of our white pine and spruce. Our northern mills would saw up every standing pine in Georgia or Alabama in twelve months, and would require but six months more for those of Florida, or either of the Carolinas. Such are the conclusions of experts officially representing the United States government in the matter of forestry, upon data furnished by the most careful measurements of the forests now standing. Three hundred million dollars' worth a year are being cut in the northern States of a crop which nobody is planting, and which private individuals, looking to immediate returns for the support of their families, cannot afford to plant. Nothing but life insurance companies could afford to plant trees and wait thirty years for a crop. They might, perhaps, afford to enter into this business in order to even up the advantage they sustain over other kinds of business, from the fact that their bills receivable mature at an average thirty years earlier than their bills payable on the same transaction. But even with life insurance companies the motive would have to be philanthropic.

Dr. Franklin B. Hough, chief of forestry in the department at Washington, estimates that in 1870 our entire area of woodlands of every kind was 380,000,000 acres; that we were stripping off the wood from 10,000,000 acres annually, and were planting less than 10,000 acres. If his data were correct, the area of wood has since been reduced by 125,000,000 acres, and stands now at 255,000,000 acres, or enough to last 25 years longer.

The lumbermen have satisfactorily shown that no remedy whatever is to be found in checking the cutting off of the lumber, even if there were power in any government or set of men to do so. They show that, owing to the frequency of forest fires, lumber that is not cut is sure to be swept over by fire every few years, and when once burned over it must be cut within the following year, or the worms destroy it. The only way to save the lumber actually in existence, therefore, and exposed to certain fires, is to cut it. Every township and nearly every square mile in Michigan and Wisconsin containing lumber uncut also has its settler, and wherever there are settlers there are fires.

Canada has no supply whatever greater for her own use than ours is in proportion to our demand. The forests of Canada will inevitably reach their period of exhaustion at about the same time as ours. She already imports from us the black walnut, which she needs for her own use or for export, and of which she formerly had considerable supplies.

What, then, is to be done? For the crisis produced in 1861-4 by the failure of the cotton supply was not worthy to be called even a hint of the crisis of disasters that would result from a failure in the lumber supply.

Three courses, the first two of which present merely possible palliatives, are really our only alternatives:

1. Ten years from now there must be a forced, sudden and total substitution of brick, stone and iron for building purposes, in lieu of wood.

2. Wood pulp manufactured from worthless woods and straw must become a substitute for timber, or, as the phrase goes, we must build our houses of paper. Or,

3. The government of the United States must take efficient peremptory measures, either of coercion or inducement, which will insure the planting and relegation to forest trees, but especially to the white pine, of at least 10,000,000 acres per year, equivalent to the quantity we are now denuding.

Of these three alternatives, the first is inadequate. We can substitute brick, tile and slate for the clap-boarding and roofs, but it will be very foreign to our tastes and habits to substitute either for floors. Even then vast supplies of wood are needed for implements, doors, wainscoting and furniture, and the prospect is that wood will become very much dearer than iron.

The second alternative would be most nearly compensatory, provided the continued cheapening in the processes by which wood and straw pulp have been applied to the manufacture of so many things shall be supplemented by such means of metalizing or hardening it as shall enable it permanently to endure the weather. This, however, is one of the contingencies of a partially developed invention. The third alternative is nearly the most hopeless of all. The government and people of the United States, though nominally omnipotent, are so lethargic of action that long before the years of agitation required to get such a project adopted have been spent in organizing the popular convulsion in behalf of tree-planting, without which Congress would do nothing, the great timber famine will be upon us in full force. Even were Congress ready to pass any required law that the most scientific forestry commission could frame, still the subject would be one of the most difficult, though by far the most useful, with which that body has ever attempted to grapple.

## FORESTRY IN MICHIGAN—OUTLOOK AND SUGGESTIONS.

BY PROFESSOR V. M. SPALDING, ANN ARBOR, MICH.

[From the American Journal of Forestry.]

It is not necessary to go into an argument to show that Michigan ought to be interested in forestry. Every one knows what an element the forests have been in our prosperity. According to a late report of the Commissioner of Immigration, "the aggregate value of the forest products of this state, already marketed, is largely in excess of \$800,000,000, and the timber product of a single year, 1879, amounted to \$60,000,000, or about thirty-five per cent. of the total value of the natural products of the state for that year. Michigan produces more salt than any other state in the Union, and the brine is evaporated by means of refuse from the great saw-mills in the vicinity of Saginaw and other lumbering towns. Ours is the second state in the production of iron, and the blast furnaces of Ironton, Elk Rapids, and a number of other places, are drawing their supply of charcoal for its reduction from the great hard wood forests in their vicinity. The products of these forests are sent to the ends of the earth. Much of the finest lumber of the Atlantic cities and of the Old World comes from Michigan pineries. Threshing machines made in Battle Creek are sold in South America and Australia, and farming implements, furniture, and a long list of articles requiring wood in their manufacture, are made in the state and exported from it, their manufacture a source of support to fifty thousand of our people, and their sale a steady source of wealth to the state.

Nor is it necessary to repeat the well known fact that our forests are rapidly disappearing. The bulletins of the last census, accessible to every one, show that the estimated amount of merchantable pine timber standing in Michigan, May 31, 1880, was thirty-five billions of feet. At our present rate of consumption—five billions of feet annually—it will take seven years to use up our pine forests.

Suppose, however, that the estimates of the amount remaining, although made with great care, are too low; suppose, for safety, that the pine will last twice as long as has been estimated; the fact still thrusts itself upon us that in a few years this great source of our wealth will be gone.

What are we doing in view of these facts? We are going on with astonishing energy and improved machinery to hasten the end. Every man who can do so is trying to get a piece of pine land or a quantity of logs before they are gone, and our own people, in company with eastern capitalists, are planning the speedy destruction of the hard wood forests as soon as the pine lands have been stripped. The newspaper articles that charge these things upon us are not sensational. They do not tell all the truth. We have squandered with reckless haste the abundant forest-wealth with which the state was endowed, and, besides all this, time and again forest fires, that

might have been prevented, have swept over fair portions of the commonwealth, carrying swift destruction with them, and completing the work that the ax had begun.

In the study of this subject, then, we may as well turn our attention at once to the forests of the future, for it is evident that those of the present will be gone in a few years. Our own legitimate wants and the great profits of the lumber trade have already settled the question for Michigan. If we want forests we must make them. Without repeating the arguments that have been given so fully by others, I shall assume, what is admitted by every one who has ever bestowed serious thought upon the subject, that the highest welfare of the state requires the establishment and continued maintenance of a suitable proportion of woodland. It may be assumed, too, that in due time both government and people, moved by necessity, if by no higher influence, will unite in a settled purpose to secure this. As soon as this attitude is taken by the people of the state, and we are ready to enter upon the work of reforestation, we shall find ourselves face to face with various difficult practical problems. Some of us, perhaps, may render a service by studying these problems now, viz.:

First. What parts of the state, and what proportion of its area, should be covered with forests? Economists estimate about twenty-five per cent. as a suitable proportion, but this varies with the position, physical character, and commercial interests of the state or country under consideration. The State of Michigan contains large areas that are worthless for any other purpose than raising timber, and still more extended regions that, if not absolutely valueless for agricultural purposes, can be used to far better advantage in growing trees than in raising any other crop whatever. Undoubtedly the great question with us is, how, in the most direct, practical way, can we rehabilitate the extensive regions in the central and northern parts of the Lower Peninsula, that have been stripped of their pine forests, and the remaining portions of this region that will so soon be bare? Any one who has been through this part of the state will remember its desolate and ruined aspect. "The valuable trees were all felled years ago, and the lumberman moved on to fresh spoils, leaving behind him an inextricable, confused mass of tree tops, broken logs, and uprooted trunks. Blackberry canes spring up everywhere, forming a tangled thicket, and a few scattering poplars, birches, and cherries serve for arboreal life, above which tower the dead pines, bleached in the weather and blackened by fire, destitute of limbs, and looking at a distance not unlike the masts of some great harbor. Thousands of such acres, repellant alike to botanist and settler, can be seen in any of our northern countries."

While there is good soil to be found in this region, much of it is light and sandy, altogether unfit for farming purposes, but it has raised one of the finest forests that ever clothed the surface of the earth, and if it can again be covered with such a forest, it will become in the future, as it has already been, a source of almost unlimited wealth.

Another portion of the state will soon force itself upon our attention, unless it is cared for. All along the eastern coast of Lake Michigan, sand dunes extend, precisely similar in their nature, though of less extent than

those of the Old World. While these dunes are covered with vegetation they keep, for the most part, within their limits, but indications of what they may do, when free from such control, may be seen any day at Grand Haven, Michigan City, and other places along the shore, where piles of light, drifting sand are covering railroad tracks and fences, and even trees, and in some localities are encroaching upon cultivated fields, to the dismay of their proprietors. The experience of Western Europe is conclusive upon this point, and it is the manifest duty of the state and of the people to absolutely prohibit and prevent the clearing away of trees, or even excessive pasturage of such lands, and to encourage, by every suitable means, their reforesting. The farming lands in the southern portion of the Lower Peninsula all need a fair proportion of woodland for fuel and shelter, and the great majority of these farms would be rendered much more valuable in a few years by judicious planting of trees; and the Northern Peninsula, though still heavily wooded over large areas, already has extensive regions that have been stripped of their forests, and that can be turned to better account for this than for any other purpose. We may safely conclude, therefore, that the State of Michigan requires fully as great, and probably a greater, proportion of its area to be kept in woodland than has been estimated as necessary for other countries; in other words, more than twenty-five per cent. in this state, rather than less, may properly be covered with timber.

Second. What kinds of trees shall we plant? To answer this question we must know something about the different species of trees, the soil and climate to which they are adapted, or to which they can be induced to adapt themselves; what kinds will endure unfavorable conditions best; what trees will grow rapidly, and what sorts are most valuable for timber or other products.

Without attempting to decide all of these questions in detail, many of them requiring not only careful study, but long experiment, for which, as yet, the state makes no adequate provision, there is one very important question suggested at the outset, and that must be met, whether it can be settled at once or not. The question is, how much significance should be attached to the principle of rotation? It has been commonly noticed that forests of oak succeeded those of pine, and vice versa. Oak and hemlock forests have been succeeded by those of beech and maple. When the pine woods in the northern part of Michigan and Wisconsin are cut off, poplars, birches and the wild red cherry spring up, and so, as in many cases this succession seems to be pretty uniform and constant, there has grown up a half-popular, half-scientific notion that it must be so, and that, if we are to succeed in reforesting our denuded pine lands, we must follow the order of nature. We have no right, however, to follow nature blindly, and sometimes we can take a short cut while nature is going round a corner. No one has ever formulated an order that governs the succession of forest trees, nor has it ever been shown that there is any such unvarying order or succession. On the contrary, it is one of the most variable things with which we are acquainted, and there is every reason for believing that it depends more upon what the ground is seeded with, than anything else. The reason why birches, poplars and wild red cherry trees spring up on our wasted pine lands is, that the



seeds of these species are carried there by the wind and by the birds, and there is no doubt whatever that other and better trees may, with suitable pains, be made to take their place. When we plant trees about our houses or along the highway, if it happens to be new land, we do not stop to make a critical inquiry into the laws governing the succession of forest trees; we find out what trees are hardy, and, having settled this point, set out whatever kinds we fancy, with the expectation of having them do well if they are cared for. Shall we, then, plant the white pine in Michigan? The answer may be given without hesitation—yes, plant it first, and last, and all the time. Give it a fair chance, and it will cover the state again. It may be wisdom to substitute some other species on those tracts that have just been covered with pine, but it is, to say the least, doubtful whether any such distinction need be made. If the white pine were planted in Michigan universally, and everywhere where the land could be spared, it would find congenial soil enough, even in those countries that have produced the most of it.

Without discussing the value of other well known species, a few may be mentioned as specially worthy of planting in Michigan. The European larch, famous for the durability of its timber, and perfectly adapted to our northern climate; the Ailanthus, the only tree that has successfully controlled the drifting sand plains of Southern Russia, and will, perhaps, be more valuable than any other on our sand dunes. The *Catalpa speciosa*, of which specimens a foot and a half in diameter may be seen in Ann Arbor, and which probably may be depended upon for hardiness throughout the southern portion of the Lower Peninsula; the white ash, and a long list of other indigenous trees, any of which may be planted with every reason to expect a good return. The consideration of the large number of species, both indigenous and introduced, that may be successfully cultivated in Michigan, is of great importance, but requires too much space for this article, and will have to be taken up in a separate paper.

Third. Admitting that it is desirable that the planting of trees in Michigan should be undertaken at once and in earnest, what are the means of securing this and of insuring the best results?

1. The legislature of the state may promote the work by offering encouragement to tree planting, in the way of exemption of property from taxation. As to the form of legislation and its practical details, a careful study of the action of other states will furnish valuable suggestions. Of all state laws on the subject of tree-planting that have come to my notice, that of Iowa has seemed pre-eminently adapted to the purpose. The law provides that "for every acre of forest trees planted and cultivated for timber within the state, the trees thereon not being more than twelve feet apart and kept in a healthy condition, the sum of one hundred dollars shall be exempted from taxation . . . for ten years after each acre is so planted: Provided," etc. Possibly, other forms of legislative action on the subject may be found better, but that of Iowa has this very excellent feature, that it has very largely accomplished the object aimed at. We can profitably follow the example of Iowa, too, in securing the preparation and distribution of something corresponding to their "Forestry Manual," an unpretentious pamphlet of about thirty pages, filled

with valuable information and practical hints on the subject of tree-planting, and distributed gratuitously among the farmers of the state.

2. The state ought also to be establishing facts upon which to base the future management of the great work of reforesting its waste lands. Two or three experimental stations, located in as many parts of the state, where trees of all sorts, both native and foreign, can be cultivated, and the results recorded, would enable us in a few years to demonstrate the usefulness of some kinds, and the unfitness of others for general cultivation. Meteorological observations carried on at these stations would give data for the solution of the difficult but important questions relating to the climatic effects of forests.

3. Very much depends upon the railroad companies. Owing, as they do in the state of Michigan, lines aggregating over four thousand miles in length, with large grants of valuable land, they control, in a very great measure the agricultural and commercial interests of large areas of the state. The Detroit, Mackinac and Marquette Railroad alone owns over one million three hundred thousand acres of land, and the Flint and Pere Marquette, the Grand Rapids and Indiana, and other roads, are possessed of large tracts of both farming and timber lands. An abundant supply of wood for ties and manufacturing purposes is a prime necessity of all these lines, and may be secured by the prompt adoption of a liberal and enlightened policy in maintaining or restoring a suitable amount of forest on their lands. A number of western railroads, though obliged to contend with great natural disadvantages, have taken hold of this work with great enthusiasm, and several of them are now employing paid foresters to direct the work of raising and caring for forests along their lines.

4. The farmers of the state have very much to do with the future of our forests, and, unfortunately, they have not yet, as a rule, taken a practical interest in maintaining or restoring them. There is, however, no class more ready to enter into undertakings that promise to be productive of good, and none more accustomed to overcome difficulties. When the farmers of Michigan are once possessed of the conviction that trees are often far more valuable than any other crop, and that they render the farm more productive and worth more per acre, trees will be planted.

5. A few, at least, of the educational institutions of the state can do an important work by giving forestry an honorable place among the subjects of their respective courses of study. Whether there is as yet a science of forestry in the United States or not, there will be before long, and intelligent and interested action on the part of such institutions will aid greatly in establishing the science, and in gaining for it the confidence and encouragement of both government and people. A beginning of this kind has been made at the University of Michigan, in connection with the school of political science recently established there, and the lectures on forestry are attended by a class of about fifty.

6. The general government still owns something over a million acres of land in Michigan, and the state government has yet large tracts of land under its control. If, instead of throwing this away or selling it at the rate of a dollar and a quarter per acre, any considerable portion might by any means still be kept in permanent forests, under the control of the state government, and this control be exercised wisely and for the public good, as is done in the state forests in the Old World, forestry in Michigan would become an established fact.

## THE MICHIGAN LAW FOR TREE-PLANTING BY ROADSIDES.

### "CHAPTER X. SHADE TREES AND WATERING TROUGHS IN HIGHWAYS.

"SECTION 1. Shade trees shall be planted along both sides of the public highways, at the uniform distance, as near as may be, of sixty feet apart, and not less than twenty-three nor more than twenty-five feet from the center line of the highway; but the township board of any township may direct as to the distance which trees may be set from each other or from the outer line of the highway. All trees now growing upon the sides of any highway, and all trees that may be hereafter planted thereon, standing more than sixty feet apart, shall be preserved, and shall not be injured or removed, unless by direction of the commissioner of highways, and with the consent of the owner of the adjoining land, unless such trees shall interfere with or obstruct the travel on the highway: Provided, That the provisions of this chapter, in whole or in part, shall not be deemed mandatory in townships in which the electors may by vote at a township meeting thus determine.

"SEC. 2. Any person, planting shade trees along the highway adjacent to property owned or occupied by such person, shall be entitled to be credited twenty-five cents upon his highway-tax for every tree so planted, but not to exceed in the aggregate twenty-five per cent. of such person's highway tax in any one year.

"SEC. 3. In road-districts, where there are not trees planted and growing along the highways to the extent required by the first section of this chapter, the commissioner shall require that at least fifty trees per year be so planted in each district, and shall require the same from year to year, until every highway in his township, where the adjoining lands are cleared, is supplied with shade trees as contemplated by said first section, but not more than twenty-five per cent. of the highway tax shall be appropriated for such purpose in any one district in any one year. The overseer, acting under the direction of the commissioner, may require twenty-five per cent. of the highway tax of any person in any year to be paid in money, the same to be applied in planting shade-trees along the highway adjoining the property of such person. The overseer shall particularly attend to the planting of such trees, and shall allow no unsuitable tree, nor any tree wanting sufficient roots or vitality to be planted, and he shall have the charge of and care for the same in the best manner for their growth.

"SEC. 4. Any commissioner may cause to be constructed suitable watering-troughs, basins, or fountains by the roadside for the refreshment of persons and animals passing upon the highway, not to exceed one, on some one of the more important roads in each road-district, and may contract therefor with some suitable person in each such district, and may credit on the highway tax of such person a sum not exceeding ten dollars in full consideration for the erection of such watering-troughs, basin or fountain, and supplying the same with water for the first year, and five dollars annually thereafter for keeping in repair and supplying the same with water."

### "THE MILLS OF WEST FORK,"

From a paper communicated at the Montreal Meeting of the American Forestry Congress by Mr. J. Jenkins, of Winona, Columbiana county, Ohio. After locating the "West Fork" as a tributary of the Beaver river, a branch of the Ohio, he thus describes its present appearance :

" Looking down the valley, you may trace a stream winding like a silver thread through the green meadows, with here and there an unused mill, its great wheel standing motionless, that used to turn in the laughing foam and spray in the once abundant flow of the waters of West Fork. Turning to the northward, where the diminished stream comes tumbling down between the abrupt hills, denuded and bare now, a visitor of twenty years back would scarcely recognize this as the same stream or the same valley that he then knew and loved. From the retired forest dells in that decade the feeding rills from many a bubbling spring joined West Fork and poured their treasures of moisture into its receptive bosom.

" Now, since the trees have been cut off, many of these sources of supply have dried up. The trickling flow from others is evaporated before reaching the foot-hills, and this paltry stream alone is left instead of the broad acres of water in successive mill-dams that used to sleep, catching the sunshine and shadow between the wooded hills.

" Let us now consider what has been gained and what lost by the wholesale destruction of the woods at the sources of West Fork.

" We have gained to agriculture, for pasturage and for cultivation, a large area of fertile land in the emptied basins of the old reservoirs and mill-dams. We have gained pastures and farming lands on the hills. We have gained in the aggregate productions of the region and in population by extending the cleared land.

" On the other hand, we have subjected ourselves to cloud-bursts on the naked hills, which once drank in the descending floods in the porous woodland soil, but now the solid compact hill-sides throw off the floods into the valley at times an irresistible torrent, carrying destruction and death in its course. We have lost in the destruction of untold millions of feet of lumber, sold at prices low compared with present rates, with vast amounts of wood recklessly destroyed; and when we consider also the fact that as a result of our interference with the restorative operations of nature, we have stamped out all prospect of the renewal of the forest growths by close pasturing and continuous plowing, it is indeed a question whether we have not lost instead of having gained by the change.

" Not that we would regain all the lands in woods again, were it in our power; but by judicious replanting of the waste lands where the woods have been destroyed, the steep and rocky hillsides and ravines that possess but little value for agriculture, we might establish the happy equilibrium, pre-

serve and restore the springs and feeding rills of West Fork, and prevent a further diminution of the stream.

"Are there not in our hill countries many 'West Forks,' where a judicious area and proportion of timber-planting and preservation by shading the springs and water-courses of the little rills that act as feeders, would enable us to utilize and render profitable lands of little value for cultivation? Keep up the proper balance of woodland and tillage which preserves in a measure greater uniformity of climate, humidity, and rainfall, while all the time, and for all time, the land so appropriated and occupied will be yielding a rapidly increasing capital, and a paying investment in the production of timber. . . . .

"Looking again down the valley, the evening shadows are clustering over the mills of West Fork.

"Those ruins of a past decade are standing like sentinels in the twilight.

"The lowing cattle are winding their way in long lines from the old basins to the spacious barns. The diminished stream gurgles on, all unmindful of its former glory that passed away with the forest.

"We welcome the new decade and the conditions of advancing civilization, yet fear lest a further destruction of the woods around the sources of West Fork, and continued neglect of their reproduction, may ere long dry up the stream, and the fertile valley become parched and desolate."

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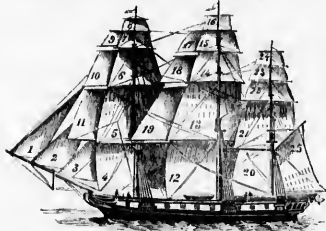
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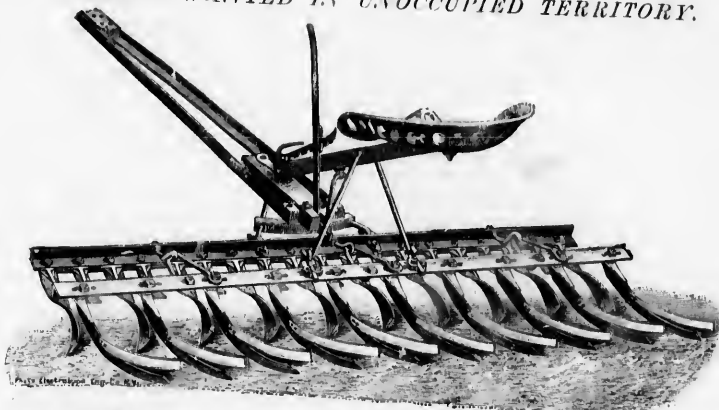
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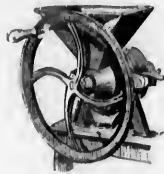
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80	5½	5½	6
85	10	6	5
100	9	6	8
110	11	4½	6
125	9½	5½	6
140	10	6	8
150	8½	6	6
160	10	4½	10½
170	10	4½	10½
180	8	8	9½
190	10½	5½	10½
200	9	6	10
225	11	5½	11½
230	12	4½	12
240	11	10	6½
250	11	6	12
275	11½	6	11½
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Henlock Spruce ( <i>Abies Canadensis</i> ) .. 4 to 6 ins.	15	60	3 00
" " " " .. 6 to 9 ins.	25	1 00	5 00
Austrian Pine ( <i>Pinus Austriaca</i> ) .. 3 to 4 ins.	15	60	3 00
" " " " .. 4 to 6 ins.	25	1 00	5 00
" " " " .. 6 to 9 ins.	50	2 00	10 00
Corsican Pine ( <i>Pinus Laricio</i> ) .. 3 to 4 ins.	25	1 00	5 00
" " " " .. 4 to 6 ins.	30	1 20	6 00
White Pine ( <i>Pinus strobus</i> ) .. 3 to 4 ins.	25	1 00	5 00
" " " " .. 4 to 6 ins.	30	1 20	6 00
" " " " .. 6 to 9 ins.	50	2 00	10 00
Scotch Pine ( <i>Pinus Sylvestris</i> ) .. 3 to 4 ins.	25	1 00	5 00
" " " " .. 4 to 6 ins.	40	1 60	8 00
Am. Arbor Vite ( <i>Thuja occidentalis</i> ) .. 3 to 4 ins.	15	50	2 50
" " " " .. 4 to 6 ins.	15	60	3 00
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Box Elder ( <i>Acer negundo</i> ) .. 4 to 6 ins.	15	50	2 50
" " " " .. 6 to 9 ins.	20	80	4 00
Sugar Maple ( <i>Acer saccharinum</i> ) .. 4 to 6 ins.	10	30	1 00
Silverleaf Maple ( <i>Acer dasycarpum</i> ) .. 6 to 9 ins.	15	50	2 50
Red Maple ( <i>Acer rubrum</i> ) .. 4 to 6 ins.	25	1 00	5 00
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Eu. White Birch ( <i>Betula alba</i> ) .. 4 to 6 ins.	15	60	3 00
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	Per 10.	Per 100.	Per 1000.
Hardy Catalpa ( <i>Catalpa speciosa</i> ) .....	4 to 6 ins. \$0 15	\$0 60	\$3 00
" " " " .....	6 to 9 ins. 25	1 00	5 00
" " " " .....	9 to 12 ins. 35	1 50	7 50
" " " " .....	12 to 18 ins. 50	2 00	10 00
Japanese Catalpa ( <i>Catalpa Koenigkeri</i> ) .....	4 to 6 ins. 35	1 50	7 50
" " " " .....	6 to 9 ins. 50	2 00	10 00
" " " " .....	9 to 12 ins. 75	3 00	15 00
" " " " .....	12 to 18 ins. 1 00	4 00	20 00
Teas' Hybrid Catalpa (New) .....	4 to 6 ins. 50	2 00	10 00
" " " " .....	6 to 9 ins. 75	3 00	15 00
" " " " .....	9 to 12 ins. 1 00	4 00	20 00
" " " " .....	12 to 18 ins. 1 25	5 00	25 00
Common Catalpa ( <i>Catalpa bignonioides</i> ) .....	12 to 18 ins. 35	1 50	7 50
" " " " .....	18 to 24 ins. 50	2 00	10 00
" " " " .....	2 to 3 ft. 75	3 00	15 00
Am. White Ash—TRUE—( <i>Fraxinus Americana</i> ) .....	9 to 12 ins. 50	2 00	10 00
Green Ash ( <i>Fraxinus viridis</i> ) .....	4 to 6 ins. 10	40	2 00
Honey Locust ( <i>Gleditsia triacanthos</i> ) .....	4 to 6 ins. 15	60	3 00
" " " " .....	6 to 9 ins. 25	1 00	5 00
" " " " .....	9 to 12 ins. 50	2 00	10 00
Sweet Gum ( <i>Liquidambar styraciflua</i> ) .....	3 to 4 ins. 75	3 00	15 00
Pear ( <i>Pyrus communis</i> ) .....	4 to 6 ins. 50	2 00	10 00
Red Oak ( <i>Quercus rubra</i> ) .....	9 to 12 ins. 35	1 50	7 50
Black Locust ( <i>Robinia pseudoacacia</i> ) .....	6 to 9 ins. 15	60	3 00
" " " " .....	1 to 2 ft. 35	1 50	7 50
" " " " .....	2 to 3 ft. 75	3 00	15 00
European Basswood ( <i>Tilia Europea</i> ) .....	2 to 4 ins. 50	2 00	10 00
Silverleaf Poplar, cuttings .....	25	1 00	5 00
Lombardy " " .....	25	1 00	5 00
Large White " " .....	25	1 00	5 00
Balsam " " .....	25	1 00	5 00
Wisconsin Weeping Willow, cuttings .....	25	1 00	5 00

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	Per oz.	Per lb.		Per oz.	Per lb.
Norway Spruce .....	\$0 25	\$1 50	Hardy Catalpa .....	\$0 40	\$2 50
Balsam Fir .....	35	2 00	Japanese Catalpa .....	75	5 00
Silver Fir .....	20	1 00	Am. White Ash .....	10	60
European Larch .....	35	2 00	Black Ash .....	25	1 50
Austrian Pine .....	35	2 00	Green Ash .....	10	50
Corsican Pine .....	40	3 00	European Ash .....	20	1 00
Maritime Pine .....	20	1 00	Honey Locust .....	15	75
Scotch Pine .....	35	2 00	Black Walnut .....	10	50
Box Elder .....	10	60	Osage Orange .....	15	75
Norway Maple .....	25	1 50	Sycamore .....	20	1 00
Sycamore Maple .....	20	1 00	Pear .....	40	2 50
Scarlet Maple .....	20	1 00	Black Locust .....	20	1 00
Ailanthus .....	25	1 50	Mountain Ash .....	20	1 00
European Alder .....	20	1 00	European Basswood, Small Leaved, .....	20	1 00
Berberry .....	20	1 00	" " " " Large Leaved, .....	20	1 00
Eu. White Birch .....	20	1 00	American " " .....	20	1 00
Yellow Birch .....	35	2 00	" " White Elm .....	35	2 00
European Hornbeam .....	20	1 00			

Seeds sent by mail for 18 cents per pound additional to the above prices. Regular Wholesale List sent free to all who apply.

TO CORRESPONDENTS.

I take this opportunity of returning sincere thanks to customers for the many flattering testimonials received during the past season, and it gives me great pleasure to know that my efforts to please customers are so well appreciated. It is impossible to publish all such letters received, as it would take a large volume to hold them, but I have selected a few at random and insert them below as samples for the benefit of intending purchasers.

STACEYVILLE, Mitchell Co., Iowa., April 14th, 1883.

To W. W. JOHNSON :

Dear Sir—The 100 Hemlock Spruce, as ordered, are at hand. I am much pleased with them ; they are much larger and nicer plants than I expected at the price. Hoping to receive your circulars as issued. I am, yours truly,

A. W. PENNEY.

EMPORIA, Kansas, April 27th, 1883.

Mr. W. W. JOHNSON :

Dear Sir—The trees came through in good order. Thanks for extra maples

MAX FAWCETT.

767 GREENWICH ST., NEW YORK, May 2d, 1883.

Dear Sir—I mailed you a letter of inquiry about my tree seedlings this morning, and gave order for seeds. To day the trees came all correct. Am highly pleased with them.

Truly, C. H. DRUMMOND.

SIoux FALLS, D. T., Feb. 4th, 1883.

Dear Sir—Sugar maple trees and seeds just received. The trees are in good condition.

Very respectfully,

M. W. PRUNER.

PULLIPSBURG Kansas, May 1st, 1883.

Dear Sir—Trees arrived all O. K. : have the larger part set out ; ground in good condition.

Yours, etc.,

H. S. & W. D. GRANGER.

GREELEY, Colorado, May 7th, 1883.

Mr. JOHNSON :

Dear Sir—The seedlings received in good condition. Got them planted in favorable time, and hope for good results.

Yours, etc.,

GEO. W. BUELL.

PASADENA, Cal., May 7th, 1883.

W. W. JOHNSON, Snowflake, Mich.:

Dear Sir—The trees ordered arrived yesterday in good condition, and are satisfactory.

Respectfully yours,

F. C. SHELDON, M. D.

## ADVERTISEMENTS.

FRESHOLD, Penn., May 26th, 1883.  
 Received goods the 24th. Many thanks for extras.  
 Yours truly, WASH. COLTON.

Mr. W. W. JOHNSON :  
 Dear Sir—The Catalpa plants you shipped the 18th inst. came all right in good condition.  
 Yours,  
 S. W. STULZMAN.

W. W. JOHNSON :  
 Dear Sir—Will you please send me your price list for 1883? If you make your more complete and enlarged edition of FOREST LEAVES (as you anticipated) please send me one. The 25 Wisconsin Weeping Willow cuttings you sent me last spring, all lived and are making rapid growth. At this date they are five feet, and have at least three months yet to grow before frost.  
 Yours truly,  
 IRA W. ADAMS.

EVANS, Colorado, June 21st, 1883.  
 Dear Sir—I take pleasure in stating to you that the trees ordered last spring came to hand in fine shape, and, although remaining at the R. R. Station ten days (by an oversight), all are now doing finely, and I am much pleased with your stock. Shall order more of you in the fall, and will recommend you to buyers in your line.  
 Yours truly,  
 GEO. H. HOWE.

NORTH BEND, Ohio, April 3, 1883.  
 Dear Sir—Many thanks for samples of Hardy Catalpa and White Ash seeds; both are correct as I believe. Catalpa presumably home grown.  
 Yours,  
 JNO. A. WARDER.

No. 5 PORTLAND ST., BOSTON, Mass., July 9th, 1883.  
 Mr. W. W. JOHNSON :  
 Dear Sir—It is due to you that I say that the 500 seedlings, by mail last spring, are doing exceedingly well, all living with slight exception and looking thrifty. The Catalpas which I wrote you May 23d (at the time set) looked lifeless, are the most thrifty of all.  
 Respectfully yours,  
 S. C. HOPKINS.

nn., May 26th, 1883.

WASH. COLTON.

ll., April 27th, 1883.

came all right in good

S. W. STULZMAN.

al., July 16th, 1883.

32? If you make your anticipated please send me last spring, all lived and have at least three

IRA W. ADAMS.

lo, June 21st, 1883.

ered last spring came to ten days (by an over our stock. Shall order our line.

GEO. H. HOWE.

Ohio, April 3, 1883.

White Ash seeds; both

D. A. WARDER.

, July 9th, 1883.

y mail last spring, are thrifty. The Catalpas are most thrifty of all. S. C. HOPKINS.



is now ready for distribution, and is conceded by both Press and Public to be "The most beautiful and useful Fruit catalogue ever published." It is profusely illustrated with truthful engravings of the best Fruits, and is replete with information valuable to all interested in their culture. The descriptions are accurate, honest, and the prices moderate. Free to all applicants. Send for it.



*My Specialty.* In addition to all the Standard Varieties I have a large and superior stock of the invaluable extra early raspberry, the **HANSSELL**, of which I am the introducer. Also, **SOBERHAN** and **TYLER** Raspberries, **EARLY HARVEST**, **WILSON, JR.**, and **EARLY CLYDE** Blackberries, **ATLANTIC**, **DANIEL BOON**, **MANCHESTER**, **OLD IRON-CLAD**, **JAMES VICK**, **PRINCE OF BEEHIVE**, **LEGAL TENDER**, and other new Strawberries; **JESSICA** (the superb new, early white Grape, of which I have the exclusive sale in the United States), **POCKLINGTON**, **EARLY VICTOR**, **LADY WASHINGTON**, etc.; **FAY'S PROLIFIC CURRANT**.



In this department a specialty is made of the **PEACH**, **200,000** Fine Trees, worked on stocks grown from natural Tennessee seed, and entirely free from "rotions," or any other disease. All the Standard Varieties in large supply and a fine stock of such new sorts as **SCHUMAKER**, **WAGER**, **WATERBURY**, **WHITLAND**, **LORD PALMERSTON**, etc. Among the other novelties in Fruit Trees I will name **YELLOW TRANSPARENT**, **RED BIRCHMEIER**, and **LANGFORD** Apples; **KIEFFER'S HYBRID** and **LECONTE** Pears; **RUSSIAN** Apricot, **CHAMPION** Quince. A large stock of Nut Bearing Trees, embracing both Standard and New Varieties.

Remember the Catalogue costs you nothing and may save you a great deal.  
 Four Fruit Farms, } Address, - **J. T. LOVETT,** } *Introducer of the Cuthbert Raspberry and*  
 Three Greenhouses. } **Little Silver, New Jersey.** } *Manchester Strawberry*

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A 10-ft. Mill will pump from 50 to 300 barrels of water every 24 hours; it will handle a pump in a well 150 feet deep. Also manufacturers of the Star Wood Pumps, Door and Window Screens, Boss Sickle Grinders, &c. To dealers we can offer superior inducements to handle our goods. Over 3,000 dealers are now handling our manufactures.



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**POWELL & DOUGLAS,**  
**WAUKEGAN, ILL., U. S. A.**



WG Reid

## U. S. LAW TO ENCOURAGE TREE PLANTING.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act entitled "An Act to amend the act entitled 'An Act to encourage the growth of timber on Western Prairies,' approved March thirteenth, eighteen hundred and seventy-four, be and the same is hereby amended, so as to read as follows: That any person who is the head of a family, or who has arrived at the age of twenty-one years, and is a citizen of the United States, or who shall have filed his declaration of intention to become such, as required by the naturalization laws of the United States, who shall plant, protect and keep in a healthy, growing condition for eight years ten acres of timber, on any quarter-section of any of the public lands of the United States, or five acres on any legal subdivision of eighty acres, or two and one-half acres on any legal subdivision of forty acres or less, shall be entitled to a patent for the whole of said quarter-section, or of such legal subdivision of eighty or forty acres, or fractional subdivision of less than forty acres, as the case may be, at the expiration of said eight years, on making proof of such fact by not less than two credible witnesses, and a full compliance of the further conditions as provided in section two: Provided further, That not more than one-quarter of any section shall be thus granted, and that no person shall make more than one entry under the provisions of this act.

Sec. 2. That the person applying for the benefits of this act shall, upon application to the register of the land-district in which he or she is about to make such entry, make affidavit, before the register or the receiver, or the clerk of some court of record, or officer authorized to administer oaths in the district where the land is situated; which affidavit shall be as follows, to wit: I, \_\_\_\_\_, having filed my application number \_\_\_\_\_, for an entry under the provisions of an act entitled "An Act to amend an act entitled 'An Act to encourage the growth of timber on the Western Prairies,' approved \_\_\_\_\_, 1874, do solemnly swear (or affirm) that I am the head of a family (or over twenty-one years of age), and a citizen of the United States (or have declared my intention to become such); that the section of land specified in my said application is composed exclusively of prairie lands, or other lands devoid of timber; that this filing and entry is made for the cultivation of timber, and for my own exclusive use and benefit; that I have made the said application in good faith, and not for the purpose of speculation, or directly or indirectly for the use or benefit of any other person or persons whomsoever; that I intend to hold and cultivate the land, and to fully comply with the provisions of this said act; and that I have not heretofore made an entry under this act, or the acts of which this is amendatory. And upon filing said affidavit with said register and said receiver, and on payment of ten dollars if the tract applied for is more than eighty acres, and five dollars if it is eighty acres or less, he or she shall thereupon be permitted to enter the quantity of land specified; and the party making an entry of a quarter-section under the provisions of this act shall be required to break or plow five acres covered thereby the first year, five acres the second year, and to cultivate to crop or otherwise the five acres broken or plowed the first year; the third year he or she shall cultivate to crop or otherwise the five acres broken the second year, and to plant in timber, seeds, or cuttings the five acres first broken or plowed, and to cultivate and put in crop or otherwise the remaining five acres, and the fourth year to plant in timber, seeds, or cuttings the remaining five acres. All entries of less quantity than one-quarter section shall be plowed, planted, cultivated and planted to trees, tree-seeds, or cuttings, in the same manner and in the same proportion as hereinbefore provided for a quarter-section: Provided, however, That in case such trees, seeds, or cuttings shall be destroyed by grasshoppers, or by extreme and unusual drought, for any year or terms of years, the time for planting such trees, seeds, or cuttings shall be extended one year for every such year that they are so destroyed: Provided further, That the person making such entry shall, before he or she shall be entitled to such extension of time, file with the register and the receiver of the proper land-office an affidavit, corroborated by two witnesses, setting forth the destruction of such trees, and that, in consequence of such destruction, he or she is compelled to ask an extension of time, in accordance with the provisions of this act: And provided further, That no final certificate shall be given, or patent issued, for the land so entered, until the expiration of eight years from the date of such entry; and if, at the expiration of such time, or at any time within five years thereafter, the person making such entry, or, if he or she be dead, his or her heirs or legal representatives, shall prove by two credible witnesses that he or she or they have planted, and, for not less than eight years, have cultivated and protected such quantity and character of trees as aforesaid; that not less than twenty-seven hundred trees were planted on each acre, and that at the time of making such proof there shall be then growing at least six hundred and seventy-five living and thrifty trees to each acre, they shall receive a patent for such tract of land.

Sec. 3. That if at any time after the filing of said affidavit, and prior to the issuing of the patent for said land, the claimant shall fail to comply with any of the requirements of this act, then and in that event such land shall be subject to entry under the homestead laws or by some other person under the provisions of this act: Provided, That the party making claim to said land, either as a homestead settler or under this act, shall give, at the time of filing his application, such notice to the original claimant as shall be prescribed by the rules established by the Commissioner of the General Land Office; and the rights of the parties shall be determined as in other contested cases.

Sec. 4. That no land acquired under the provisions of this act shall, in any event, become liable to the satisfaction of any debt or debts contracted prior to the issuing of the final certificate therefor.

Sec. 5. That the Commissioner of the General Land Office is hereby required to prepare and issue such rules and regulations, consistent with this act, as shall be necessary and proper to carry its provisions into effect; and the registers and receivers of the several land-offices shall each be entitled to receive two dollars at the time of entry, and the like sum when the claim is finally established and the final certificate issued.

Sec. 6. That the fifth section of the act entitled "An Act in addition to an act to punish crimes against the United States, and for other purposes," approved March third, eighteen hundred and fifty-seven, shall extend to all oaths, affirmations, and affidavits required or authorized by this act.

Sec. 7. That parties who have already made entries under the acts approved March third, eighteen hundred and seventy-three, and March thirteenth, eighteen hundred and seventy-four, of which this is amendatory, shall be permitted to complete the same upon full compliance with the provisions of this act; that is, they shall, at the time of making their final proof, have had under cultivation, as required by this act, an amount of timber sufficient to make the number of acres required by this act.

Sec. 8. All acts and parts of acts in conflict with this act are hereby repealed.  
Approved June 14, 1878.



