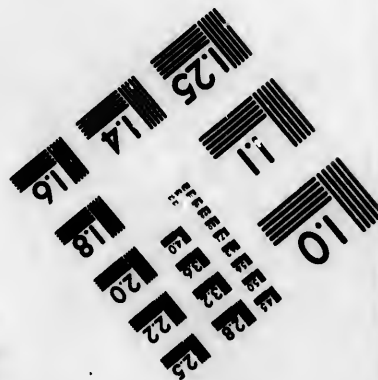
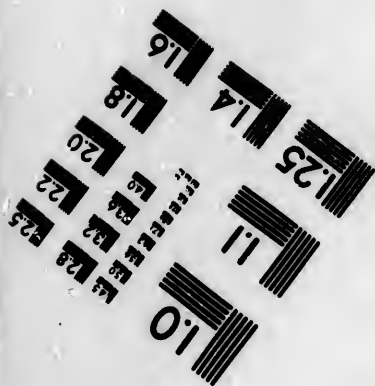
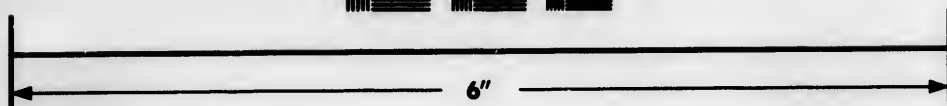
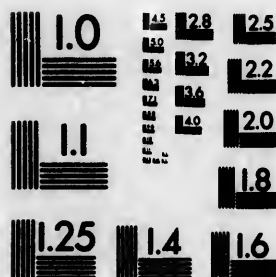


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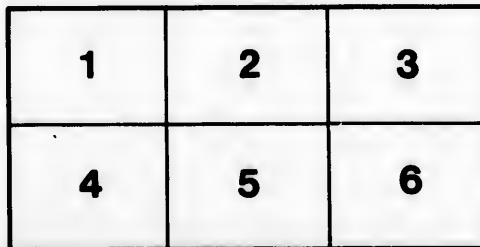
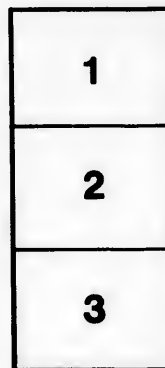
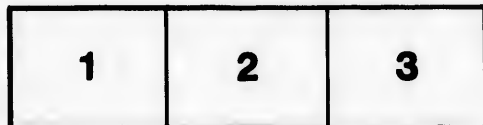
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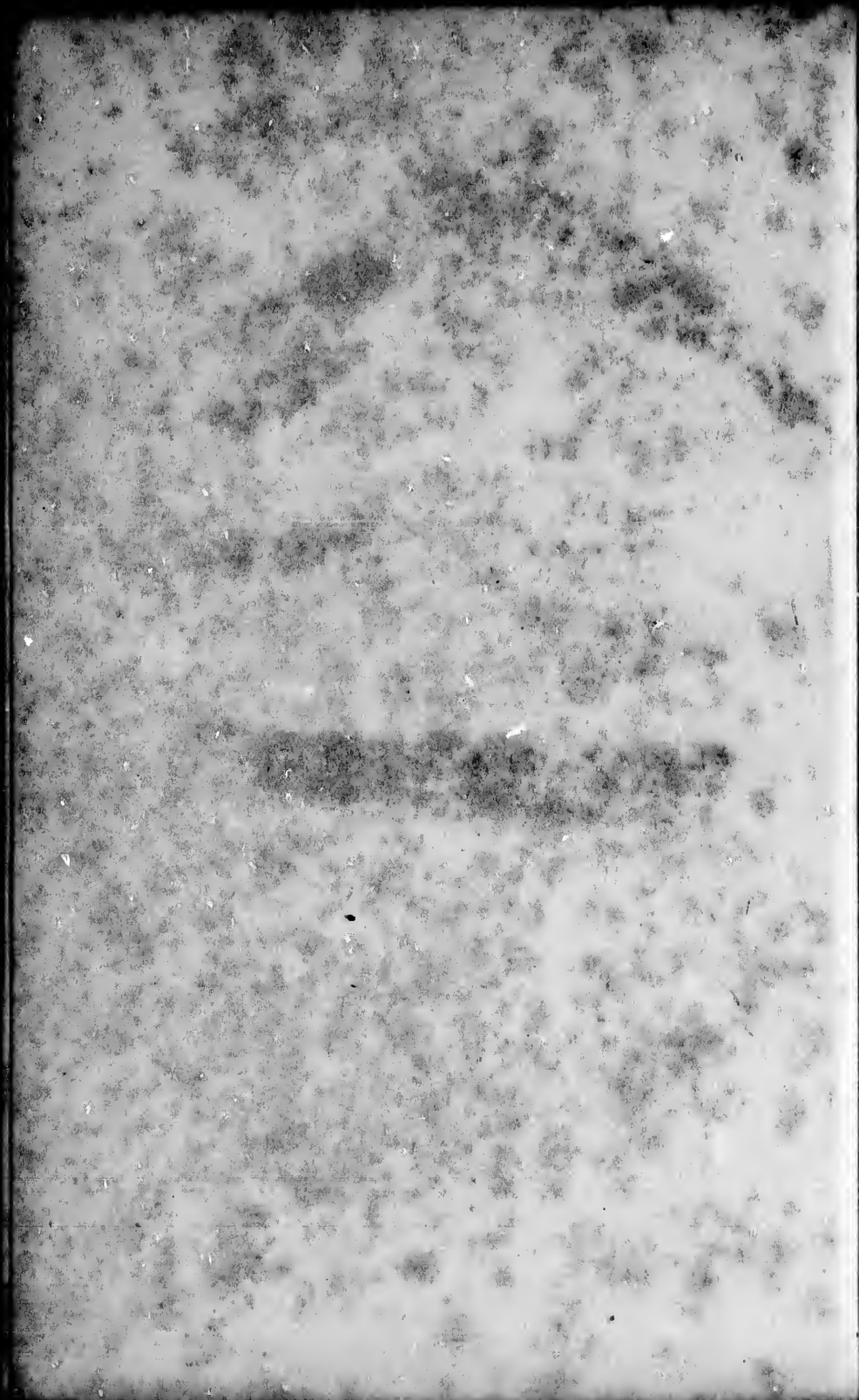
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OR
A DESCRIPTION OF THE FOREST TREES
OF THE
UNITED STATES, CANADA AND NOVA SCOTIA,

Considered particularly with respect to their use in the Arts,
and their introduction into Commerce;

TO WHICH IS ADDED
A DESCRIPTION OF THE MOST USEFUL OF THE EUROPEAN FOREST TREES.
ILLUSTRATED BY 156 COLOURED ENGRAVINGS

Translated from the French of

F. ANDREW MICHAUX,

Member of the American Philosophical Society of Philadelphia; Correspondent of
the Institute of France; Member of the Agricultural Societies of Charleston, S. C.,
Philadelphia and Massachusetts; Honorary Member of the Historical, Literary and
Philosophical Societies of New York.

.... *arbore sulcamus maria, terrasque admoveamus,
arbore exadificamus tecta.*

PLINII SECUNDI: *Nat. Hist.*, lib. xvi.

VOL. II.

PARIS,
PRINTED BY C. D'HAUTEL.

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1819.



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Bova del.

Gabriel sculp

Locust.

*Robinia pseudo-acacia.*

THE  
NORTH AMERICAN  
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LOCUST.

ROBINIA PSEUDO-ACACIA. *R. stipulis spinosis; foliis impari  
pinnatis; racemis cernuis seu pendulis; calicis dentibus  
muticis.*

Oss. Flores albi.

ONE of the first trees introduced into Europe from the forests of North America east of the Mississippi, was the Locust. For the acquisition of this tree, still more interesting for the excellent properties of its wood than for the beauty of its foliage and of its flowers, we are indebted to J. Robin, a French botanist, who received it from Canada, and cultivated it on a large scale, in the reign of Henry IV, about the year 1601. Since that period it has been so extensively propagated, that it has become universally known in France, England and Germany. To commemorate the introduction of so valuable a tree, and to express the acknowledgments due to the person who had conferred this benefit upon the Old Continent, Linnæus gave the genus to which it belongs the name of *Robinia*.

In the Atlantic States, the Locust begins to grow naturally in Pennsylvania, between Lancaster and Harrisburgh, in the latitude of  $40^{\circ} 20'$ . West of the mountains, it is found 2 or 3 degrees farther north; which is explained by an observation already repeated, that, in proceeding towards the West, the climate becomes milder and the soil more fertile. But the Locust is most multiplied in the South-West, and abounds in all the vallies between the chains of the Alleghany Mountains, particularly in *Limestone Valley*. It is also common in all the Western States, and in the territory comprised between the Ohio, the Illinois, the Lakes, and the Mississippi. It is not found in the States east of the river Delaware, nor does it grow spontaneously in the maritime parts of the Middle and Southern States, to the distance of from 50 to 100 miles from the sea, all the stocks that are seen in these parts having been planted at different periods.

The dimensions of the Locust vary with the soil and climate: thus in Pennsylvania, between Harrisburg and Carlisle, where it begins to appear, it is much smaller than in Virginia, and particularly in Kentucky and West Tennessee, which are situated 3 or 4 degrees farther south, and where the soil is more fertile. In these States it sometimes exceeds 4 feet in diameter, and 70 or 80 feet in height; which is twice the size it attains east of the mountains.

The foliage of the Locust is light and agreeable to the eye. Each leaf is composed of opposite leaflets, 8,

10, 12, and sometimes more, in number, surmounted by an odd one. The leaflets are nearly sessile, oval, thin, of a fine texture, and of so smooth a surface that the dust is blown off from them as it alights. These leaves are rarely injured by insects.

The flowers are disposed in numerous pendulous bunches: they are perfectly white, and diffuse the most delicious odour. Their fine effect, heightened by the fresh tint of the light green foliage, renders the Locust one of the most admired, in Europe, among ornamental trees. In passing through Harrisburgh on the 4th of June, 1808, I saw the Locust in full bloom: it was in flower at the same season of the year 1812, at Paris, in the latitude of  $48^{\circ} 50'$ . The flower succeeds a narrow, flat pod, about 3 inches long, containing 5 or 6 small seeds, which are commonly brown, and sometimes black.

On the trunk and large limbs of the old Locust, the bark is very thick and deeply furrowed. The young tree, till it attains the diameter of 2 or 3 inches, is armed with formidable thorns, which disappear in its maturer age. The wood, which is commonly of a greenish yellow colour, marked with brown veins, is hard, compact, and susceptible of a bright polish; it has a good deal of strength with but little elasticity. Its principal value in the United States, where the greater part of the houses and of the fences of cultivated grounds are of wood, is its power of resisting decay longer than almost any other species of wood.

Though the Locust is multiplied east of the mountains, in the upper part of Virginia and of the two Carolinas, it forms a much smaller proportion of the forests than the Oaks and Walnuts, and it is nowhere found occupying exclusively tracts even of a few acres. For this reason it is the only tree, besides the Black Walnut, that is left standing in the clearing of new lands : hence these two species, which are not sufficiently multiplied to supply the demand for their wood, are frequently seen growing in the midst of cultivated fields.

The greatest consumption of Locust wood is for posts, which are employed of preference for the enclosing of court-yards, gardens and farms, in the districts where the tree abounds, and in the circumjacent country. They are transported for the same use to Lancaster, Baltimore, Washington, Alexandria and the vicinity. When the trees are felled in the winter, while the circulation of the sap is suspended, and the posts are allowed to become perfectly dry before they are set, they are estimated to last 40 years. Experience has shown that their duration varies according to certain differences in the trees from which they are formed : thus about Lancaster and at Harrisburgh, a small town on the Susquehannah, where a considerable trade is carried on in wood that is brought down the river, those trees are reputed the best whose heart is red ; the next in esteem are those with a greenish yellow heart ; and the least valuable are those with a white heart. From

this variety in the colour of the wood, which probably arises from a difference of soil, are derived the names of Red, Green, and White Locust. In the Western States there is a variety which is sometimes called Black Locust:

Great quantities of Locust posts are sold at Harrisburgh: they are 7 or 8 feet long, and the price is 18 cents each in the rough state, or 25 cents when hewn and mortised. They are made from stocks less than a foot in diameter, split into two pieces. I have remarked that when the trunk of the Locust exceeds 15 inches in diameter it is frequently decayed at the heart; but I presume this defect is not found in trees that grow farther south. Posts of Locust and of Red Cedar of the same dimensions are sold in the *lumber-yards* of Baltimore; those of Locust at 40 cents, and those of Red Cedar at 50. This difference is probably attributable to the great strength of the Locust. In the Western States also, where this tree is larger and more abundant than in the country east of the mountains, it is the most esteemed and the most generally employed for posts.

In naval architecture the ship-wrights use as much Locust wood as they can procure. It is as durable as the Live Oak and the Red Cedar, with the advantage of being stronger than the one, and lighter than the other. It enters, with the Live Oak, the White Oak, and the Red Cedar, into the upper and lower parts of the frame, though in a very small proportion; for in the interior



of Pennsylvania, Maryland and Virginia; where, as I have observed, it grows naturally and whence it is procured, nine tenths of the Locusts do not exceed a foot in diameter, and from 36 to 40 feet in height: it thus becomes difficult to procure timber of the requisite size. Another very important use of the Locust in ship-building is for the *trunnels* or the pins destined to attach the *side-planks* to the frame. Instead of decaying, they acquire with time an extreme hardness, and they are used, to the exclusion of all others, in the ports of the Middle States. The mean price at Philadelphia, whither they are brought from the river Susquehannah, is 10 dollars a thousand. From fifty to a hundred thousand of these pins are annually exported to England.

In the construction of houses, even of such as are wholly of wood, the Locust is not extensively employed in the countries where it is most multiplied: the use to which it is more particularly applied is to support the *sills* or the beams on which the frame reposes. These *sills* are of Oak, and if they were placed immediately on the ground, they would decay more rapidly than the Locust. This invaluable property of durability, which is possessed by the Locust in a degree far superior to that of any other tree except the Red Mulberry, sufficiently indicates the purposes to which it may be advantageously applied: but in the United States its use is limited to the objects which I have enumerated, and it is through mistake that it has been said to be employed for staves and hoops, and for composing hedges.

From the hardness of the Locust wood when seasoned, from the fineness of its grain and its lustre when polished, it has been, for ten years, extensively substituted by turners for the Box in many species of light work, such as salt-cellars, sugar-bowls, candlesticks, spoons and forks for sallad, boxes, and many other trifling objects which are carefully wrought into pleasing shapes, and sold at low prices.

The rapid growth of the Locust was early remarked by the inhabitants of the United States; for this is an inestimable quality in a tree whose wood unites so many excellencies. This consideration has induced many persons to plant it in those parts of the country where it does not naturally grow, particularly in the lower part of the States lying east of the river Delaware. Thus between New York and Boston, a distance of nearly 300 miles, it is seen at intervals growing before the farm-houses, and sometimes by the side of the fences: but perhaps not one proprietor in a hundred has adopted this useful measure. On Long Island, near the west end of which lies the city of New York, the forests were in a great measure destroyed in the war of Independance, and many persons have successfully adopted the cultivation of the Locust on an extensive scale: but these plantations are still very much circumscribed, and, except the larger trees which are cut into *trunnels*, and which serve to supply in part the demand of the ship-wrights of New York, the whole growth is

consumed by the cultivators. Regular plantations of Locust of 20 or 30 acres have not been formed in any part of the United States, though several agricultural societies have offered premiums for their encouragement.

Within 18 or 20 years an obstacle has unhappily appeared, which will contribute greatly to prevent the multiplication of the Locust in all the anciently settled parts of the United States : this is a winged insect which attacks the tree while standing, penetrates through the bark into the centre of the trunk, and, for the space of a foot, mines it in every direction, so that it is easily broken by the wind. This inconvenience is already so serious as to induce many people to forego all attempts to form plantations of Locust. In Virginia, I have not learned that trees of the natural growth have been visited by this destroyer, but those that have been reared about the plantations have already felt its ravages. This evil, which it appears difficult to remedy, will be more sensibly felt when the destruction of the forests now on foot, an inevitable consequence of the increase of population and of the neglect of all measures of preservation, shall force the inhabitants to have recourse to plantations, which they will wish to form in a certain proportion of the Locust. Hence it may result that, disappearing successively from the American forests by constant consumption, and not being reproduced on account of this insect, the Locusts will become extremely rare in their native

country, and abundant in Europe, where no similar catastrophe forbids their propagation.

Though I have asserted that I have seen Locusts in America 70 or 80 feet high, it must be observed that this luxuriant growth is confined to the most fertile districts of Kentucky and West Tennessee, where the newly cleared lands yield for several years in succession, without manure, from 30 to 60 bushels of maize or *Indian corn* an acre. In general, this tree does not exceed 40 or 45 feet in height on lands of a middling quality, that produce the Oaks and the Hickories, compared with which the Locust is a tree only of secondary size, affording timber of inconsiderable dimensions. For this reason it should not be substituted for the Oak, the Beech, the Chesnut and the Elm, in soils where these species already flourish.

In Europe, the greatest share of attention has been bestowed upon the Locust, and the most extended observations on its culture have been published in countries lying north of the 48° of latitude: but notwithstanding the success which is said to have been obtained in cultivating it, I cannot think that this is its proper climate. I have observed, as well as many other persons, that its vegetation is accelerated by the warmth of a more southern sun: the effect is visible even at Orleans, where, though the difference of latitude is only one degree, the Locusts are larger than in the vicinity of Paris. Italy and the southern departments of France

are the countries of Europe where the greatest advantages may be expected from the rapid growth of the Locust. Individuals who are more in haste than governments to realise their gains, may obtain from it, at the end of 20 or 25 years, a mass of wood twice as great as from any other species of tree; and it might be formed in this country, as in America, into *trunnels* for the purposes of ship-building, and sold at a high price in the sea-ports. Raised upon uncultivated and open grounds, the quality of the wood would be superior to that of trees growing in the primitive forests of the New World, where it is injured by the humidity of the atmosphere.

It appears from the authors who at different periods have written on the Locust, that about 100 years since it was in great request in Europe on account of the beauty of its foliage and of its fragrant flowers. It was afterwards found to have defects, and declined so far in public favour, that during half a century it fell into entire neglect. Within 10 or 15 years, several agriculturists have given it fresh celebrity, by representing it as an useful rather than an ornamental tree; though its merit in this last respect is undeniable.

In France, and still more in Germany, much has been published in favour of the Locust, and very little has been written against it; but the greater part of those who are engaged in forming plantations oppose its propagation. It appears to have been too much vaunted on the one hand, and too much decried on

the other, and not to have been justly appreciated in those respects in which it has an incontestable superiority over most other trees of the temperate zones.

If I may be allowed to give my opinion, I should say that its principal advantages consist in the rapidity of its growth, and in the excellent qualities by which its wood is fitted for the most important uses. To these must be added another property by which it is distinguished from other trees of a rapid growth, and which has not been placed in a sufficiently striking light by the authors who have treated of the Locust : it is that of beginning from the third year to convert its sap into perfect wood ; which is not done by the Oak, the Chestnut, the Beech and the Elm, till after the tenth or the fifteenth year. Hence, if all these species were planted at the same time upon good land, in 25 or 30 years the Locusts, already one third larger in general than the others, and often twice as large, would be found almost wholly composed of heart, and would be of sufficient dimensions for the various uses to which their wood is adapted ; while the others, besides being too small at this age to be employed with advantage, would have only half the diameter of the trunk converted into perfect wood. This is a most important consideration, for it is well known that every species of wood must be deprived of the sap before it is used, as this part is subject to become worm-eaten if it is sheltered, and to decay if it is exposed to the air.

But these prominent excellencies are balanced by defects which seem difficult to remedy. When standing alone, the branches of the Locust are easily broken by the wind: if left to itself, its trunk, after attaining a certain height, rarely preserves its shape; and the limbs, ill arranged, of unequal size and very divergent, give to its summit an uncouth and disagreeable form. Its thin and restless foliage yield also a scanty shade: hence this tree is not proper for the avenues and allies of extensive gardens, nor for bordering public roads: for these purposes the Elm is infinitely superior; for, besides the facility with which it is fashioned by the pruning-hook, its tufted foliage casts a denser shade, and its wood is of great value to the wheel-wright.

It is observed also that in plantations of Locusts whose verdure announces the most vigorous vegetation, there are some trees which languish and turn yellow: the cause of this malady it is difficult to assign.

For several years past the proprietors of the department of the *Gironde* and of the neighbouring country have taken advantage of the rapid growth of the Locust by cultivating it in copses, which are cut at the age of four years. The young stocks are then large enough to be split into props for vines, which are found to last more than twenty years. Old trees are also lopped, and the suckers cut every third year for the same purpose. This vigorous vegetation is doubtless attributable to the warmth of the climate.

The greatest inconvenience attending these copses is the thorns with which the young plants are armed, and by which the preparing of them for use is rendered more difficult and expensive than that of any other species. This disadvantage, however, is compensated by a double product obtained in half the time.

I must not omit to mention a new variety of Locust; called *Robinia pseudo-acacia spectabilis*, which in its early age is entirely destitute of thorns. This valuable variety is distinguished by the superior size of its leaves and by the greater rapidity of its growth. Though its seeds produce stocks with thorns, it is still probable that they will disappear from the future generations of the tree: in the meanwhile this variety may be multiplied by layers, or by forming small trenches in which the roots will send up shoots that may be afterwards separated from the parent tree.

I need not say how much this variety is preferable for copses; the twigs, with their leaves, may also be safely given to cattle, who eat them with avidity. For the production of this variety, which gives a new value to the Locust, particularly in the south of France, we are indebted to Mr. Descemet, a gentleman distinguished by his theoretical and practical knowledge of agriculture.

It has been asserted that the most profitable manner of disposing of poor lands, too much exhausted to produce the Oak and other species of hard wood, is to cover them with copses of Locust: but about Paris, and



farther north, the experiment has not uniformly succeeded. During three or four years, the Locusts surpass the Birches planted at the same time, and give the most flattering promise; but by the seventh or eighth year their voracious roots appear to exhaust the soil, the branches about the middle of the young tree perish, and its short and languishing shoots announce its decay; while, on the other hand, the young Birches continue healthful and vigorous, and some of them already equal the Locusts in height. Perhaps the Locusts require lopping the third or fourth year.

Such is the fruit of my enquiries concerning this tree in America, and my observations on its culture in Europe. Its propagation is attended with advantages and disadvantages: on weighing them together, I am of opinion that, as an ornamental and as a useful tree, it merits a place, particularly the variety without thorns, both in gardens and plantations.

PLATE LXXVI.

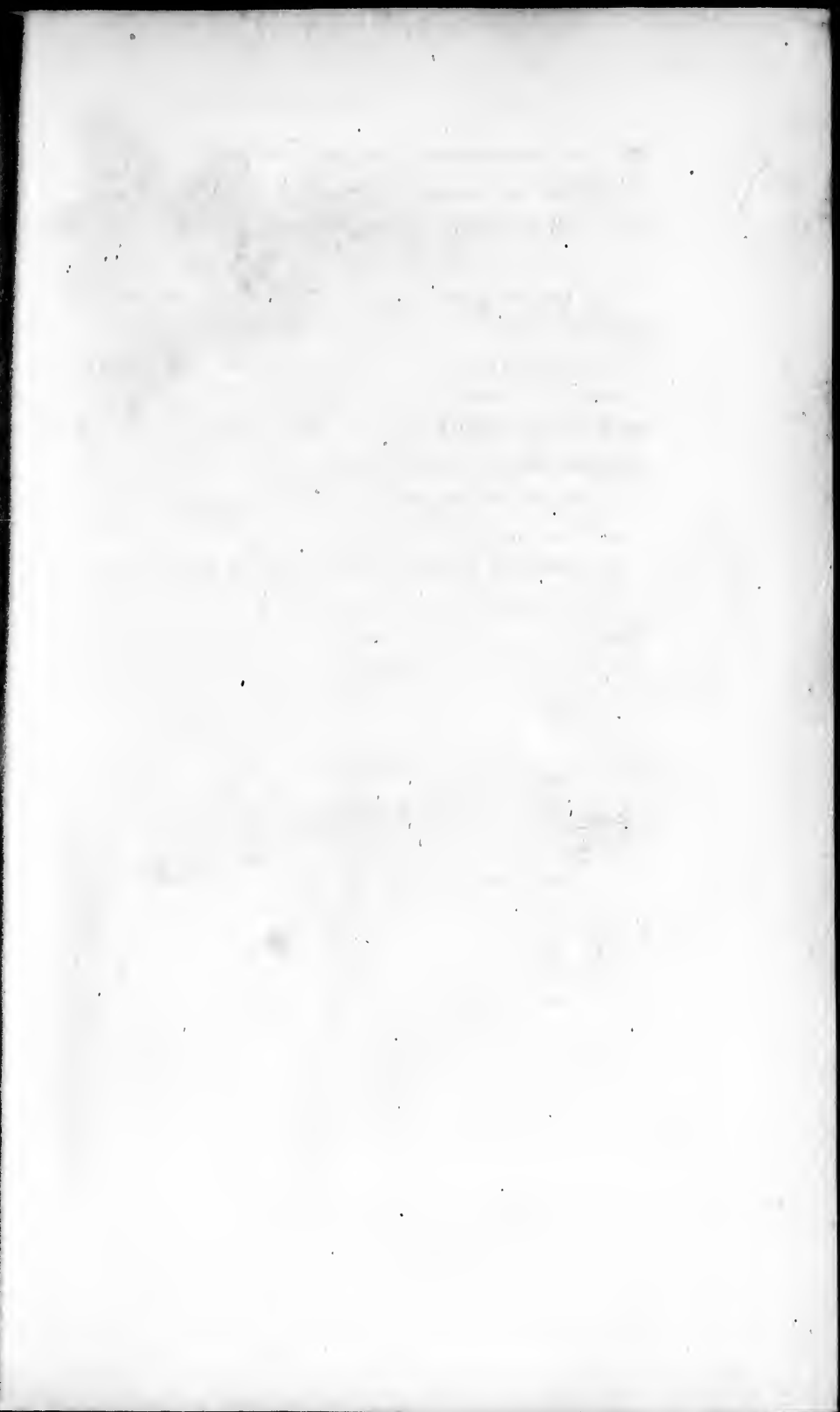
*A branch with a bunch of flowers. Fig. 1, A pod. Fig. 2, A seed.*

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Fig. 2,





Brown del.

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Rose flowering Locust.  
*Robinia viscosa.*

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## ROSE-FLOWERING LOCUST.

**ROBINIA VISCOSA.** *R. foliis impari pinnatis; ramis viscoso glandulosis.*

*Ord. Flores roseo-albi.*

THIS species of Locust is found only on that part of the Alleghanies which traverses Georgia and the Carolinas, and in the territory of the Cherokee Indians, situated west of the mountains. My father discovered it in the summer of 1790, and his subsequent researches, as well as my own, confirm the opinion that it does not exist north of the 35th degree of latitude, nor in all the lower part of the Southern States: hence it appears to be confined to a very small tract.

The Rose-flowering Locust is not as large as the preceding species: its ordinary stature does not exceed 40 feet, with a diameter of 10 or 12 inches. Its branches, like those of the Locust, are garnished with thorns, which, however, are smaller and less numerous. The annual shoots are of a dull red colour, and are covered with a viscid, adhesive humour: Mr. Vauquelin, of the French Institute, has analysed this substance, and found it to be a new vegetable matter.

The foliage of the Rose-flowering Locust is thick and of a dusky green. The leaves are 5 or 6 inches long, and are composed of opposite leaflets, 10, 12, or 14 in



Gabriel

number, with a terminal odd one. The leaflets are about an inch in length, oval, nearly sessile, smooth, and of a fine texture.

The flowers are in oval bunches 4 or 5 inches long. They are numerous and of a beautiful rose colour, but destitute of fragrance. This tree not unfrequently blooms twice in the year, and it forms one of the most brilliant ornaments of the park and the garden. The seeds are small and contained in hairy pods 2 or 3 inches long, and 3 or 4 lines broad.

Well-informed and unprejudiced cultivators, employed in the raising of exotic trees and plants, assure us that seeds of the Rose-flowering Locust, which they have themselves collected and sown, have produced the Locust. The difference between the two species is however so distinctly characterized, that this metamorphosis is hardly credible.

The wood of the Rose-flowering Locust is of a greenish colour, like that of the common species, which it resembles also in its other properties: but the inferior size of the tree, notwithstanding its surprisingly rapid growth, renders it less interesting to the arts.

This species easily supports the rigorous winters of New York and Pennsylvania, where it succeeds perfectly well; several stocks sent by my father to his friends residing in these Capitals, bloom luxuriantly every year: but it is liable to the ravages of the same insect which destroys the Locust;

This beautiful tree was introduced into Europe in 1791: my father, who had transported it from the mountains to his garden near Charleston, S. C., sent me a stock, which arrived in July of that year. I presented it to Mr. Lemonnier, first physician of Lewis XVI, who planted it in his garden at *Petit Montreuil*, near Versailles, where it is still standing. From this stock are derived, by sprouts or by grafting, all the trees of the species which at present adorn the pleasure grounds throughout Europe.

## PLATE LXXVII.

*A branch with flowers of the natural size. Fig. 1, A pod.  
Fig. 2, A seed.*

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## YELLOW WOOD.

VIRGILIA LUTEA. *V. foliis impari-pinnatis, foliolis ovato-acuminatis; racemis pendulis; gemmis inclusis.*

Ona. Flores albi.

THE Yellow Wood is confined to that part of West Tennessee which lies between the 35th and the 37th degrees of Latitude, where it is commonly designated by the name which I have adopted.

This tree grows of preference on gentle declivities, in a loose, deep and fertile soil, and is usually accompanied by the Red Mulberry, Coffee Tree, Sweet Locust, Black Walnut, and other species whose presence evinces the richness of the land. It rarely exceeds 40 feet in height and one foot in diameter, and in general it does not attain even these dimensions. Its trunk is covered with a greenish bark, which is smooth instead of being furrowed like that of most other trees.

The leaves of the Yellow Wood are 6 or 8 inches long on old trees, and of twice this size on young and thrifty stocks. They are composed of two rows of leaflets, smooth, entire, nearly round and about an inch and a half in diameter. The leaflets are 3, 4 or 5 on each side, borne by short petioles, and surmounted by an odd one which is supported by the common footstalk. As in the



W. S. Kesteven del.

G. S. Gilbert sc.

Yellow Wood.  
*Vizydia lutea.*

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Buttonwood, the lower part of the footstalk contains the bud, which becomes visible in plucking the leaf.

The flowers form elegant, white, pendulous bunches, a little larger than those of the Locust, but less odoriferous.

The seeds of the Yellow Wood also nearly resemble those of the Locust, and are contained in pods that differ only in being a little narrower. The seeds are ripe in the vicinity of Nashville about the 15th of August, at which season, in the year 1812, I collected a quantity and afterwards distributed them in France to nurserymen and amateurs of foreign plants. From these seeds have sprung the trees which we see growing with so much vigour in Europe, and mocking the rigour of our winters: several of them bloomed in the year 1813.

From the form and foliage of this tree, my father was of opinion that it belonged to the genus *Sophora*: the affinity is proved by the fact that it is grafted with success into that genus only. It was hastily ranged as a new genus, by the name of *Virgilia*, before its flowers had been examined; though without the inspection of this part of a vegetable no certain opinion can be formed of its affinities.

To procure the seeds from which have sprung the beautiful trees that are seen in the gardens of Paris, I felled several stocks, and thus had an opportunity of examining the quality of the wood. Its grain is fine and soft; it is principally remarkable for the yellow

colour of the heart, which speedily imparts this hue to cold water; but the colour is fugitive even where the wood is boiled with alum. The inhabitants of the country were very desirous of finding some method of rendering it permanent.

Aside from the fine vegetation of the Yellow Wood, the brilliant colour of its heart appears to me to be a sufficient motive for multiplying it till we become able to appreciate its importance in dying.

PLATE LXXVIII.

*A leaf of half the natural size. A bunch of flowers of the natural size. Fig. 1, A pod. Fig. 2, A seed.*

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Boson del.

Gubriel sculp.

Sweet Locust  
*Gleditsia triacanthos.*

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## SWEET LOCUST.

*Polygamia dioecia.* LINN.

*Leguminosae.* Juss.

**GLEDITSIA TRIACANTHOS.** *G. ramis spinosis ; spinis crassis ;  
foliis lineari-oblongis ; leguminibus longis , compressis ,  
polyspermis.*

THE Sweet Locust belongs peculiarly to the country west of the Alleghany Mountains, and it is scarcely found in any part of the Atlantic States, except in Limestone Valley and its branches, which lie between the first and second ranges of the Alleghanies, beginning near Harrisburgh in Pennsylvania, in the latitude of 40° 42', and extending from north-east to south-west into the State of Virginia. The soil in this valley is generally very substantial. In the fertile bottoms which are watered by the rivers emptying into the Mississippi, in the Illinois country, and, still more, in the southern part of Kentucky and Tennessee, the Sweet Locust is abundant. It commonly grows with the Black Walnut, Shell-bark Hickory, Red Elm, Blue Ash, Locust, Box Elder and Coffee Tree, and forms a part of the forests that cover the most fertile soils. In different parts of the United States, this species is called indifferently Sweet Locust and Honey Locust; the French of Illinois call it *Févier*.

In situations the most favourable to its growth, such as I have observed on the banks of the Ohio, between Gallipolis and Limestone, the Sweet Locust attains a very ample size. I have measured several stocks which were 3 or 4 feet in diameter, and which appeared to equal in height the loftiest trees of these immemorial forests. Some of them had the trunk undivided for 40 feet.

The Sweet Locust is easily known by its bark, which, at intervals of a few inches, detaches itself laterally in plates 3 or 4 inches wide and 2 or 3 lines thick, and by the form of its trunk, which appears to be twisted, and which presents three or four crevices of inconsiderable depth, opening irregularly from the bottom towards the top. The large thorns which cover the branches, and frequently the trunk of young trees; afford another very distinct character. These thorns are sometimes several inches long, ligneous, of a reddish colour, and armed, at some distance from the base, with two secondary thorns about half the size of the first.

The leaves of the Sweet Locust are pinnated and composed of small, oval, serrate, sessile leaflets. This foliage is elegant and of an agreeable tint; but it is thin, and scarcely obstructs the passage of the sun-beams. It is shed annually at the approach of winter.

The flowers are small, not very conspicuous, and disposed in bunches. The fruit is in the form of flat,

crooked, pendulous pods, from 12 to 18 inches long, and of a reddish brown colour. The pods contain brown smooth, hard seeds, enveloped in a pulpy substance, which, for a month after their maturity, is very sweet, and which then becomes extremely sour. Beer is sometimes made by fermenting this pulp while fresh; but the practise is not general, as the Apple Tree and Peach Tree, particularly the last, have become common in the Western Country, and afford a much superior beverage.

The perfect wood or heart of the Sweet Locust nearly resembles that of the Locust, but its grain is coarser and its pores more open: in these respects it is more strikingly characterised even than the wood of the Red Oak. When perfectly seasoned it is extremely hard. It is little esteemed in Kentucky, where it is more employed; and consequently can be better appreciated, than elsewhere. It is used neither by the carpenter nor the wheelwright: it is sometimes taken by the farmers for rails to fence their fields, but only when they are unable to procure better wood. It is found by experience to be far inferior to the Wild Cherry and Black Walnut for cabinet-making. The only destination for which it appears to be peculiarly adapted is the forming of hedges, which would be rendered impenetrable by its long thorns.


The Sweet Locust has been cultivated for many years in Europe. It flourishes, blooms, and yields seed in the



climates of London and Paris; but its vegetation is less active than in the south of France.

## PLATE LXXIX:

*A branch with leaves and a thorn of the natural size.*  
*Fig. 1, A pod of the natural size. Fig. 2, A seed.*



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*tural size.*



Boca del.

Gabriel sculp

Water locust.  
*Gleditsia monosperma*

# WATER LOCUST.

**GLEDITSIA MONOSPERMA:** *G. ramis subspinosis; foliis ovato-oblongis; leguminibus ovalibus, mucronatis, monospermis.*

This species is plainly distinct from the preceding, especially in the form of its fruit, and belongs to a more southern climate; in the Atlantic States it is first seen in the lower part of South Carolina. The point at which it is found nearest to Charleston is about two miles beyond Slanbridge, at the distance of 32 miles: In South Carolina, as well as in Georgia and East-Florida, where I have myself observed it, this tree, though not very rare, is not common, and the traveller sometimes loses sight of it for whole days, in tracts that seem peculiarly favourable to its growth. In the Western Country it is found 3 or 4 degrees farther north; near Kaskaskias in the Illinois Country.

In the Southern and maritime part of the United States this tree is designated by no other name than that of Water Locust, and grows only in the large swamps that border the rivers, where the soil is constantly wet and, often, inundated at the season of the rising of the waters. It is commonly associated with the Cypress, Large Tupelo, Red-flowering Maple; Overcup

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Gabriel sculp

Oak, Planer Tree, and Nutmeg Hickory. It is probably found, also, united with the same trees, in the impenetrable forests which cover the swamps on the banks of the Mississippi.

The Water Locust is 50 or 60 feet high, and from 1 to 2 feet in diameter. The bark upon the trunk of young trees is smooth; on old stocks it is cracked, but less deeply than that of the Oaks and the Walnuts. The branches, like those of the Sweet Locust, are armed with thorns, which are less numerous, smaller and more pointed; they are often simple, or accompanied near the base with a single secondary thorn.

The leaves nearly resemble those of the Sweet Locust, from which they differ in being a little smaller in all their proportions.

The flowers, which are not conspicuous, are of a greenish colour and destitute of odour. The pods are ripe at the beginning of November. They are reddish, about an inch in diameter, and united in bunches of three or four pods, each of which contains a single naked seed.

The wood of the Water Locust resembles that of the Sweet Locust in its loose texture and yellow colour; but as it grows in wet grounds, it is consequently inferior in quality. In Carolina and Georgia it is wholly neglected in use.

I believe there exists in the Western States another species of Prickly Locust, whose pods are narrow and

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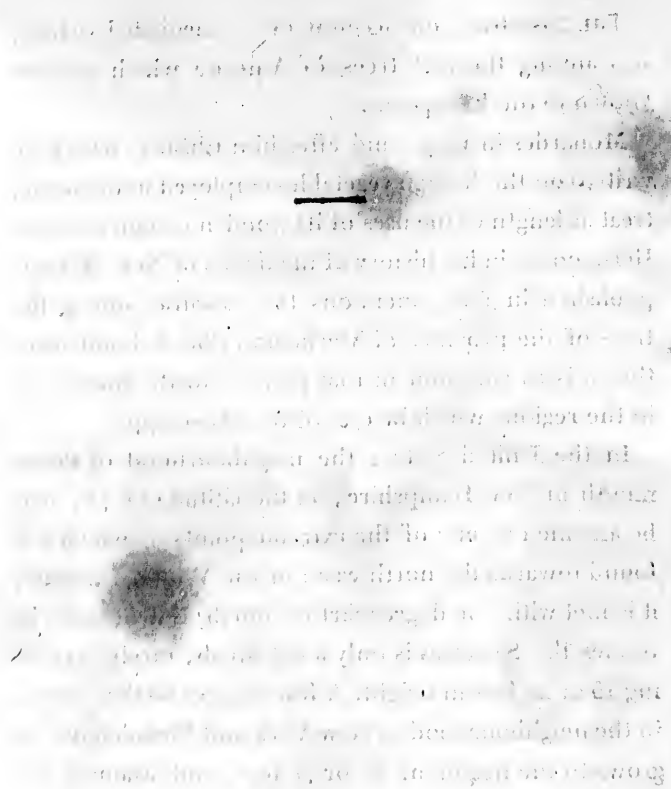
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**WATER LOCUST:**

only 4 inches in length; but my information is not sufficiently accurate to allow me to describe it.

**PLATE LXXX:**

*A branch with leaves and a thorn of the natural size.*  
*Fig. 1, A pod of the natural size. Fig. 2, A seed.*



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**SASSAFRAS.**

*Encandria monogyria.* Linn.

Laurina. Juss.

**LAURUS SASSAFRAS.** *L. foliis deciduis, integris trilobisque ;  
floribus dioicis.*

THE Sassafras, on account of its medicinal virtues, was among the first trees of America which became known to the Europeans.

Monardes in 1549, and after him Clusius, who have written on the foreign vegetables employed in medicine, treat at length of the uses of its wood in certain diseases. Hernandes, in his history of the plants of New Mexico, published in 1638, mentions the Sassafras among the trees of the province of Mechoacan ; but I doubt whether it is as common in that part of North America as in the regions which lie east of the Mississippi.

In the United States, the neighbourhood of Portsmouth in New Hampshire, in the latitude of 43°, may be assumed as one of the extreme points at which it is found towards the north-east : in the Western Country it is met with one degree farther north. But in these latitudes the Sassafras is only a tall shrub, rarely exceeding 15 or 20 feet in height. A few degrees farther south, in the neighbourhood of New York and Philadelphia, it grows to the height of 40 or 50 feet, and attains a still

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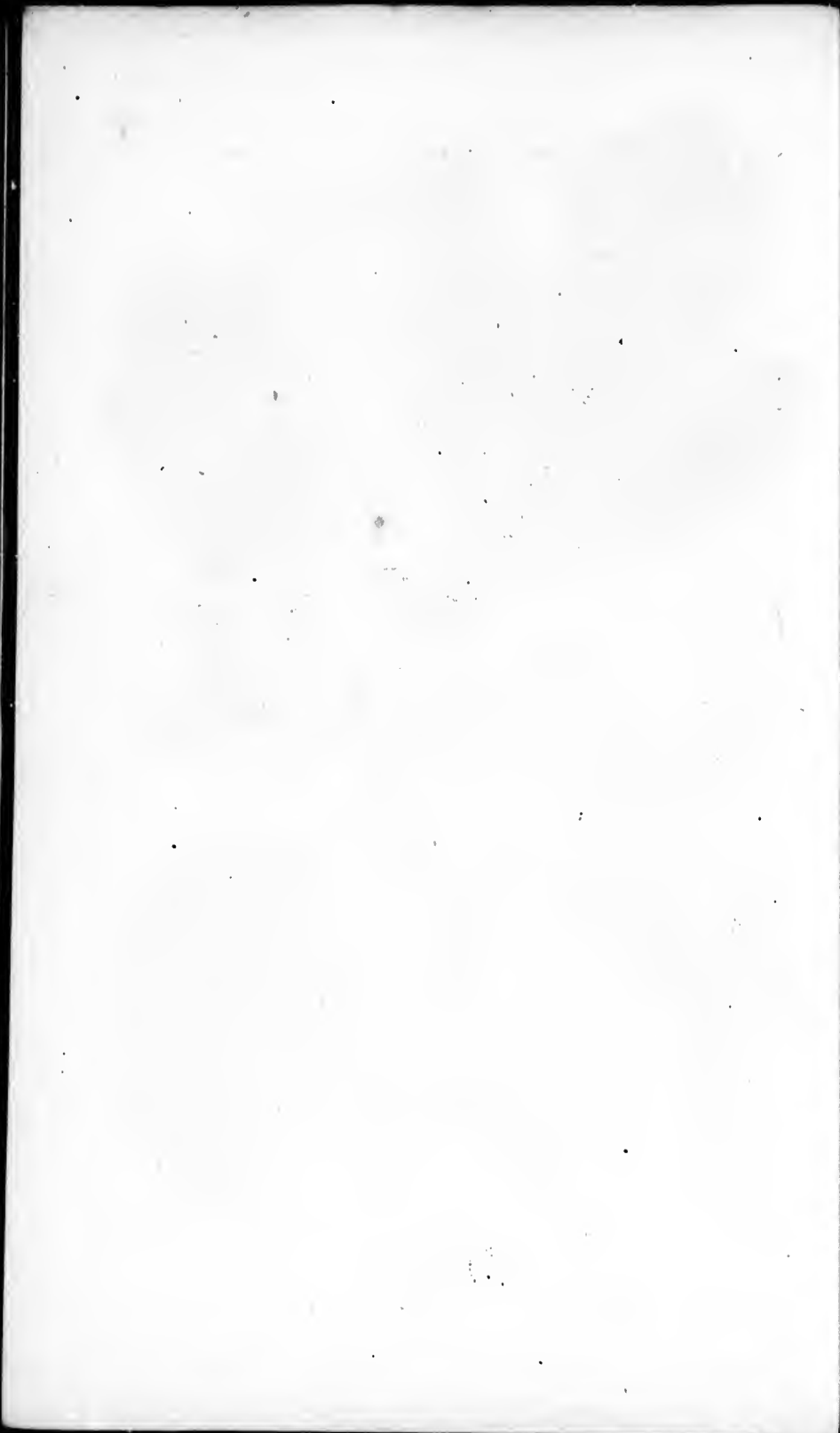


Bossa del.

Gabriel vulp.

Sassafras.  
*Laurus sassafras.*





loftier stature in some parts of Virginia, the Carolinas, and the Floridas, as well as in the Western States and in Upper and Lower Louisiana. It is abundant throughout these countries, except in the mountainous districts of the Alleghanies, by which they are divided, where it appears to be comparatively rare. In fine, from Boston to the banks of the Mississippi, and from the shores of the Ocean in Virginia to the remotest wilds of Upper Louisiana beyond the Missouri, comprising an extent in each direction of more than 1800 miles, the Sassafras is sufficiently multiplied to be ranked among the most common trees. It is seen growing on lands of every description, from the dry and gravelly to the moist and fertile, with the exception of such as are arid and sandy to excess, like the *pine-barrens* of the Southern States: neither is it found in the swamps that border the rivers by which these States are watered.

In the low, maritime parts of Virginia, of the two Carolinas and of Georgia, the Sassafras is observed to grow of preference about plantations and in soils which have been exhausted by cultivation and abandoned. The old trees give birth to hundreds of shoots, which spring from the earth at little distances, but which rarely rise higher than 6 or 8 feet. Though this tree is common on poor lands, and blooms and matures its seed at the height of 15 or 20 feet, yet it is never of very ample dimensions, except in fertile soils, such as form the declivities which skirt the swamps, and

such as sustain the luxuriant forests of Kentucky and West Tennessee.

The leaves are 4 or 5 inches in length, alternate, and petiolated. At their unfolding in the spring they are downy and of a tender texture. They are of different shapes upon the same tree, being sometimes oval and entire, and sometimes divided into lobes, which are generally three in number, and which are rounded at the summit. The lobed leaves are the most numerous and are situated on the upper part of the tree.

About New York and Philadelphia the Sassafras is in full bloom in the beginning of May, and six weeks earlier in South Carolina. The flowers unfold before the leaves, and appear in small clusters at the end of the last year's shoots. They are of a greenish yellow hue, and are but slightly odoriferous. In this species of Laurel the sexes are confined to different stocks. The fruit or seed is of an oval form and of a deep blue colour, and is contained in small bright red cups, supported by peduncles from 1 to 2 inches in length. These seeds, when ripe, are eagerly devoured by the birds, and soon disappear from the tree.

The bark which covers the trunk of an old Sassafras, is of a greyish colour and is chapped into deep cracks. On cutting into it, it exhibits a dark dull red, a good deal resembling the colour of the Peruvian bark. The bark of the young branches and suckers is smooth and of a beautiful green colour. The wood of this tree is not

strong, and branches of considerable size may be broken with a slight effort. In the young tree the wood is white; in those which exceed 15 or 18 inches in diameter it is reddish and of a closer grain. It is not, however, in these respects to be compared with the Oak and the Hickory. Experience shews that this wood, stripped of its bark, resists for a considerable period the progress of decay; and it is on this account employed for the posts and rails of rural fence. It is also sometimes used in the country for joists and rafters in houses built of wood. I have been informed that it is secure from the attacks of worms: this advantage is attributed to its odour which it preserves as long as it is sheltered from the sun and the rain. Bedsteads made of it are never infested by insects. But for these purposes the Sassafras wood is not in habitual use, and is only occasionally employed in the country: it is never seen exposed to sale in the *lumber-yards* of the large towns, and it appears incapable of ever becoming an article of great interest in the mechanical arts. For fuel, also, it is held in little esteem, and it is only in the cities of the Southern States, which are not, like those of the north, abundantly furnished with fuel, that it is brought into the market as wood of the third quality. Its bark contains a great deal of air, and snaps while burning like that of the Chesnut.

The medicinal virtues of the Sassafras are so well proved, that during more than 200 years, since its first

introduction into *materia medica*, it has maintained the reputation of an excellent sudorific, which may be advantageously employed in cutaneous affections, in chronic rheumatisms, and in siphilitic diseases of long standing. In the last case it is always joined with *lignum vitæ* and *salsaparella*. The wood is slightly aromatic, but the smell and taste which are peculiar to the vegetable are more sensible in the young branches, and incomparably more so in the bark of the roots; this part of the tree therefore should always be preferred, for the wood appears to me to contain but a small degree of the qualities assigned to it, and even this it loses after being long kept. From the bark of the roots, which is thick and sanguineous; the greatest quantity of essential oil is extracted: this oil, after long exposure to the cold, is said to deposit very beautiful crystals.

The flowers of the *Sassafras* when fresh have likewise a weak aromatic odour. A great number of people in the United States, in the country and even in the cities, consider them as stomachic and efficacious in purifying the blood; and, for this purpose, during a fortnight in the spring, they drink an infusion of them with a little sugar, in the manner of tea. They are carried to market in the cities, and sold at 7 or 8 cents a pint. To gather the flowers, the branches are lopped and often the whole tree is cut down: great havoc is in this way made of the species.

The dried leaves and the young branches of the Sas-

sasfras contain a mucilaginous principle nearly resembling that of the Ochro. In Louisiana the leaves are used by the inhabitants to thicken their pottage.

In Virginia, and in the more Southern States, the country people make a beer by boiling the young shoots of the Sassafras in water, to which a certain quantity of melasses is added, and the whole is left to ferment: this beer is considered as a very salutary drink during the summer.

Such is the result of my observations on the Sassafras, a tree highly interesting from its uses in medicine. It is, in my opinion, sufficiently valuable in this respect to merit propagation in Europe: in the South of France and in Italy it would undoubtedly thrive, since it succeeds in the climate of Paris and London.

## PLATE LXXXI.

*A branch with leaves and fruit of their natural size.  
Fig. 1, Male flowers. Fig. 2, Female flowers.*



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## RED BAY.

**LAURUS CAROLINIENSIS.** *L. foliis perennantibus, ovato-acuminatis, subtus subglaucis, baccis cœruleis.*

THIS species of Laurel is first observed in the lower part of Virginia, and it continues to be seen uninterruptedly throughout the maritime districts of the Carolinas and of Georgia, in the two Floridas, and in Lower Louisiana. It is confined, as well as several other trees which I have described, precisely within the limits which I have assigned to the *pine-barrens*.

This tree is known only by the name of Red Bay. It is profusely multiplied, and with the Sweet Bay, Tupelo, Red-flowering Maple, Water Oak, etc., it fills the *branch-swamps* which intersect the *pine-barrens*. It is seen on the skirts of the great swamps which border the rivers and around the ponds covered with the *Laurus æstivalis*, Pond-bush, that are met with in the barrens. A cool and humid soil appears to be essential to its growth, for it is never found in dry and sandy lands. It is also remarked that the farther south it grows, the more vigorous and beautiful is its vegetation: thus in the southern part of Georgia and in the Floridas it is often 60 or 70 feet high, and from 15 to 20 inches in diameter: dimensions which it more rarely attains in the Carolinas. Perhaps, also, as the Ca-



H. J. Redouté del.

Gabriel sculp.

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*Laurus carolinensis* L.

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rolinas have been longer inhabited and are more fully peopled, the largest stocks have been felled for certain uses to which they are found perfectly adapted.

When the Red Bay arrives at a lofty stature, it rarely exhibits a regular form : its trunk is generally crooked and divided into several thick limbs at 8, 10 or 12 feet from the ground. It differs in this respect from the Lob-lolly Bay, the Sweet Gum, the Tupelo, and the Oaks; whose trunk is straight and of nearly an uniform size for 20 or 30 feet.

Upon old trunks the bark is thick and deeply furrowed; that of the young branches, on the contrary, is smooth and of a beautiful green colour. The leaves are about 6 inches long, alternate, oval-acuminate, whitish or glaucous on the lower surface, and ever-green. When bruised, they diffuse a strong odour resembling that of the Sweet Bay, *Laurus nobilis*, and may be employed in cookery. The flowers are disposed in small, axillary bunches, springing between the leaf and the twig, and are supported by slightly downy peduncles. The fruit or seed is oval and very similar to that of the *Sassafras*. The seeds germinate with ease, and the old trees are surrounded by hundreds of young plants.

The wood of the Red Bay is of a beautiful rose colour; it is strong, has a fine, compact grain, and is susceptible of a brilliant polish. Before Mahogany became the reigning fashion in cabinet-making, this

wood was commonly employed in the Southern States; and afforded articles of furniture of the highest beauty. That it is no longer used is attributable to the difficulty of finding trees of sufficient diameter, and to the facility of obtaining Mahogany, which is imported in large blocks from St. Domingo, at a moderate price.

It has lately been discerned that the Red Bay, like the Red Cedar, may be usefully employed in ship-building, as it unites the properties of strength and durability. In the southern part of Georgia and in East Florida, when stocks are met with of considerable dimensions, they are sent, in the form of square timber, to New York and Philadelphia with the Live Oak and the Red Cedar.

In fine, the Red Bay is a handsome tree, whose wood is elegant and of a superior quality, but which rarely attains such dimensions as to afford important resources to the arts: such at least appears to be the result of experience as far as it has gone:

PLATE LXXXII.

*A branch with leaves and seeds of the natural size.*

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*Laurus camphora.*

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## CAMPHOR TREE.

**LAURUS CAMPHORA.** *L. foliis ovatis, utrinque acuminatis, trine-viis, nitidis; petiolis laxis; fructibus atropurpureis.*

AMONG the vegetables of the Old Continent which possess a high degree of interest for the United States, the Camphor Tree holds an eminent place. It especially deserves attention from the inhabitants of the Floridas, of the lower part of the Carolinas, and of Lower Louisiana. Its multiplication in these climates would be so easy, that after a few years it might be abandoned to nature.

The Camphor Tree in its general character is nearly related to the Red Bay, so common throughout the regions which I have just mentioned: they are of the same height, are both ever-green, and are so similar in appearance that at a little distance they are easily confounded.

The Camphor Tree grows in China, Japan and some other parts of the East Indies. It often exceeds 40 or 50 feet in height, with a proportional diameter. The leaves are supported by long petioles, and are alternate, shining on both sides, 2 or 3 inches long, an inch broad, and acuminate at both extremities, with distinct longitudinal ribs. The young branches are green.

The flowers, like those of the Red Bay, are diminutive

tive, whitish, and united in small axillary bunches. The seeds resemble those of the Red Bay in size and form, but are of a dark purple colour. The leaves, the bark, the wood and the roots are strongly impregnated with the odour of Camphor: from the roots especially, this substance, so useful in medicine, is extracted.

In China and Japan the unrefined Camphor is obtained in the following manner: the roots are cut into small pieces and boiled with water in large iron retorts, of which the cover is made of earth and garnished with cords of rice-straw. When the ebullition commences, the Camphor rises with the vapour and attaches itself to these cords in the form of greyish dust, in which state it is brought to Europe. The greater part of the Camphor of commerce comes from the province of Sotsoanna and from the Isles of Gotha.

Till within a few years the Dutch have exclusively possessed the secret of refining the Camphor, and of bringing it into a state proper for medical use. But chemistry has made such rapid progress in France since the revolution, that this art among others has become known, and it is now extensively practised in the laboratories of Paris. We are informed, in general, that the distillation is effected without water, in glass retorts, with the addition of one sixteenth part of quick lime.

The Camphor thus refined is a whitish, transparent resin, highly volatile and inflammable, and of a very penetrating odour. It is so light that it floats upon water,

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CAMPHOR TREE.

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and so inflammable that it may be entirely consumed upon the surface of the fluid.

Camphor is regarded as one of the most powerful remedies in the art of medicine : it is sedative, antiseptic, and diaphoretic ; but it is considered as injurious in inflammatory complaints : the ablest physicians unite sulphat of potash or nitre with it as a corrective.

From its powerful antiseptic properties it is frequently employed in the preservation of animal substances, and always forms a part of the composition destined to secure the skins of birds and quadrupeds from decay, in collections of natural history.

Another tree which is also natural to the East Indies ; and which, according to M. Corea de Serra, has a great affinity to the *Shorea robusta* of Dr. Roxburg, furnishes Camphor of an excellent quality. This substance is obtained likewise from certain plants of the class of *Labiæ*, such as Lavander and Mint, but not in sufficient quantities to form an article of commerce.

PLATE LXXXIII:

*A branch with leaves and fruit of the natural size. Fig. 1, Flowers.*



## AMERICAN HOLLY.

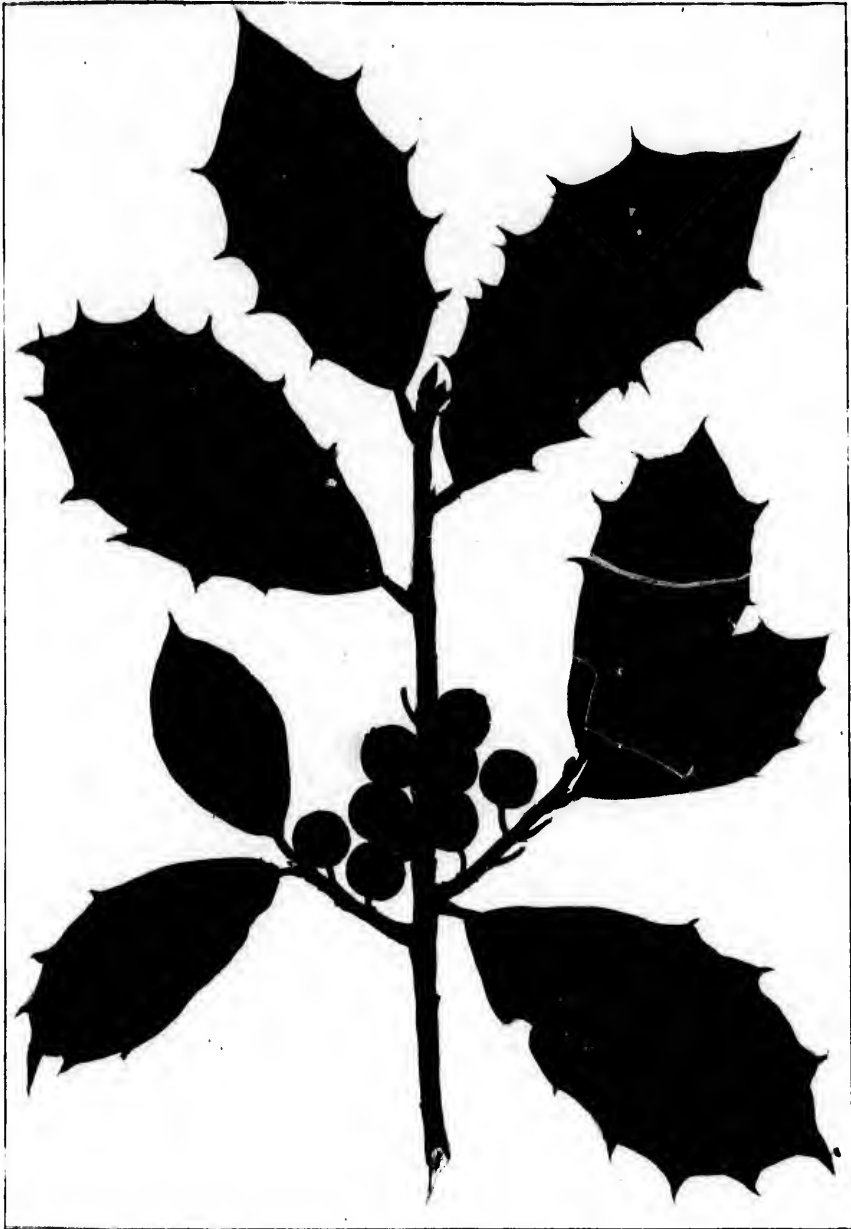
*Dioecia tetrandria.* Linn.

*Rhamnoides.* Juss.

**ILEX OPACA:** *I. foliis ovalibus, rigidè patulèque dentato-spinosis; fructibus ovoïdeis, rubris.*

Among the Hollies of North America, I shall confine myself to the description of a single species, which sometimes grows to a great height, and whose wood is employed in the arts. It is designated in all parts of the United States where it grows by the name of American Holly.

I am unable to mark the northern limit of this tree with as much precision as that of many others; but I believe it does not extend far beyond Long Island, though it is already common in Lower Jersey. It is found in all the more southern States, in the Floridas, in Lower Louisiana and in West Tennessee, but it is observed to become more rare in approaching the mountains. On the eastern shore of Maryland, and in certain parts of Virginia, for instance near Richmond, where it particularly abounds, it grows almost exclusively on open grounds and in dry and gravelly soils; while in South Carolina, Georgia and Lower Louisiana it is seen only in shady places, on the edges of swamps, where the



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American Holly.  
*Ilex opaca.*

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soil is cool and fertile. Its vegetation in these situations is so vigorous that it equals 40 feet in height and 12 or 15 inches in diameter.

The American Holly, in its pyramidal shape and in its brilliant ever-green foliage, bears a striking resemblance to the European species, *Ilex aquifolium*. Its leaves present a slight difference, being less twisted, less acuminate, and of a lighter green. Its flowers are white and not conspicuous. They are succeeded by numerous red berries which remain long attached to the branches. Upon the trunk of old trees the bark is smooth and of a whitish grey colour; on the young branches it is green and shining.

The wood of the American Holly is very similar to that of the European species; they are both heavy and compact, with a white alburnum and brown heart. Its grain is fine and compact; hence it is very brilliant when polished. Its principal use is for inlaying mahogany furniture: the black lines with which cabinet-makers sometimes adorn their work are of Holly died in the coppers of the latter. As it turns well, it is chosen for light screws and for the small boxes in which apothecaries put their opiates. When perfectly dry, this wood is very hard and unyielding, hence it is excellently adapted for the pulleys which are used in ships; but the *Lignum Vitæ*, which is easily and cheaply procured from the West Indies, is preferred.

The best bird-lime employed in Europe is made of

the Holly. The inner bark is pounded into a paste which is put into pots and left to ferment in the cellar. When the process has proceeded far enough, the paste is washed, to separate the ligneous fibres, and preserved in close vases with the addition of a little oil. This substance is green, soft, and very viscid. It is condensed by cold and softened by heat.

The attempt has been successfully made of employing the Holly for hedges, which are very dense and which have the recommendation of preserving their foliage through the year: but it is found in Europe that the Thorn and the Locust possess superior advantages; especially where it is necessary, as in the United States, to enclose large tracts of arable land. The seeds of the Holly, of the Thorn and of the Dogwood do not spring before the second or third year; but I have been told that they may be caused to shoot the first year by the following very simple method. After gathering the seeds, which are ripe towards the close of autumn, they must be cleared of the pulpy envelope by rubbing them in water; they are afterwards slightly covered with earth in a box, and deposited during the winter in the cellar. Care must be taken to keep the earth moist by watering it from time to time, for the purpose of swelling the seeds. When the warm season commences, they are committed to the earth, in the spot where they are to remain. The berries of the Holly are purgative, and, taken to the number of 15 or 20, they

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excite vomiting; but there are so many remedies whose operation is better understood and more certain, that the best treatises on *materia medica* attach little importance to this vegetable.

My enquiries concerning the American Holly have not led me to an acquaintance with any property which should entitle it to a preference in Europe over our native species, *Ilex aquifolium*.

## PLATE LXXXIV.

*A branch with leaves and fruit of the natural size.*



44.

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## SOREL TREE

Decandria monogynia. LINN.

Ericem. Juss.

**ANDROMEDA ARBOREA.** *A. foliis oblongo-ovalibus, acuminatis, denticulatis; paniculis terminalibus; corollis subpubescentibus.*

Obs. Arbor altitudinem 50-60 pedum assequens.

THIS is the only species of *Andromeda* which rises to a sufficient height to be ranked among forest trees: It begins to appear on the Alleghanies in Virginia, and is found to their termination in Georgia. It grows also in the Southern States on the steep banks of the rivers that flow from the mountains; but it becomes more rare in following them from their source, whether eastward or westward, and ceases entirely in the maritime parts of the Carolinas and of Georgia.

I have nowhere seen the Sorel Tree of ampler dimensions than in the fertile vallies at the foot of the lofty mountains of North Carolina, particularly in those whose waters unite in the northern branch of the river Catawbaw, about 30 miles from Morgantown and 300 miles from Charleston. In these vallies I have measured Sorel Trees which were 50 feet high and 12 or 15 inches in diameter. This is an extraordinary size for a tree of this genus, which is very numerous in the Atlantic



Beccari del.

Gabriel sculp.

Sorel Tree.  
*Andromeda arborea.*



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States, and three fourths of whose species, to the number of eight or ten, rarely exceed 6 feet in height and an inch in diameter. The growth of the Sorel Tree is observed to be stunted in dry and gravelly lands, so that it presents itself in the form of a bush : as I have particularly remarked about Knoxville, where it is most abundant.

The leaves of the Sorel Tree are downy in the spring, but they become smooth and glabrous in acquiring their growth. They are alternate, oval-acuminate, finely denticulated, and from 4 to 5 inches long.

The flowers are small, white, and formed into spikes 5 or 6 inches long. United in groups they have a fine effect, and render this tree very proper for the embellishment of gardens. The seeds are exceedingly minute, and are contained in small capsules.

On the trunk of the Sorel Tree the bark is thick and deeply furrowed. The wood is of a pale rose colour and very soft. It burns with difficulty, and is wholly rejected in the arts.

The acidity of its leaves has procured this tree the appropriate name of Sorel Tree. In drying they become black, and, when sumac is not to be obtained, they are used to impart this colour to wool.

The Sorel Tree endures an intenser degree of cold than that of its native climate. I have seen a stock 18 feet high flourishing at New York, where the winter is more severe than in any part of France or England.

This fact should induce amateurs to multiply it on account of its beautiful flowers, which it begins to display at the height of 5 or 6 feet.

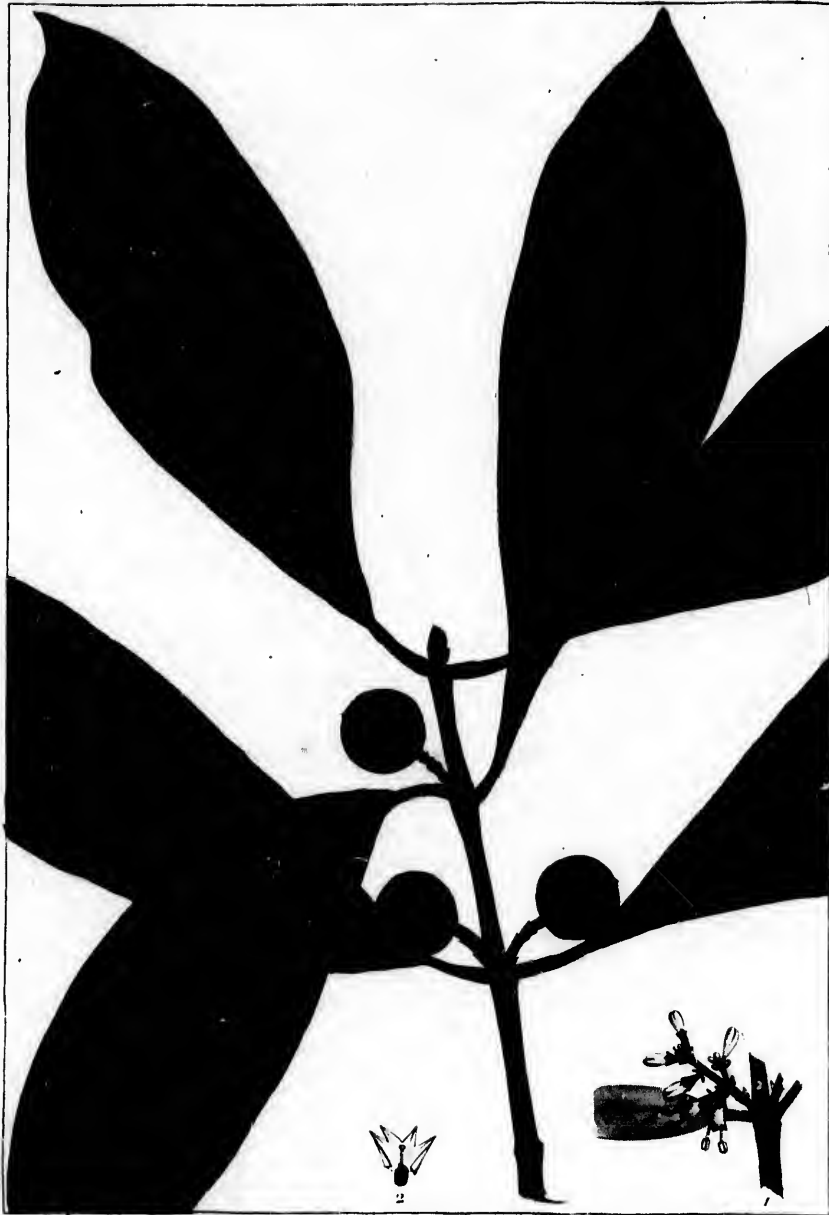
## PLATE LXXXV.

*A branch with leaves and flowers of the natural size.  
Fig. 1, Capsules which contain the seed. Fig. 2, Seeds.*

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Gabriel sculp.

Devil Wood.  
*Olea americana.*

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## DEVIL WOOD.

*Diosca diandra*. Linn.

Jasmine. Juss.

**OLEA AMERICANA.** *O. foliis latè oblanceolatis, coriaceis, lucidis, integerrimis; drupa globosa.*

THIS tree belongs exclusively to the Southern States, the Floridas and Lower Louisiana; towards the North it is not found beyond Norfolk in Virginia, and, like the Live Oak and the Cabbage Tree, it is confined to the sea-shore, being rarely found even at a small distance within the country. It is so little multiplied, that it has hitherto received no name from the inhabitants of the country, except on the banks of the river Savannah, where it is called Devil Wood.

This tree grows in soils and exposures extremely different: on the sea-shore it springs with the Live Oak in the most barren and sultry spots, and in other places it is seen with the Big Laurel, the Umbrella Tree, the Sweet Leaves, etc., in cool, fertile and shaded situations.

This tree, or, to speak more accurately, this large shrub, is sometimes 30 or 35 feet high, and 10 or 12 inches in diameter: but this size is extraordinary; it commonly fructifies at the height of 8, 10, or 12 feet. The leaves are 4 or 5 inches long, opposite and lanceolate, entire at the edge, smooth and brilliant on the



*Gabriel only*

upper surface, and of an agreeable light green. They are ever-green, or at least are partially renewed only once in 4 or 5 years. The fertile and barren flowers are on separate trees : they are very small, strongly scented, of a pale yellow, and axillary, or situated between the petiole of the leaves and the branches. The season of flowering, in the neighbourhood of Charleston, is about the end of April. The fruit is round, and about twice as large as a common pea. When ripe, it is of a purple colour, approaching to blue, and consists of a hard stone thinly coated with pulp. As it remains attached to the branches during a part of the winter, its colour forms, at this season, an agreeable contrast with the foliage.

The bark which covers the trunk of the Devil Wood is smooth and greyish. The wood has a fine and compact grain, and when perfectly dry it is excessively hard and very difficult to cut or split : hence is derived the name of Devil Wood. It is, notwithstanding, neglected in use. On laying bare the cellular integument of the bark, its natural yellow hue changes instantaneously to a deep red, and the wood, by contact with the air, assumes a rosy complexion. Experiments should be made to detect the nature of this active principle in the bark, which causes it to change colour so suddenly by exposure to the air.

From the temperature of the native skies of this tree we may conclude that it is capable of resisting a greater

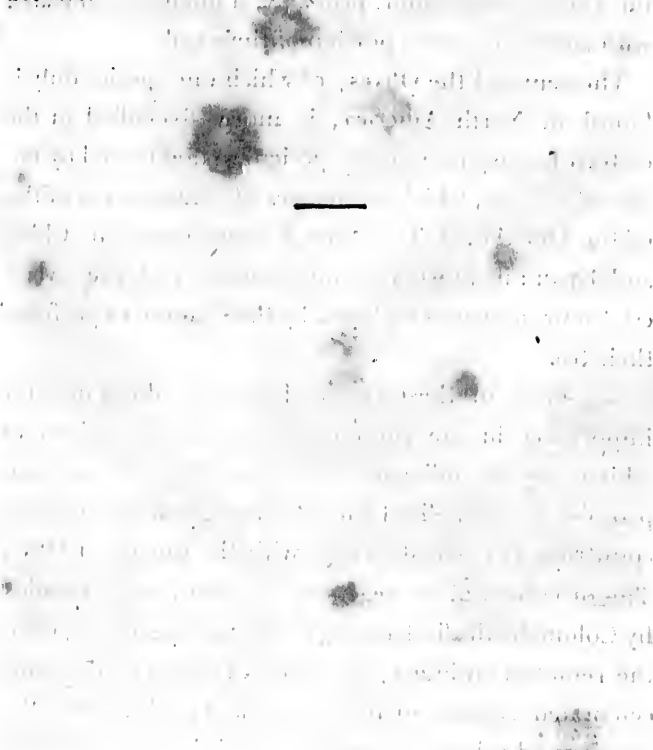
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degree of cold than the Common Olive : it becomes then, on account of its beautiful foliage, its odoriferous flowers and its showy fruit, a valuable acquisition to Italy, and the South of France.

PLATE LXXXVI.

*A branch with leaves and fruit of the natural size. Fig. 1, Flowers.*



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## OLIVE TREE.

**OLEA EUROPEA.** *O. foliis lanceolatis, integerrimis;*  
*racemis paniculatis.*

SINCE the introduction of the vine, the Olive seems principally wanting to complete the vegetable riches of the United States; and, probably, it might be cultivated with success on some portion of their soil.

The genus of the Olives, of which one species only is found in North America, is more diversified in the eastern hemisphere: nine species are mentioned by botanical writers, which are natives of remote extremities of the Old World. The *Olea fragrans* grows in China and Japan: its flowers are impregnated with the sweetest odour, and are employed by the Chinese to perfume their tea.

But none of these species forms an object of great importance in the rural economy of the regions to which they are indigenous, nor does their introduction promise very beneficial fruits to the agriculture of other countries. It is far otherwise with the European Olive. This ornament of the vegetable kingdom, which is called by Columella the first among trees, has constituted, from the remotest antiquity, the pride of some of the most celebrated regions of the globe; and, aside from the commercial value of its products, it is invested, both by





*Boiss del.*

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Olive Tree  
*Olea Europæa.*

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sacred and profane history, with a thousand interesting associations.

It is difficult, or rather impossible, to assign with precision the native climate of the Olive : the most probable opinion is that it came originally from Asia Minor, and that it was also indigenous to Egypt, or introduced into that country at an early period of its settlement. It was transplanted to Greece by the Egyptian colonies. The Phenicians probably carried it to Carthage, and the Carthaginians to Spain. Before its introduction into Spain, the Phenicians carried on a lucrative trade with the Spaniards in oil, which they exchanged for bars of gold. Pliny informs us that this culture was unknown in Spain and Italy in the reign of *Tarquinius Priscus*, but that when once introduced it was rapidly diffused. The Olive was planted in France by the Phoecean colony which founded Marseilles, 600 years before Christ.

The Athenians held the Olive in such esteem, that they ascribed its production to their tutelary deity. This beneficent miracle, which is retraced in the monuments of Athens, is differently represented by ancient authors ; it is thus agreeably related by *Apollodorus Atheniensis* : In the reign of Cecrops leave was first given to the Gods to assume the patronage of cities, in which they might appropriate to themselves peculiar honours. Upon which Neptune came into Attica, and, standing in the middle of the citadel, smote the earth with his trident and caused the sea to flow at his feet. After him

appeared Minerva, who, calling Cecrops to be a witness of what she was about to perform, caused an Olive Tree to spring from the ground. A contention hence arose between these divinities, to appease which Jupiter appointed the twelve Gods to be judges of the dispute, by whom, on the testimony of Cecrops, it was decided in favour of Minerva. The goddess, thus become tutelar divinity of the city, called it after her own name; and Neptune, irritated by his defeat, inundated all Attica to revenge the affront.

The Olive has flourished chiefly on the shores of the Mediterranean Sea, between the 36th and the 44th degrees of latitude. It still abounds in Greece: in the northern provinces it requires to be placed on hill-sides exposed to the south, that it may be warmed by the reflected heat; but in Attica the climate, as well as the soil and face of the country, is peculiarly favourable to its growth. <sup>1</sup> Near the foot of the mountains the Olives form vast curtains of a pale green, which is agreeably contrasted with the deeper verdure of the meadows beneath, and with the dusky grey of the rocks above. <sup>2</sup> The beautiful plain of Athens, as seen towards the north-west from Mount *Hymettus*, appears entirely covered with them. <sup>3</sup> The Wild Olive grows upon the mountains with the Pine and the Oak, and the cultivated varieties

<sup>1</sup> See *Beaujour's Commerce of Greece.*

<sup>2</sup> See *Olivier's Travels.*

<sup>3</sup> See *Beaujour's Commerce of Greece.*

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are reared about the villages with the Fig Tree and the Pomegranate Tree.

The produce of the soil is said to be one third greater when planted with Olives, than under any other species of culture; and oil is the principal article of commerce which affords the Athenians the enjoyments of life and the means of paying their taxes.

But the industry of the Greeks languishes beneath a despotism restricted to no forms and tempered by no public opinion, whose extemporaneous oppression it is impossible by the most ingenious calculations to elude: In ancient Athens a premium was given for the multiplication of the Olive, and severe penalties were inflicted upon proprietors who destroyed it even on their own estates. The Turks, on the contrary, subject it to a return of one tenth, to which is added a tax of a *para* for each tree, imposed by Sultan Selim III. To avoid the exactions to which he is a prey, the unhappy Athenian peasant frequently prefers cutting down his Olives, or selling them at a price unequal to the value of their annual produce.

The Wild Olive is common on the islands of the Propontis, and upon the declivities sloping to the sea upon the Asiatic side of the Hellespont.

Perhaps one of the finest countries of the world are the Persian provinces of Ghilan and Mazenderan, which lie north of the Caspian Mountains, between the 37th and the 38th degrees of latitude. The soil is fertile and

watered by innumerable streams that gush from the bosom of these mountains ; the surface is even, and, from the depression of the level and from the proximity of the Caspian Sea, the climate is mild and equable. The Olive is found here with the Mulberry, the Orange Tree, and other productions of warm climates, which do not flourish in the more southern parts of this dry and sterile kingdom.

In Syria the Olive grows spontaneously ; but it is rare, and its cultivation is neglected. The natural advantages of a country formed to be the seat of the richest and most powerful empire of Asia, are lost in the absence of an industrious and enlightened population. The slothful and improvident habits of the Turks themselves ; and the paralysing influence of their government, are particularly unfavourable to a culture whose fruits are tardy, and which, therefore, requires to be encouraged by the security of property. The Island of Candia produces great quantities of oil, and Mitylene or *Lesbos* exports pickled olives. Several other Islands of the Archipelago share in this commerce.

In Egypt a few stocks of the Olive are seen in almost every village ; but it is not extensively multiplied, nor regarded as one of the resources of agriculture. Oil is made in several of the Barbary States, and Desfontaines found the Wild Olive abundant on Mount Atlas.

But the greatest variety of Olives, the most judicious culture, and the most perfect method of extracting the

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oil and of preserving the fruit, are found in Italy, France and Spain. *Bætica*, or that part of Spain which lies between the Guadalquiver and the sea, is mentioned by Columella as a country eminently adapted to the Olive; and with a more intelligent husbandry it might again become, as it was in the age of Cicero, the admiration of Europe.

France is divided by agricultural writers into zones, each of which is named after one of its important vegetable productions, and bounded towards the north by the line at which this production ceases to flourish. The *Abbé Rozier* makes four of these zones succeeding each other from south to north in the following order: that of the Orange Tree, which ceases at Ouliolles, near Toulon; that of the Olive, which extends to Carcassonne, and of which Nismes may be taken as the extreme boundary; that of the Vine, and that of the Apple Tree. In travelling from Toulouse to the shore of the Mediterranean, along the canal of Languedoc, I first observed the Olive at a little distance from Carcassonne: but it appeared to have ventured hither only upon trial, and from the size of the trees I judged them to be a recent settlement. About Béziers, Montpellier, Aix, etc., the hills in every direction are covered with Olives.

Thus we see that this inestimable production has been widely diffused by the bountiful hand of nature.

The beauty of the Olive is far from corresponding



to its intrinsic value. It varies in size according to the soil and climate in which it grows; and in France the temperature is not warm enough for its perfect development. Pliny says that in Spain it was one of the largest trees: *Non alia major in Bœtica arbor*. On Mount Atlas, Desfontaines saw Wild Olives from 45 to 60 feet in height; and Beaujour compares the Olives of the plains of Marathon to the finest Walnuts for stature and expansion. Lofty Olives are still seen in the Island of Corfu, shading the spot where they once enriched the gardens of *Alcinous*.

In the Olive-yards of France these trees are generally from 18 to 20 feet in height, and from 6 inches to 2 feet in diameter. About Aix, Montpellier, etc., they are kept low partly by the disasters to which they are exposed from the cold, and partly by the care of the cultivator, to facilitate the gathering of the fruit. They ramify at a small height, and form a compact and rounded summit. The open, coriaceous foliage is of a pale, impoverished verdure, and the general appearance of the tree is not unlike that of a common Willow which has been lopped, and which has acquired a new summit of three or four years' growth.

Indeed the Olive possesses neither the majesty of forest-trees, nor the gracefulness of shrubbery. It clothes the hills without adorning them, and, considered as an accident of the landscape, it does not charge the picture sufficiently to contribute greatly to its beauty. The

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rich culture for which the southern provinces of France are celebrated is less conducive to rural beauty than some of the humbler species of husbandry. The richest country is not always the most lovely; a country of mines, for example, is usually ungracious to the eye, and the Olive is called by an Italian writer, a mine upon the surface of the earth.

This tree is remarkable for its longevity: the ancients limited its existence to two hundred years, but modern authors assert that, in climates suited to its constitution; it survives its fifth century. Relations are made of the bulk of some of these patriarchal trees, too surprising to be repeated unless they were perfectly authenticated; but in France there are Olives which two men can hardly compass in their arms.

The main limbs of the Olive are numerously divided: the branches are opposite, and the pairs are alternately placed upon conjugate axes of the limb. The foliage is ever-green, but a part of it turns yellow and falls in the summer, and in three years it is completely renewed. In the spring or early autumn, the seasons when vegetation is in its greatest activity, the young leaves come out immediately above the cicatrice of the former petioles, and are distinguished by their suppleness and by the freshness of their tint.

The colour of the leaves varies in the different varieties of the Olive, but they are generally smooth and of a light green above, whitish and somewhat downy with

a prominent rib beneath. On most of the cultivated varieties they are from 15 lines to 2 inches long, and from 6 to 12 lines broad, lanceolate, entire, nearly sessile, opposite and alternate in the manner of the branches.

The Olive is slow in blooming as well as in every function of vegetable life. The buds begin to appear about the middle of April, and the bloom is not full before the end of May or the beginning of June. The flowers are small, white, slightly odoriferous, and disposed in axillary racemes or clusters. A peduncle about as long as the leaf issues from its base, upon which the flowers are supported by secondary pedicles like those of the Common Currant. Sometimes the clusters are almost as numerous as the leaves, and garnish the tree with wanton luxuriance; at others, they are thinly scattered over the branches, or seen only at their extremity. It is essential to remark that they are borne by the shoots of the preceding year. Each flower is complete in itself, consisting of a calyx, a monopetalous corolla divided into four lobes, and of the organs of reproduction, namely, two stamina and one pistil.

A week after the expanding of the flower the corolla fades and falls. If the calyx remains behind, a favourable presage is formed of the fruitfulness of the season: but the hopes of the husbandman are liable to be blasted at this period by the slightest intemperateness of the elements, which causes the germ to fall with the flower. Warm weather, accompanied by gentle

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The fruit of the Olive is called by botanists a *drupe*: it is composed of pulpy matter enveloping a stone, or ligneous shell containing a kernel. The olive is ovate, pointed at the extremity, from 6 to 10 lines in diameter in one direction, and from 10 to 15 lines in the other: on the wild tree it hardly exceeds the size of the red currant. The skin is smooth, and, when ripe, of a violet colour; but in certain varieties it is yellowish or red. The pulp is greenish, and the stone is oblong, pointed and divided into two cells, one of which is usually void. The oil of the olive is furnished by the pulp, which is a characteristic almost peculiar to this fruit; in other oleaginous vegetables it is extracted from the seed. The young olive sets in June, increases in size and remains green through the summer, begins to change colour early in October, and is ripe at the end of November or in the beginning of December. On the Wild Olive five or six drupes are ripened upon each peduncle; but on the cultivated tree a great part of the flowers are abortive, and the green fruit is cast at every stage of its growth, so that rarely more than one or two germs upon a cluster arrive at maturity.

It has been observed from early antiquity that the produce of the Olive is alternate; and in France it is proverbially said to labour one year for itself and one year for its owner. The cause of this phenomenon will

be mentioned hereafter. It is asserted that the Wild Olives are sometimes barren; but these must be trees that have sprung from stones dropped upon arid rocks, in whose crevices the roots barely find nourishment enough to sustain the abject existence of the plant.

On the branches of the Olive, and on the trunk of the young tree, the bark is smooth and of an ashy hue. When the epidermis is removed, the cellular integument appears of a light green. On old trees the bark upon the trunk and upon the base of the principal limbs is brown, rough and deeply furrowed. In the spring and autumn, when the sap is in motion, the bark is easily detached from the body of the tree.

The wood is heavy, compact, fine-grained and brilliant. The alburnum is white and soft; and the perfect wood is hard, brittle and of a reddish tinct, with the pith nearly effaced as in the Box. It is employed by cabinet-makers to inlay the finer species of wood which are contrasted with it in colour, and to form light, ornamental articles, such as dressing-cases, tobacco-boxes, etc. The wood of the roots, which is more agreeably marbled, is preferred. The Olive was classed by the ancients among the hard and durable species of wood, such as the Ebony, the Cedar, the Box and the Lotus. On account of its hardness it was used for the hinges of doors, and before metal became common in statuary, it was selected by the Greeks for the images of their Gods. Three sta-

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tues of Minerva were preserved in the citadel of Athens which exemplified the progress of this admirable art : the first, made of Olive wood and of rude workmanship, was said to have fallen from heaven; the second, of bronze, was consecrated after the victory of Marathon; the third, of gold and ivory, was one of the miracles of the age of Pericles.

From its resinous and oleagenous nature, the olive wood is eminently combustible, and burns as well before as after it is dried. The value of its fruit renders this property unimportant; but after the severe winter of 1709, which proved fatal to the Olives throughout Languedoc and Provence, the country was warmed for a considerable time with this precious wood.

The Olive accommodates itself to almost every variety of soil; but it shuns a redundancy of moisture, and prefers loose, calcarious, fertile lands mingled with stones, such as the territory of Attica and of the South of France. The quality of its fruit is essentially affected by that of the soil: it succeeds in good loams which are capable of bearing corn; but on fat lands it yields oil of an inferior flavour, and becomes laden with a barren exuberance of leaves and branches. The temperature of the climate is a consideration of more importance than the nature of the soil, as all the varieties of the Olive dread the extremes both of heat and cold. Neither do they delight in very low or in very elevated situations, but rather in gentle declivities with

an exposure adapted to the climate, where the fresh breezes, playing among the branches, may contribute to the health of the tree and to the fineness of the fruit.

Notwithstanding the delicacy of its complexion, the Olive is extremely tenacious of life. When the trunk has perished by frost or by fire, it sprouts anew, and we are assured that if a bit of the bark, with a thin layer of wood, is buried in the earth, it becomes a perfect plant.

In this respect the Olive is the polypus of vegetables. It is multiplied by all the modes that are in use for the propagation of trees: by sowing the seed, by layers, by slips, by cuttings of the root, and by sprouts separated from the trunk or from the roots of the parent stock. The most obvious method, that of forming nurseries from the seed, is generally censured in books; and rejected in practice: the difficulty of obtaining the young plants, and the length of time which must elapse before they begin to reward the labour of the husbandman, have discouraged its adoption. But, if these objections could be obviated, this is doubtless the most eligible practice. As the plants thus reared begin a new life, they are more vigorous and of longer duration than off-sets from an old tree; they form also a perpendicular root, which penetrates deeply and secures them from the danger of suffering by drought.

In most of the experiments that have been made of this method, the fruit has been sown entire; and this

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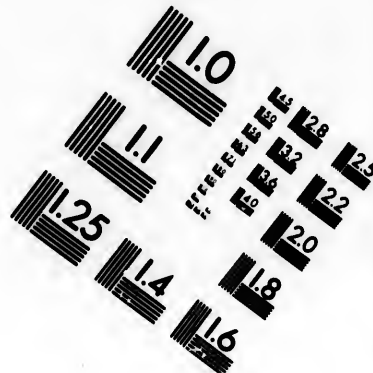
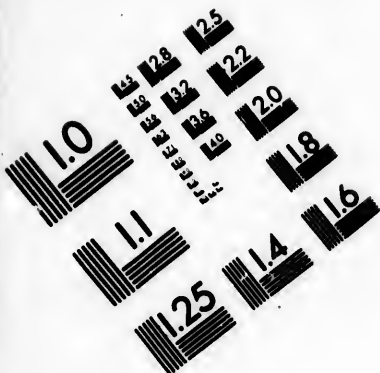
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is even enjoined, as a necessary precaution. But, however it may seem to be indicated by nature, such is not her own process. The stones which produce the Wild Olives are deposited by animals that digest the pulp, or by birds that carry away the fruit in their beaks, devour the pulp and leave the stones to take their chance with the elements. The principles of vegetable physiology, also, support the conclusions derived from these observations. The pulp not only invites the depredations of animals such as field-mice, pies, etc.; but this oily envelope, by preserving the shell from moisture, prevents its decaying in season for the germination of the kernel, which, in the meantime, becomes rancid and loses its fecundity.

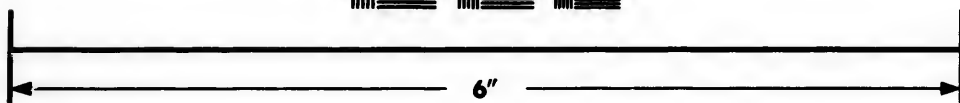
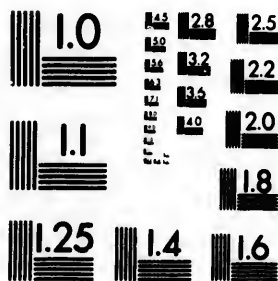
Ripe fruit of the finest varieties is selected; that of the *Gros Ribis* is the best; and the stones, after being separated from the pulp, are cleansed in an alkaline solution. A sheltered situation is chosen, where the earth is thoroughly loosened to the depth of three feet, and enriched with the warmest manures. In the month of March the stones are sown, at a small distance apart, in trenches 2 or 3 inches deep, and covered with earth. The soil should be kept free from herbage, and occasionally watered during the summer. The young plants appear in October and continue to vegetate through the winter; by the following spring, the most thriving among them will have attained the height of 30 inches. The feebler stocks should now be eradicated. With







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proper attention, and in a favourable soil, the remainder will be 4 or 5 feet high and 6 or 7 lines in diameter; in the course of the third spring, with a perpendicular root of 30 inches. This is the season for transplanting them. Great care should be bestowed upon the preparation of the ground, and the young plants should be placed 3 feet apart. After two years they will be sufficiently advanced to be grafted, and at the end of five years they may be transplanted to the olive-yard.

To accelerate the germination, the stones may be kept in fine mould during the summer and autumn, and sown in the beginning of January. They soon begin to vegetate, and before the following winter the young stocks acquire strength enough to support its rigours, while the tender plant that comes up in October is in danger of suffering by the lightest hoar-frost. Perhaps some advantage would be found in reducing the thickness of the shell before it is committed to the ground, in order to expose the germ more speedily to the influence of those agents which are necessary to its expansion.

Every mode of grafting is successfully practised on the Olive: the most common and the most proper for young stocks is that of inoculation. The operation should be performed in May, while the juices are in active circulation. Different opinions prevail respecting the insertion of the graft above or below the surface of the ground: grafting below the surface is attended with this

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advantage, that, when the trunk is destroyed, a generous progeny springs from its base.

A few stocks should be left to form new varieties. Fruit trees and flowers lose, in reproduction, the properties which they had acquired by culture, and tend anew to the state of nature. But in a great number of plants reared from the seed, a few are found that equal or excel the parent: florists consider themselves as fortunate, if, among a thousand Hyacinths or Tulips, they obtain three or four deserving of notice.

The young Olives begin to yield fruit the tenth or twelfth year, and are fully productive about the twenty-fifth or thirtieth: thus Hesiod's observation, that no man gathers fruit from an Olive of his own planting, must be admitted with the abatements of poetry.

A second method of forming a nursery, which has been successfully adopted near Toulon, is by transplanting the young Wild Olives.

The ancients relied principally upon propagation by slips, and this easy and expeditious mode is still generally followed in Spain. A smooth, thriving sprout or branch, one or two inches in diameter, is cut into pieces twelve or fifteen inches long, which are carefully set, without wounding the bark, in ground prepared as for the seed. They are placed at the distance of three feet, and at such a depth that three inches only appear above the surface. To encourage the formation of roots, the larger end, which is committed to

the earth, should be smeared with a composition of mould and animal manure, and the end which is exposed to the air should be protected by a covering of clay. Cuttings of the roots, also, buried in an inclined position in trenches four inches deep, will sprout in the course of the year. A few months later the feeble stocks are plucked up, and the more vigorous ones are left at the distance of three feet. Another easy resource is found in the shoots that spring up round the base of an old Olive, or from roots laid bare and wounded for this purpose.

It is necessary, in every case, to ascertain the point at which the original stock was grafted. The offspring is invariably identical in its nature with that part of the parent tree from which it was separated; it requires grafting, therefore, if it was detached from a point below the insertion of the graft, or from a tree which had not submitted to this process.

All these operations are performed at the close of winter or the opening of spring. The length of time which the young plants should remain in the nursery varies with their size and strength, but it rarely exceeds four or five years. During this period the ground should be kept mellow and clean, and occasionally watered in the summer, if the season is dry. But this indulgence should not be prodigally bestowed. Vegetable as well as animal and moral life is susceptible of habitude. For this reason it is, also, an important precept in the formation

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of nurseries, to select a soil analogous to that in which the trees are to reside. If the young plant is lavishly supplied with nutritious juices, its pores become distended, its fibre gross, and its vegetation luxuriant. Superfluous enjoyments easily become necessities of life; hence, when it is removed to a different scene, and condemned to struggle for existence in an ungrateful soil, it loses heart and perishes where it might have been long-lived and fruitful, if its temperament had been hardened by early privation.—Thus it fares, if I may be pardoned the reflection, with the mind of an ingenuous youth, which, under better influences, might have been formed to virtue. If the lesson of disinterestedness had been early inculcated, it might have been indelibly learned; he might have been led to sacrifice fame to humanity, as unhesitatingly as he sacrifices pleasure to fame. But, instead of being taught to consult only the unchanging principles of rectitude, and to be satisfied with the pleasures of benevolence, he is sedulously inspired with the love of glory: his ambition is fomented till this ungenerous passion assumes the ascendant in his breast, and becomes the arbiter of its existence.

When the nurselings have arrived at a proper age, the next step is to transplant them to the olive-yard. The task of preparing the ground for their reception should be begun immediately after the harvest. Holes or trenches, at least three feet in width, are dug and left mouldering till the close of winter, which is the season

for transplanting the Olive. The stock and principal branches are lopped and the wounds are covered with clay. As much of the roots as possible should be preserved, with the earth adhering to them. When the trees are carried to a distance, which may be done with the precautions that are used for other fruit trees, they should be set during several hours in water before they are replaced in the ground. Mellow, fertile mould should be spread upon the bottom of the holes and thrown first upon the roots; among which the earth should be lightly forced; though it is not useful to render it compact nor to heap it about the trunk. A copious watering follows, which is repeated in the course of the season, as the weather and the health of the plant may require.

The Olive arrived at an advanced age may be transplanted in the same manner as the young tree. In general, whatever vegetable is to support this trial, the most important precept is that the earth be widely broken up and minutely subdivided, so that the roots may be placed in their natural position, and that their first efforts to extend themselves may not be embarrassed by compact masses, which they penetrate with difficulty, and from which they derive a scanty subsistence.

The Olives should be planted at such a distance that they may not interfere with each other, and that every portion of the soil may contribute to their nourishment. In meager lands from which no other produce is exact-



ed, eighteen or twenty feet are enough; but in vineyards or corn lands they may be thirty-five or forty feet apart. Cato assigns twenty-five or thirty feet, which, as mean term, is sufficiently exact. In warmer climates certain varieties attain such dimensions as to require a space of, sixty or seventy feet.

Our olive-yard being thus formed, our next enquiry is concerning the culture necessary to obtain the most certain and the most abundant produce. Virgil, after describing the assiduous attention exacted by the Vine, leaves the Olive almost to nature.

*Contra, non ulla est Oleis cultura : neque illa  
Procurvam expectant falcem, rastrosque tenaces,  
Cum semel hæserunt arvis, aurisque tulerunt.  
Ipsa satis tellus, cum dente recluditur unco,  
Sufficit humorem. . . . .*

VIR. GEOR. II.

Not so the Olives : when their roots have found  
A commerce open with the friendly ground,  
And, firmly seated, can securely bear  
The summit tempted by the sportive air,  
No more the harrow nor the knife they ask —  
The plough completes, alone, the easy task.

Columella, on the contrary, advises the husbandman to bear in mind a judicious proverb : *Eum, qui aret olivetum, rogare fructum ; qui stercoret, exorare ; qui caedat, cogere.* It is true that the Olive does not become barren

when totally abandoned; but, like other vegetables, it repays the neglect of the husbandman with a diminished produce, and his care with larger and more abundant fruit.

In Provence it is customary to turn the soil in the spring and in the fall. Besides the tillage of the plough, the ground should be carefully dressed with the spade about the foot of each tree. More labour is required by some soils than by others: a compact, argillaceous loam must be more frequently turned than a light, calcareous mould.

The olive-yard should be manured at least once in three or four years; but it would be more beneficial to sustain its strength by moderate, annual supplies. Most species of manure, while they increase the produce of the Olive, impair the quality of its fruit: the finest oil is made from wild trees growing in calcareous lands of moderate fertility. Vegetable substances are preferable to animal manures for fruit trees in general, and especially for the Olive and the Vine. When animal matter is employed, it should be tempered with marl, seaweed, leaves, etc., and applied only when the whole is reduced to mould. To soils deficient in this ingredient, calcareous matter is of the utmost utility. Great benefit is said to be found in Spain from sea-water poured upon the roots of the Olive. But the finest manure is the offals of the fruit that has been pressed, and the washings of the utensils and of the oil-vessels.

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The manure is spread in the fall, in the winter, or before the tillage in the spring. Its effects are most sensible when it is applied at the beginning of winter, as, during this season, its virtues are imbibed by the soil and communicated to every fibre of the roots; through the spring and summer, on the contrary, it sometimes remains nearly inert beneath the surface. But in climates where the Olive is liable to injury from cold, the most serious accidents are to be feared from keeping its roots too warm in the winter. Its vegetation being in this manner quickened, so that the sap is set in motion by every genial sun that softens the bosom of nature, it is exposed to the most imminent danger from the returning frost. The fatal effects of cold are frequently less attributable to its intensity than to its suddenness: a plant which has become relaxed by the tepid breath of a deceitful zephyr is surprised and killed by the frozen blast of the north wind. To maintain an even temperature at the roots during the winter, earth should be heaped about the base of the trees, and the manure should be spread early enough in the fall to assist them in ripening their fruit and preparing the bloom of the succeeding year, or late enough in the spring to avoid the accidents of frost. The Greeks do not make use of manure, except when chance conducts a flock of sheep to the foot of an Olive, which immediately becomes conspicuous by a richer vegetation.

When substances proper for manure cannot be ob-

tained in the requisite abundance, the deficiency may be supplied by sowing grasses or cereal plants, and ploughing in the green herb. The intelligent cultivator is aware that he thus not only renders back what was extracted from the earth, but, as vegetables imbibe nourishment from the atmosphere, and as their roots arrest nutritious particles which would have escaped by filtration or evaporation, that he enriches the soil by an accession of new matter.

Vegetable chemistry has probably important secrets to reveal in this part of practical agriculture. As a soil may be exhausted by the continued growth of the same plants while it is still capable of bearing those of another genus, we should examine the nature of the particles consumed by different vegetables, in order to repair the waste by analogous supplies.

The most glaring imperfection in the agriculture of those parts of France which I have visited, is the deficiency of manure. The number of cattle on the soil of the kingdom is unequal to its wants; and the modes of supplying the deficiency of animal manure are not generally understood. Where the species of husbandry admits of rotation, a field is sometimes exhausted by the repetition of the same crop, and left to recruit itself by a period of absolute repose; and in Languedoc the vineyards are often prematurely destroyed, that the

• See Elements of Agricultural Chemistry.

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In some parts of France agriculture has made approaches to perfection ; but the zeal of improvement is not widely diffused. Agricultural societies exist in almost every department , whose labours are seconded by the ardour of enlightened individuals ; but great meliorations must spring from a general spirit of emulation , which it is not easy to awaken. The French , notwithstanding the rapidity of their conceptions , are a passive people , tenacious of routine. The number of liberally educated men who unite a taste for rural life with a fortune sufficient for experimental farming is comparatively small , « The foot of the owner is the best manure for his land ; » but the gentry of France rush into the capital to escape from *ennui* , as , in the noble days of chivalry , the defenceless inhabitants of the champaign fled into the castles , at the approach of some plundering Knight or lawless Baron. The inspired twilight of their native groves is forsaken for the luxurious shades of the royal gardens , and the simple independance of rural life , for the gilded servitude of the court. Existence has a charm only in Paris : those who cannot reside in the metropolis hurry into the provincial capitals to attend the levee of the prefect , and prefer bending in the saloon of this humble representative of royalty to dispensing instruction and happiness among their dependants at home. What *place* should a man solicit , before

his country invites his services, who can breathe an untainted air upon his own estate?—Nor have the French, in appreciating the dignity of agriculture, modelled their taste upon that of the ancients as scrupulously as in their literature: under the former monarchy rural employments were considered degrading to a gentleman.

Though these reflections were doubtless more applicable before the revolution, and even before the restoration of the throne, they are still, to a certain degree, just.—But let me not lightly reproach an august nation with faults to which a corrective has been applied, radical in its effects, though necessarily slow in its operation. They will disappear as its institutions become more popular, so that public consideration shall be obtained by public services, and not by the favour of the great. Experience has not been thrown away upon the French people; they are forming a national character, in whose splendour the glory by which they and Europe have been dazzled will be swallowed up and lost. Their liberty was planted amid storms that threatened the social world with dissolution; it has resisted the hostile influence of every element, and it will rise and spread itself, ample and strong, till it overshadows this happy country, and till its roots pierce the soil of distant lands. England herself, if she does not rise up betimes and assert the reforms that have become vitally necessary to her constitution, may take lessons from her rival

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widely different from the contrasts with which she has been wont to feed her pride.

The remaining part of the cultivation of the Olive is pruning. Bernard informs us that this practice was but lately introduced into Provence, and that it is not universally adopted, nor reduced to correct principles and uniform rules. In some places a limb is lopped away every year to renew the wood: but this is an injudicious mode, as the suckers to which it gives birth engross the sap to the prejudice of the productive branches. Pruning consists in cleansing a tree from dead wood and other impurities, which may be done at all seasons and by the simplest hand; and in retrenching its superfluous growth, which is a delicate operation and requires judgment and experience. Its object is to determine the form of the tree, to open it to the light and air, and to regulate its produce. This is done by diminishing the number of branches; and by extirpating such as are too feeble or too luxuriant. The pruning of the Olive is subject to the general principles of the art, modified by the peculiar nature of the tree. A part of its branches should be curtailed every year, and the number of bearing shoots determined so that it may not be exhausted by its fruit. After twelve or fifteen years, one or two of the principal limbs may be lopped, and at intervals, which must depend upon the condition of each tree, the whole summit may be retrenched. The most favourable season for pruning the Olive is in March.

Such is, summarily, the husbandry of Provence, which, though susceptible, perhaps, of improvement, is the most perfect in Europe.

More than thirty varieties of the Olive are known in France, which are distinguished by their size, by their

The most exact and extensive catalogue of the Olives is found in the New Duhamel. The following are some of the most esteemed varieties:

1. The *Olivier pleureur*, *Olea craniomorpha*, 14th variety in the New Duhamel, is one of the largest and finest trees. Its branches are redundantly numerous, and pendent like those of the Weeping Willow. Its fruit is good for the table, and yields a pure and abundant oil. It should be placed in vallies rather than on elevated grounds, as it has more to apprehend from drought than from cold: there are individuals of this variety in Languedoc that have three times survived the general destruction of the Olives by frost.

2. The *Olivier à fruit arrondi*, *Olea sphaerica*, 26th variety, N. D., is also among the least sensible to cold. It requires moisture, a good soil, and abundant manure. Its oil is of a superior quality.

3. The *Olivier de Lucque*, *Olea minor Lucensis*, 9th variety, N. D., is hardy and yields a fruit proper for preserving.

4 and 5. The *Aglandaou*, *Olivier à petit fruit rond*, *Olea fructu minore et rotundiore*, 3rd variety, N. D., and the *Olivier de Salon*, *Olea media fructu subrotundo*, 19th variety, N. D., are good for oil, and prefer dry and elevated grounds.

6. The *Olivier amygdalin*, *Olea amygdalina*, 25th variety, N. D., is much esteemed about Montpellier for its fine and abundant oil.

7. The *Picholine*, *Olea oblonga*, 11th variety, N. D., yields the most celebrated pickled olives. This variety is not delicate in the choice of soil and climate.



temperament as to soil and climate, and by the qualities of their fruit. Some of these varieties, like those of the Vine, owe their characteristic properties to the scene in which they are reared.

The principal product of the Olive is oil, but the pickled fruit is also a valuable article of commerce. The simplest manner of preserving the green olives is by covering them with a solution of common salt impregnated with fennel, cumin, coriander-seed and rosewood : the most perfect method is that employed for the *picholines* of Provence, which are so called from *Piccio- lini*, by whom the process was invented. They are gathered in the beginning of October, and the finest of them are selected and thrown into a weak solution of soda or potash rendered caustic with lime. In this solution they remain eight or ten hours till the pulp ceases to adhere to the stone : they are then steeped, during a week, in pure, cold water, daily renewed, and are afterwards transferred to an aromatic brine. Such of them as are destined for the tables of the luxurious are taken out after a certain time, deprived of the stone, in place of which is substituted a caper or a bit of truffle, and closed up in bottles of the finest oil. In this manner they are kept palatable for two or three years. The sweet olive of the ancients, which was eaten without preparation, is said to exist in the kingdom of Naples.

The proper season for gathering the olives for the press is the eve of their maturity, which varies in differ-

ent climates and in different varieties of the Olive, but which is easily distinguished by the colour of the fruit. Two powerful considerations should engage the cultivator not to delay the olive-harvest. We have already observed that the produce of this tree is alternate. The phenomenon, it is true, is more uniformly witnessed in some varieties than in others; but it might be assumed as a constant character, if it was not proved by experience to depend upon accidental causes. It has been attributed to the injury sustained by the trees in beating off their fruit; but it is not observed in some places where this practice prevails, and is constant in others where it is discarded. It has also been ascribed to injudicious pruning; but it is witnessed alike in oliveyards pruned in the most opposite modes, and in those that are unconscious of the knife. The little fruit that is borne in the year of repose is, also, of an inferior quality. Some other explanation must therefore be sought for, and a satisfactory one is indicated by Pliny in the continuance of the fruit upon the branches after its maturity: *Hærendo, enim, ultra suum tempus, absumunt venientibus alimentum*. This cause, which is generally admitted by vegetable physiologists in France, has been developed by Olivier in a memoir presented to the Economical Society of Paris. Evergreen trees, and among them the Olive, put forth the young shoots that are to bloom the succeeding year, not in the spring, like trees with deciduous leaves, but at the

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close of summer ; and the buds are prepared during the autumn and the beginning of winter. If, then, the tree is overladen with fruit, this second growth is prevented, and the hopes of the following season are precluded ; or, if the fruit is left too long upon the branches, it diverts the juices which should be employed in the preparation of the flower-buds. At Aix, where the olive-harvest takes place early in November, it is annual and uniform ; in Languedoc, Spain, Italy, etc. ; where it is delayed till December or January, it is alternate. The quality of the oil, also, depends upon gathering the fruit in the first stage of its maturity. It should be carefully plucked by hand, and the whole harvest completed, if possible, in a single day. To concoct the mucilage and to allow a part of the water to evaporate, it is spread out, during two or three days, in beds three inches deep.

The oil-mill retains nearly its primitive form : it consists of a basin raised two feet from the ground, with an upright beam in the middle, around which a massive mill-stone is turned by water or by a beast of burthen. The press is solidly constructed of wood or of cast iron, and is moved by a compound lever. The fruit, after being crushed to a paste, is put into sacks of coarse linen or of feather-grass, and submitted to the press. The virgin oil, which is first discharged, is the purest, and retains most sensibly the taste of the fruit. It is received in vessels half filled with water, from which it is taken off

and set apart in earthen jars : to separate the vegetable fibres and other impurities , it is repeatedly decanted. When the oil ceases to flow , the paste is taken out and broken up. As the sacks are returned to the press , boiling water is shed over them, and the pressure is renewed with redoubled force , till every particle of the oil and water is extracted. The mixture is left in a vat from which the oil is taken off as it rises to the surface. This oil, though less highly perfumed than the first, is nearly as fine and is usually mingled with it. The offals of the fruit are sometimes submitted to a third process : in a basin into which a rill of pure water is admitted, they are ground anew, the skins and mucilaginous particles floating on the surface are drawn off into reservoirs, and the shells are preserved for fuel. The utmost cleanliness is necessary in making the oil, which is finished in a day : with the nicest economy in the process, it amounts in weight to nearly one third of the fruit. The mean produce of a tree may be assumed, in France at ten pounds, and in Italy at fifteen : but single trees have been known in the productive season to yield three hundred pounds.

The kernel of the olive affords an oil the mixture of which with that of the pulp is said to injure its flavour and to hasten its rancidity. A machine has, in consequence, been invented for bruising the pulp without crushing the stone : that the arguments for its adoption have not prevailed over the established usage is no proof

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of their unsoundness; more convincing evidence is found in the exquisite quality of the oil of Aix.

But there are abuses which experience has demonstrated without being able to correct them: the fruit, after hanging too long upon the trees, is kept fermenting in heaps, to increase the quantity of oil, while the only effect is to vitiate its quality.

Before the revolution, an apology was found for these abuses, in France, in the embarrassments to which industry was subject from the oppressive exactions of the feudal lords, and from the absurd interference of the government. The tenants were compelled to use the mills of the lord, which were never sufficiently numerous; and in Languedoc the period of opening them was fixed by the police, as the time of collecting the gall-nuts is appointed by the Turkish Agas in Asia. The ancient practice is now gradually yielding to a more perfect method; yet how slowly is prejudice subverted, even by interest!

Besides the finest oil which is used upon the table, immense quantities are employed in the making of soap and for other mechanical purposes. A part of what is consumed in this way at Marseilles is imported from Greece and the Mediterranean Isles.

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I have thus rapidly sketched an outline of the history and cultivation of the far-famed Olive.—Among the gifts

of Minerva which adorn our rising empire, policy and arts and arms, may we hope to see her favourite tree enrich our soil? Some light may be thrown upon this enquiry by an examination of our climate, but it can be resolved only by experience.

The eastern and western shores of the Atlantic Ocean differ essentially in the phenomena of climate. In Europe the distribution of heat through the seasons is more uniform, and the medium of the year more elevated. This equability is highly favourable to the perfection of organized bodies; hence the vegetables of America are meliorated in the corresponding latitude in Europe, while many productions of Europe cannot exist under the same parallel in America. We are obliged, also, to migrate in the train of the seasons in quest of an agreeable temperature, which the more favoured Europeans enjoy without changing their native signs: we experience, in the same latitude, the summer of Rome, the winter of Copenhagen, and the mean temperature of the coast of Britany. Nor is this difference attributable to the state of cultivation, nor to any accidental cause with which we are acquainted: in the eternal forests that shroud our north-western coast we find again the delicious climate of Europe, while Tartary and China repeat the phenomena of our own. For the enjoyment of life and for the richness of agriculture, we

\* See De Humboldt's Memoir on the Distribution of Heat.

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should have been more advantageously situated on the opposite side of the Continent.

The Olive requires a climate whose mean temperature is equal to  $57^{\circ}, 17'$ , and that of the coldest month to  $41^{\circ}, 5'$ . In the United States, where the mean temperature of the year is  $57^{\circ}, 17'$ , that of the coldest month is only  $0^{\circ}, 5'$ , with some days far more intense. The capriciousness of our climate is still more dangerous to delicate vegetables than its inclemency; the difference of temperature in a single day is sometimes almost equal to that of the whole year in the south of Italy. The Olives near Charleston were rendered barren by the vernal frosts which congealed the young shoots. In a more southern latitude they would be secure in the winter, but they would languish through a sultry summer, unrefreshed by the healthful breezes which they respire on the shores of the Mediterranean Sea; they would, besides, find a silicious instead of a calcarious soil.

But with all these disadvantages, tracts uniting the conditions necessary for the growth of the Olive may probably be found sufficiently extensive for our wants. The possibility of its flourishing on our shores has been demonstrated by at least one experiment. While the Floridas were held by the English, an adventurer of that nation led a colony of Greeks into the eastern province, and founded the settlement of New Smyrna:

\* See De Humboldt's Essay on the Geographical Distribution of Plants.

the principal treasure which they brought from their native clime was the Olive. Bartram, who visited this settlement in 1775, describes it as a flourishing town. Its prosperity, however, was of momentary duration; driven to despair by hardship and oppression, and precluded from escape by land, where they were intercepted by the wandering savages, a part of these unhappy exiles conceived the hardy enterprize of flying to the Havanna in an open boat; the rest removed to St. Augustine when the Spaniards resumed possession of the country. In 1783 a few decaying huts and several large Olives were the only remaining traces of their industry.

Louisiana, the Floridas, the islands of Georgia and chosen exposures in the interior of the State, will be the scene of this culture. Perhaps it will be extended to some parts of the Western States; it has been hastily concluded that the Olive can exist only in the vicinity of the sea; it is found in the centre of Spain, and in Mesopotamia at the distance of a hundred leagues from the shore. The trial should be made in every place where its failure is not certain, and for this purpose young grafted trees should be obtained from Europe, and the formation of nurseries from the seed immediately begun.

The Olive is perhaps the most valuable, but it is not the only accession that might be made to our vegetable reign, if a more enterprising spirit prevailed in our hus-

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bandry, and if establishments were formed for the reception of exotic plants. This important subject claims the attention of government : amid its labours for the promotion of commerce and manufactures, why should not its fostering care be extended to agriculture ?

The people of the United States, instructed by experience, have consecrated an altar of oblivion to the Genius of the waves and to the Genius of the soil. They will not allow one system of industry to be promoted at the expence of another. We have solved the transcendent problem of reconciling the interest of the individual with that of the public, by throwing down the barriers to every species of industry, and by leaving every man to enjoy the fruits of his labour undiminished by the exactions of a rapacious government. Let these principles be the immovable basis of our political economy. The height of prosperity at which we have arrived is doubtless attributable to the successful enterprises of our merchants, and our commerce should still be cherished and defended like the sacred soil of the Republic. But is not the moment arrived when we may begin to measure the greatness of our country by some other standard than simply that of commercial prosperity? With means so ample and unembarrassed, might we not give more activity and extension to works of domestic improvement? Education remains to be perfected—a national character to be formed—our strength to be established on durable foundations by the developement of our

internal resources. Institutions should be devised, which, by assimilating the feelings of our citizens, may corroborate that union which is the bulwark of our national independence, without intrenching on those subordinate sovereignties which are the guarantees of our political liberty. A taste for pacific glory should be inspired, and an impulse given to public spirit, in harmony with that magnanimous moderation which becomes the future arbiter of nations.

From these great objects no schemes of vulgar ambition should for a moment divert our ardour. Already, the influence of our character far exceeds that of our strength, and our claims to the rank of a primary power are admitted by anticipation. The attention of the world is daily becoming more intently fixed upon our actions. Old Europe contemplates us with reverent affection, as the hoary-headed warrior gazes on the blooming hero whose youthful achievements eclipse the glory of his sire. A great example is wanted by mankind; from us they demand it; and the cause of universal liberty is interested in our conduct.

I do not utter these sentiments in the language of reproach. Much has already been done by my country, which is admired by cotemporary sages, and which will go down with honour to a more enlightened and philosophical posterity; all that is great and good may be hoped from her maturer wisdom: but I feel interested in her glory; she has risen upon my af-

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fections by absence, and upon my esteem by comparison; her progress, however rapid, halts behind the impatience of my wishes.

Our fathers have left us a noble inheritance, and it is our duty to improve it. What surer basis can we choose for national wealth, than a learned and enterprising agriculture? How can we more effectually strengthen the ties of interest that bind the extremities of our country in indissoluble union, than by augmenting the number and the value of their useful productions? How can the intelligence of a people be more favourably developed, than by an art which gives so wide a scope to comparative sagacity, and which brings its conclusions to the test of immediate experience? Who are more likely to be devoted to their country, than those who have attached the hopes of their children to its soil?—There is, besides, in the profession of agriculture, something so congenial to republican manners, that we should naturally expect to see the freest country the best cultivated. Remote from the contest of sordid passions, and surrounded by all that is necessary to his happiness, the husbandman has no inducement to calculate the interest upon political corruption. A laborious life, spent in the open air, in the majestic presence of Nature, lends a corresponding simplicity and elevation to his character. In public stations a patriot is often driven from his purpose by the jealous opposition of his rivals, or by the invincible prejudices of

his age; he must, at least, sacrifice his freedom to the duties of his office; but in a life devoted to agricultural improvement, the purest sources of rational enjoyment are united: the first want of a generous spirit is that of being useful to mankind, the second, is that of *liberty*.

PLATE LXXXVII.

*A branch with leaves and fruit of the natural size. Fig. 1, Flowers of the natural size. Fig. 2, A flower magnified. Fig. 3, A drupe with the stone exposed.*

Note. *The preceding article was written at the request of Mr. Michaux, for whom I seize with pleasure an opportunity of expressing my esteem; justice obliges me to avow that it has not had the benefit of his revision.*

*I have consulted the most judicious ancient and modern works, Columella, Pliny, the New Duhamel, the Memoirs of the Academy of Marseilles, etc., and have myself observed the Olive in Provence.*

AUGUSTUS L. HILLHOUSE,

*Citizen of the United States.*

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## WILD CHERRY TREE.

*Icosandra monogynia*, LAM.

Rosace. Juss.

**CERASUS VIRGINIANA.** *C. foliis deciduis, ovati-oblongis, acuminatis, serratis, nitidis; racemis terminalibus, elongatis; fructibus globosis, nigris.*

The Wild Cherry Tree is one of the largest productions of the American forests. Its wood is of an excellent quality and elegant appearance, and is usefully employed in the arts. In the Atlantic as well as in the Western States, this tree is known only by the name which I have adopted. It is more or less abundant as the soil and climate are more or less favourable to its growth, to which the extremes of heat and cold in the seasons, and of dryness and humidity in the soil, are alike unpropitious. Thus in the district of Maine, where the winter is long and intense, it hardly exceeds 30 or 40 feet in height, and from 8 to 12 inches in diameter; in the southern and maritime parts of the Carolinas and of Georgia, where the summer is intemperately hot and where the soil is generally arid and sandy, it is rarely seen, and on the banks of rivers where the ground is too wet, its dimensions are stinted; but in the upper part of these States, where the climate is milder and the soil more fertile, it is sufficiently common, though less multiplied than in Virginia and Pennsylvania. It abounds,

also, in the Illinois Country, in Genessee and in Upper Canada, and unites with the Overcup White Oak, the Black Walnut, the Honey Locust, the Red Elm and the Coffee Tree in the forests which cover these fertile regions. But it is no where more profusely multiplied nor more fully developed than beyond the mountains in the States of Ohio, Kentucky and Tennessee. On the banks of the Ohio I have measured stocks which were from 12 to 16 feet in circumference, and from 80 to 100 feet in stature, with the trunk of an uniform size and undivided to the height of 25 or 30 feet.

The leaves of the Wild Cherry Tree are 5 or 6 inches long, oval-acuminate, denticulated, of a beautiful brilliant green, and furnished at the base with two reddish glands. It is remarked in the neighbourhood of inhabited places that they are peculiarly liable to be attacked by caterpillars.

The flowers are white and collected in spikes which have a beautiful effect. The fruit is about the size of a pea, disposed in the same manner as the flowers, and nearly black at its maturity; soon after which, notwithstanding its bitterness, it is devoured by the birds. It is sold in the markets of New York and Philadelphia, and is employed to make a cordial, by infusion in rum or brandy, with the addition of a certain quantity of sugar.

The bark of this tree is so peculiar as to render it distinguishable at first sight, when from its height the form of its leaves cannot be discerned. The trunk is re-

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gularly shaped, but the bark is blackish and rough, and detaches itself semi-circularly in thick, narrow plates, which are renewed after a considerable lapse of time.

The perfect wood is of a dull, light red tint, which deepens with age. It is compact, fine-grained and brilliant, and not liable to warp when perfectly seasoned. It is extensively employed in the small towns of the Middle and Western States for every species of furniture; and when chosen near the ramification of the trunk it rivals Mahogany in beauty. The Wild Cherry Tree is generally preferred to the Black Walnut, whose dun complexion with time becomes nearly black. Among the trees that grow east of the Mississippi, it is the most eligible substitute for Mahogany. On the banks of the Ohio, at Pittsburgh, Marietta and Louisville, it is employed in ship-building, and the French of Illinois are said to use it for the felloes of wheels.

In the *lumber-yards* of New York and Philadelphia, Wild Cherry wood is sold in planks of different thicknesses, which are employed for bed-steads and other articles of furniture. These planks, 3 inches thick, are sold at 4 cents a foot at Philadelphia, and at less than half this price at Pittsburgh and in Tennessee. They are sent from Kentucky to New Orleans, where they are also employed in cabinet-making.

The Wild Cherry Tree deserves a place in the forests of Europe, and it is especially adapted to the northern departments of France and to the country along the

Rhine, which bear the greatest analogy to its native regions. To recommend its propagation to the foresters of Europe is at the same time to invite those of America to preserve it with care, and to favour its reproduction; they should leave on foot the old stocks of the natural growth for the purpose of furnishing seed, and favour the increase of the young trees by destroying those of other species by which it might be impeded.

## PLATE LXXXVIII.

*A branch with leaves and fruit of the natural size.*

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Wild Orange.  
*Cerasus caroliniana.*

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## WILD ORANGE TREE.

*CERASUS CAROLINIANA*. *C. foliis perennantibus, breviter, petiolatis, lanceolato-oblongis, mucronatis, laevigatis, subcoriaceis, integris; racemis axillaribus, brevibus; fructu subgloboso, acuto, sub-exsuo.*

Obs. Arbor formosa, fastigiata; ramis strictis; fructibus hieme persistentibus.

THIS beautiful species of Cherry Tree was observed in the Bahama Isles by Catesby, and subsequently by my father. On the Continent of North America it appears to be nearly confined to the islands on the coast of the Carolinas, of Georgia and of the Floridas. Except the margin of the sea, it is rarely found on the mainland, even at the distance of 8 or 10 miles from the shore, where the temperature is 5 or 6 degrees colder in the winter, and proportionally milder in the summer.

This tree is known only by the name of Wild Orange Tree. Its leaves are oval-acuminate, evergreen, smooth and shining on the upper surface, and about 3 inches in length. The flowers are numerous, white, and arranged in little bunches an inch or an inch and a half long, which spring at the base of the leaf. The fruit is small, oval, and nearly black: it consists of a soft stone surrounded with a small quantity of green pulpy substance, which is not eatable. This fruit persists through a great

part of the following year, so that in the spring the tree is laden at once with fruit and with flowers. The Wild Orange Tree may be considered as one of the most beautiful vegetable productions of this part of the United States, and it is selected with the more reason by the inhabitants to plant about their houses, as it grows with rapidity and affords an impenetrable shade.

I have remarked that of all the trees which grow naturally in the Carolinas and in Georgia, the flowers of the Wild Orange are preferred by bees.

It ramifies at a small height, and forms a spacious and tufted summit, which is owing, perhaps, to its growing upon open ground instead of being compressed in the forest, and forced to shoot upwards in order to enjoy the light. The bark of the trunk is of dun complexion, and is commonly without cracks.

The perfect wood is rose-coloured and very fine-grained; but, as this species is not extensively multiplied, I do not know that it is appropriated to any use: there is the less occasion for it, as other wood, in no respect inferior, is procured with facility.

I have remarked in the bark of the roots a strong odour resembling that of the Wild Cherry stone: hence I presume that it would afford a fragrant, spirituous liquor.

The only merit of this tree is its brilliant vegetation; which renders it, when in bloom, one of the most beautiful productions of the southern part of the United

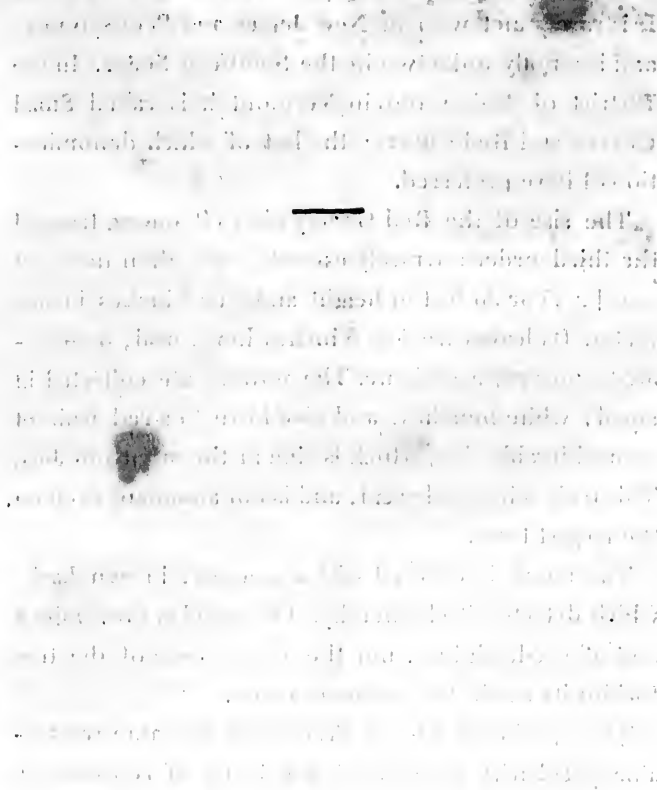
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States. Too delicate to support the winter of Paris, it would flourish in the open field only in the southern departments of France and in Italy.

PLATE LXXXIX.

*A branch with leaves and flowers of the natural size, and fruit of the preceding year.*



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## RED CHERRY TREE.

**CERASUS BOREALIS.** *C. foliis ovali-oblongis, acuminatis, glabris; floribus subcorymbosis; fructibus rubris.*

**THE** Red Cherry is common only in the Northern States and in Canada, New Brunswick and Nova Scotia. It is rarely met with in New Jersey and Pennsylvania, and is wholly unknown in the Southern States. In the District of Maine and in Vermont it is called Small Cherry and Red Cherry; the last of which denominations I have preferred.

The size of the Red Cherry places it among trees of the third order: it rarely exceeds, and often does not equal, 25 or 30 feet in height and 6 or 8 inches in diameter. Its leaves are 5 or 6 inches long, oval, denticulated and very acuminate. The flowers are collected in small, white bunches, and give birth to a red fruit of inconsiderable size, which is ripe in the month of July. This fruit is intensely acid, and is not abundant even on the largest trees.

The trunk is covered with a smooth, brown bark, which detaches itself laterally. The wood is fine-grained and of a reddish hue; but the inferior size of the tree forbids its use in the mechanical arts.

This species of Cherry Tree offers the same remarkable peculiarity with the Canoe Birch of reproducing





H. J. Redouté del.

Gabriel sculp.

Red Cherry.  
*Cerasus borealis.*

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itself spontaneously in cleared grounds, and in such parts of the forests as have been burnt, which is observable in spots where fire has been kindled by travellers.

Of all the native species of North America the Red Cherry Tree bears the greatest analogy to the cultivated Cherry Tree of Europe, hence it is the most proper for receiving grafts: it has been found difficult to graft the European Cherry Tree upon the Wild Cherry Tree.

## PLATE XC.

*A branch with fruit of the natural size. Fig. 1, A bunch of flowers.*



## LARGE BUCKEYE.

Heptandria monogynia. LINN.

Aceris. Juss.

PAVIA LUTEA. *P. foliis quinatis, æqualiter serratis;  
corollis luteis, tetrapetalis, viscosis, clausis.*

THE Yellow *Pavia*, or Large Buckeye, is first observed on the Alleghany Mountains in Virginia, near the 39th degree of latitude; it becomes more frequent in following the chain towards the south-west, and is most profusely multiplied in the mountainous districts of the Carolinas and of Georgia. It abounds, also, upon the rivers that rise beyond the mountains and flow through the western part of Virginia and the States of Kentucky and Tennessee to meet the Ohio. It is much less common along the streams which have their source east of the Alleghanies, and which, after watering the Carolinas and Georgia, discharge themselves into the Ocean. This species may be considered then as a stranger to the Atlantic States, with the exception of a tract 30 or 40 miles wide in the Southern States, as it were beneath the shadow of the mountains. It is here called Big Buckeye, to distinguish it from the *Pavia rubra*, which does not exceed 8 or 10 feet in height, and which is called Small Buckeye.

I have seen no situation that appeared more favourable to the Big Buckeye than the declivities of the lofty



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mountains of North Carolina, and particularly of the Greatfather Mountain, the Iron Mountain and the Black Mountain, where the soil is generally loose, deep and fertile. The coolness and humidity which reign in these elevated regions, appear likewise to be necessary to its utmost expansion; it here towers to the height of 60 or 70 feet, with a diameter of 3 or 4 feet, and is considered as a certain proof of the richness of the land.

The leaves of this tree are united to the number of five at the end of a common petiole of considerable length. They are lanceolate, pointed at the summit, serrate and slightly furrowed. The flowers, of a light, agreeable yellow, are upright and disposed in bunches at the end of the shoots of the same season. The numerous bunches of flowers, contrasted with the fine foliage, lend a highly ornamental appearance to the tree. The fruit is contained in a fleshy, oval capsule, which is often gibbous, and whose surface, unlike that of the Horse Chesnut of Asia and of the American Horse Chesnut, is smooth. Each capsule contains two seeds, or chesnuts, of unequal size, flat upon one side and convex on the other. They are larger and lighter-coloured than those of the common Horse Chesnut, and, like them, are not eatable.

In 1808 I passed a great part of the summer with Messrs. John and William Bartram, at their charming residence at Kingsess on the banks of the Schuylkill, five miles from Philadelphia, where they have collected

a great variety of trees from different parts of the United States and of Europe ; I remarked that the Large Buckeye was one of the earliest among them to cast its leaves ; they begin to fall about the 15th of August, while the other Horse Chesnuts are still clothed with their finest verdure. Its foliage and flowering are also tardy, which is an essential defect in a tree whose only merit is its beauty. The wood, from its softness and want of durability, can subserve no useful purpose. Even in beauty, this species is inferior to the common Horse Chesnut, and can never supplant that magnificent tree.

## PLATE XCI.

*A branch with leaves and flowers of the natural size.*  
*Fig. 1, Fruit beginning to open. Fig. 2, A chesnut of the natural size.*

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**OHIO BUCKEYE,**  
OR  
**AMERICAN HORSE CHESNUT.**

**PAVIA OHIOENSIS. *P. foliis quinatis, inæqualiter dentatis;*  
*floribus sub-flavis; fructibus muricatis.***

**THIS** species of Horse Chesnut, which is mentioned by no author that has hitherto treated of the trees and plants of North America, is unknown in the atlantic parts of the United States. I have found it only beyond the mountains, and particularly on the banks of the Ohio for an interval of about 100 miles, between Pittsburgh and Marietta, where it is extremely common. It is called Buckeye by the inhabitants, but as this name has been given to the *Pavia lutea*, I have denominated it Ohio Buckeye, because it is most abundant on the banks of this river, and have prefixed the synonyme of American Horse Chesnut, because it is proved to be a proper Horse Chesnut by its fruit, which is prickly like that of the Asiatic species, instead of being smooth like that of the *Pavia*.

The ordinary stature of the American Horse Chesnut is 10 or 12 feet, but it sometimes equals 30 or 35 feet in height, and 12 or 15 inches in diameter. The leaves are palmated, and consist of five leaflets parting from a common centre, unequal in size, oval-acuminate, and

irregularly toothed. The entire length of the leaf is 9 or 10 inches, and its breadth 6 or 8 inches.

The bloom of this tree is brilliant : its flowers appear early in the spring, and are collected in numerous white bunches. The fruit is of the same colour with that of the Common Horse Chesnut and of the Large Buckeye, and of about half the size : it is contained in fleshy, prickly capsules, and is ripe in the beginning of autumn.

On the trunk of the largest trees the bark is blackish, and the cellular integument is impregnated with a venomous and disagreeable odour. The wood is white, soft, and wholly useless.

The value of the Ohio Buckeye or American Horse Chesnut consists chiefly in the beauty of its flowers, which, with its rapid vegetation and hardy endurance of cold, will bring it into request both in Europe and America as an ornamental tree.

#### PLATE XCII.

*A branch with leaves and flowers. Fig. 1, Fruit*

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# PERSIMON.

*Polygamia dioecia.* Linn.

*Guaiacana.* Juss.

**DIOSPYROS VIRGINIANA.** *D. foliis longè petiolatis, oblongo-ovalibus, acuminatis, subtis pubescentibus.*

THE banks of the river Connecticut, below the 42nd degree of latitude, may be considered as the northern limit of this tree; but it is rendered rare in these parts by the severity of the winter, while in the State of New Jersey, near the city of New York, it is common, and still more so in Pennsylvania, Maryland and the Southern States: it abounds, also, in the western forests. It is every where known to the Americans by the name of Persimon; the French call it *Plaqueminier*, and its fruit *plaquemines*.

The Persimon varies surprisingly in size in different soils and climates. In the vicinity of New York it is not more than half as large as in the more southern States, where, in favourable situations, it is sometimes 60 feet in height and 18 or 20 inches in diameter.

The leaves are from 4 to 6 inches in length, oblong, entire, of a fine green above and glaucous beneath: in the fall they are often variegated with black spots. The terminal shoots are observed to be usually accompanied, at the base, by small, rounded leaves.

This tree belongs to the class of vegetables whose sexes

are confined to different stocks. Both the barren and fertile flowers are greenish and not strikingly apparent. The ripe fruit is about as large as the thumb, of a reddish complexion, round, fleshy, and furnished with six or eight semi-oval stones, slightly swollen at the sides, and of a dark purple colour. It is not eatable till it has felt the first frost, by which the skin is shrivelled, and the pulp, which before was hard and extremely harsh to the taste, is softened and rendered palatable. The fruit is so abundant that in the Southern States a tree often yields several bushels, and even in New Jersey I have seen the branches of stocks not more than 7 or 8 feet in height bent to the ground by their burthen. In the South it adheres to the branches long after the shedding of the leaf, and when it falls it is eagerly devoured by wild and domestic animals. In Virginia, the Carolinas and the Western States, it is sometimes gathered up, pounded with bran, and formed into cakes which are dried in the oven, and kept to make beer, for which purpose they are dissolved in warm water, with the addition of hops and leven. It was long since found that brandy might be made from this fruit, by distilling the water, previously fermented, in which they had been bruised. This liquor is said to become good as it acquires age: but it will be impossible to derive profit from the Persimon in these modes, and in the country where it is most abundant a few farmers only employ its fruit occasionally for their households. The Apple Tree and

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the Peach Tree are far more advantageous, as their growth is more rapid and their produce more considerable.

The trunk of the full-grown Persimon is covered with a deeply furrowed, blackish bark. The fresh sap is of a greenish colour, which it preserves after it is seasoned, and the heart is brown, hard, compact, strong and elastic; I have been told, however, that it is liable to split. At Baltimore it is used by turners for large screws, and by tinmen for mallets. At Philadelphia shoelasts are made of it equal to those of Beech, which are usually preferred. In Carolina the negroes employ it for the large wedges with which, aided by those of iron, they split the trunks of trees. I have been assured by coach-makers in Charleston that they had employed it for the shafts of chaises, and found it preferable to the Ash and to every other species of wood except the Lance Wood of the West Indies, and that the difficulty of procuring stocks of the proper size alone prevented it being more frequently applied to this use: in truth, though it is common in the woods, it is usually of inconsiderable dimensions.

Such are the particulars with which I have become acquainted concerning the wood of the Persimon. Its properties appear not to be distinctly ascertained nor generally recognized; they are such, however, as to deserve the attention of persons whose object is a practical knowledge of the trees of the United States.

I have heard it asserted by farmers in Virginia, that the grass is more vigorous beneath the Persimon than under any other tree, and this fact is attributed to the speedy decay of its leaves, which form an excellent manure. In an ancient periodical work printed at Philadelphia, I find that the English government, in the years 1762 and 1763, offered a premium of 20 pounds sterling for every fifty pounds of gum collected from the Persimon in their American Colonies. They were doubtless misinformed on this subject : a greenish gum, without taste or smell, exudes from the tree, but, in several hundred experiments, I have not been able, by wounding the bark, to collect more than two scruples from a single stock.

Breckel, in his history of North Carolina, says that the inner bark has been used with success in intermitting fevers. The fact remains to be verified ; I have not had an opportunity of proving it by my own observations nor by authentic report, but it is rendered in some degree probable by the extreme bitterness of the bark.

The inhabitants of the Southern States have very properly preserved the Persimon in clearing the forests. Its fruit might, without doubt, be doubled in size by attentive cultivation. As the tree is dioecious, care must be taken to procure stocks of both sexes. The roots run to a great distance, and produce a numerous family of sprouts.

The Persimon grows perfectly well and even yields

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fruit in the climate of Paris; but farther south it would succeed still better. Its propagation may be recommended for the sake both of its fruit and of its wood.

*Observation.* — Dr. B. S. Barton, professor of Botany and *Materia Medica* in the University of Pennsylvania, believes the Persimon of the Southern States to be a distinct species from that of New Jersey. He grounds this opinion upon the fact that the leaves of the Virginian Persimon are one half larger and slightly downy beneath, and the fruit one half smaller, with flat instead of convex stones. I am disposed to admit the distinction, but am not prepared to adopt it with confidence. I have always ascribed the difference to climate, which, as we have had occasion to remark, has so extraordinary an influence on the development of other trees, that are common to different parts of the United States. I leave the difficulty, however, to be resolved by more accomplished botanists, simply observing that the two varieties are similar in their general appearance and in the properties of their wood and of their fruit.

## PLATE XCHII.

*A branch with leaves of the natural size. Fig. 1, Fruit of the natural size. Fig. 2, A seed.*

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## CAROLINIAN POPLAR.

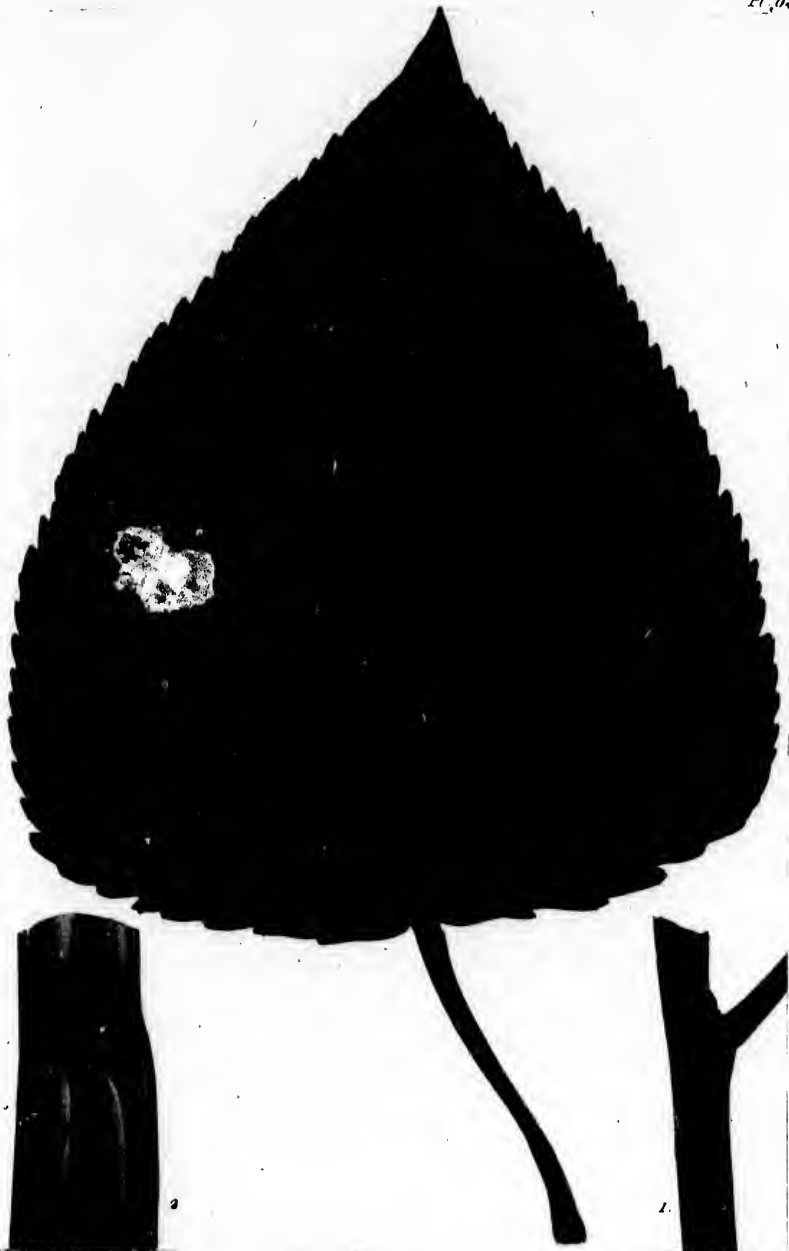
*Diccia polyandria.* Linn.

Amentac. Juss.

**POPULUS ANGULATA.** *P. arbor maxima; ramis acutangulis; foliis deltoideis, serratis; junioribus amplissimis, cordatis; gemmis viridibus; non resinosis.*

THE lower part of Virginia is the most northern point at which I have found this species of Poplar, and here it is less common than in the two Carolinas, in Georgia and in Lower Louisiana. It grows of preference on the marshy banks of the great rivers which traverse these States, and is peculiarly abundant on the Mississippi, from the ocean to the mouth of the Missouri, and along the Missouri for 100 miles from the junction of these streams, which, in following their windings, is a distance of 1500 miles. In the swamps the Carolinian Poplar is accompanied by the Cypress, Large Tupelo, Red-flowering Maple, Water Hickory, Overcup Oak, Cotton Wood and Cotton Tree. Among the numerous species of Poplar found in the United States this is one of the most remarkable for its size, being sometimes 80 feet high with a proportional diameter and an expansive summit garnished with beautiful foliage.

The leaves, from the moment of their unfolding; are smooth and brilliant, but they differ widely in con-



*J. H. H. del.*

*Gabriel sculp.*

Carolinian Poplar.  
*Populus Angulata.*

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formation, at different ages of the plant; on sprouts and young stocks they are 7 or 8 inches long, as much in breadth in the widest part, heart-shaped and rounded at the base, with the principal ribs of a reddish colour; on trees exceeding 5 or 6 inches in diameter and 30 or 40 feet in height, they are only one fourth as large; particularly on the higher branches, and their base is nearly straight, and at right angles with the petiole. These leaves are thin, smooth, of a fine green tint, marked with yellowish nerves and edged with obtuse teeth, which are finer towards the summit and coarser near the base. The long petiole compressed in the upper part renders them easy to be agitated by the wind.

On sprouts and young stocks the annual shoots are very thick, distinctly striated and of a green complexion spotted with white; on branches of the second, third, and even of the seventh or eighth year, the traces of the furrows are still observable: they are indicated by prominent red lines in the bark terminating at the insertion of the young shoots, which ultimately disappear with the growth of the branches. This character belongs also to the Cotton Tree; but, besides the difference of their general appearance, the two species are distinguished by their buds; those of the Carolinian Poplar are short, of a deep green, and destitute of the resinous, aromatic substance which covers those of the Cotton Wood, and of which the vestiges remain till late in the season.

The wood of the Carolinian Poplar is white, soft; and considered unfit for use in its native country. This stately tree was introduced many years ago into Europe, where it is justly esteemed as an ornamental vegetable by the amateurs of foreign plants. In the climate of Paris its terminal branches are liable, in rigorous seasons, to be destroyed by the frost.

In the North American Flora, my father has confounded the Carolinian Poplar and the Cotton Wood. The two species agree in the angular form of their trunk, but they differ in other respects, which I have particularly mentioned.

#### PLATE XCIV.

*A leaf of the natural size from the middle of a large tree.*  
*Fig. 1, A portion of an annual shoot. Fig. 2, A piece of the bark from a branch of the third year.*

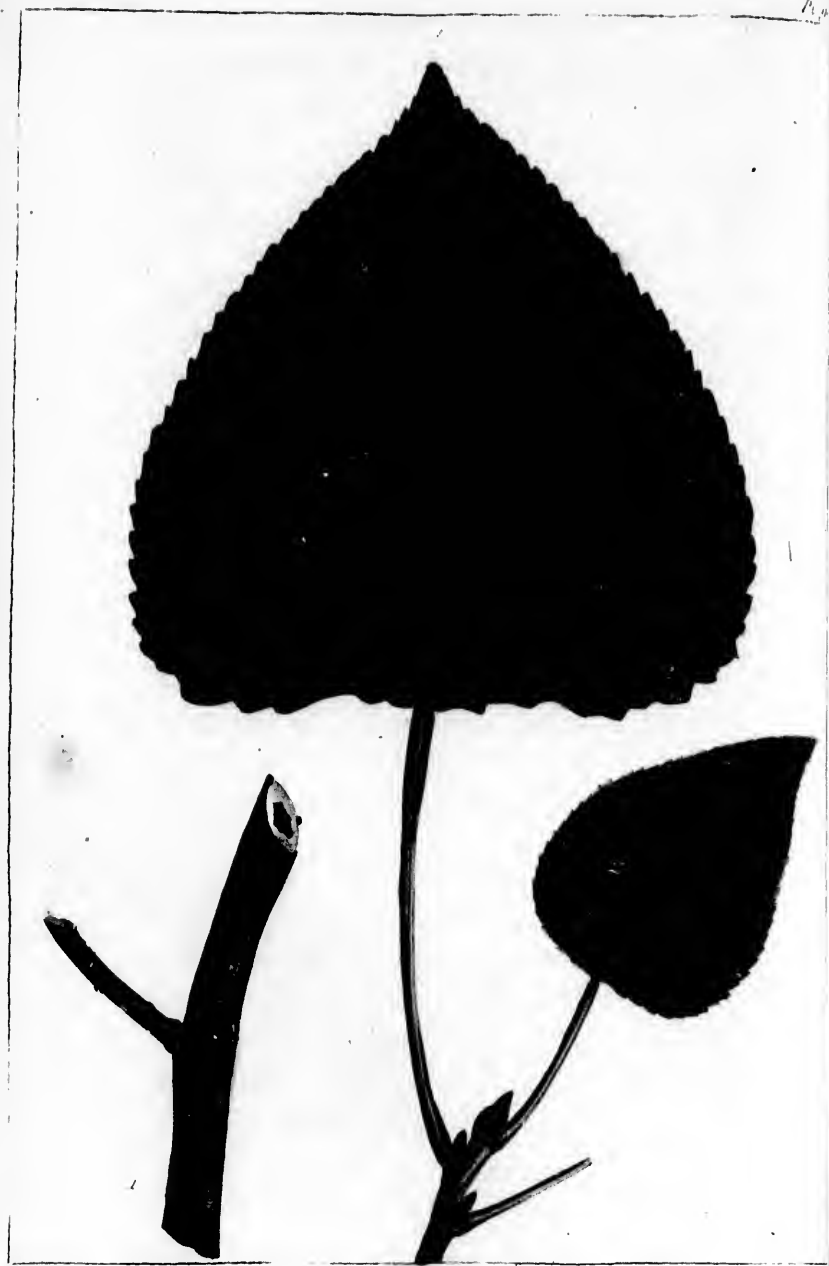
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## COTTON WOOD.

POPULUS CANADENSIS. *P. foliis magnis lato-cordatis, crenatis, glabris; basi glandulosis; ramis angulatis in adultis.*

THIS species, like the Virginian Poplar, has long been known in Europe. It was probably introduced into France from Canada; such at least is the origin indicated by the name *Canadian Poplar*. I have found this tree in the upper part of the State of New York on the banks of the river Genessee which empties into Lake Ontario in the latitude of 43 degrees, in some parts of Virginia, and on several islands of the Ohio. I have every where seen it on the margin of rivers in a fat, unctuous soil, exposed to inundation at their overflowing in the spring. It is never met with on the skirts of swamps and in other wet grounds in the forests. On the banks of the Genessee, where the winter is as rigorous as in the north of Germany, the Cotton Wood is 70 or 80 feet high and 3 or 4 feet in diameter.

The remarks communicated to me by Mr. De Foucault, who has long cultivated this tree and studied it with more minute attention than myself, agree perfectly with the result of my own observations in the country of its natural growth. "The leaves," says Mr. De Foucault, "are deltoid, or trowel-shaped, approaching to cordiform, always longer than they are

broad, glabrous and unequally toothed : the petioles are compressed and of a yellowish green, with two glands of the same colour as the base : the branches are angular, and the angles form whitish lines, which persist even in the adult age of the tree. Every soil does not suit the Cotton Wood; in compact, argilacious lands it grows less kindly than the Virginian Poplar.

“ The Virginian Poplar is justly preferred as a useful tree, not only because it is less difficult in the choice of soil, but because it is superior in height : the elevation of the Cotton Wood is repressed by the frequent ramification of its limbs near the trunk, and if the lower limbs are lopped away the same form is assumed by those above.

“ The Cotton Wood is a more picturesque tree than the Virginian Poplar, particularly when growing on the sides of rivers. Its trunk is very plainly sulcated even in its old age. It is less so indeed than the Carolinian Poplar, but far more so than the Virginian Poplar, whose trunk is rounder and its summit more spherical; hence the two species are easily distinguished. The Cotton Wood, also, acquires a superior bulk.”

The female aments are 6 or 8 inches long, flexible and pendulous. The seeds are surrounded with a beautiful plume which has the whiteness of cotton, and the young buds are coated with a resinous, aromatic substance of an agreeable odour.

In the Atlantic States this Poplar is rare and has re-

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ceived no specific name. It appears, on the contrary, to be common on the banks of the Mississippi above the river of the Arkansas, and on the Missouri and its tributary streams. It is doubtless the Poplar designated by the name of Cotton Wood, and mentioned so frequently by Gass, who accompanied Lewis and Clark to the Western Ocean, and by Pike in his interesting account of the northern part of New Spain. Often, say these travellers, it is the only tree seen growing on the sides of the rivers. The Mandanas, who live 1,500 miles from the mouth of the Missouri, feed their horses during the winter with its young shoots. The excessive cold experienced in these regions sufficiently proves that the Cotton Wood is not the same tree with the Carolinian Poplar, whose annual shoots freeze every year with a degree of cold much less intense. The Americans of Upper Louisiana, it is true, confound the two species because they are found growing in company on the banks of the Mississippi; but the Carolinian Poplar, which is more abundant than the other in Lower Louisiana, where the temperature of the winter is too mild for snow, disappears on the Missouri at the distance of 100 miles from its junction with the Mississippi.

## PLATE XCV.

*Leaves of the natural size taken from a large tree. Fig. 1,  
Part of a branch of two years' growth.*

## AMERICAN BLACK POPLAR.

POPULUS HUDSONICA. *P. ramulis junioribus pilosis; foliis dentatis, conspicuè acuminatis.*

I have found the American Black Poplar only on the banks of the river Hudson, above Albany, but I presume that it grows also in the provinces of Canada, which I have never visited. The stocks which I have observed were insulated, and consequently, spread into a diffuse summit, hence I was unable to determine the stature of this tree when confined in the forest, but their size, which was 30 or 40 feet in height and 12 or 15 inches in diameter, sufficiently proves that it surpasses the American Aspen and the Large Aspen.

The bark of the young branches is of a greyish white, and the buds, which spring from the bosom of the leaves, are of a dark brown. One of the distinctive characters of this species is the hairiness of the young shoots and of the petioles in the spring, which is perceptible, also, on the back of the young leaves. The leaves are smooth, of a beautiful green colour, denticulated, rounded in the middle, and acutely tapering towards the summit. When fully developed they are a little more than 3 inches long, about 2 inches broad, and, unlike the leaves of trees in general, they exhibit nearly the same shape from the moment of their unfolding. The

*Black pine.*

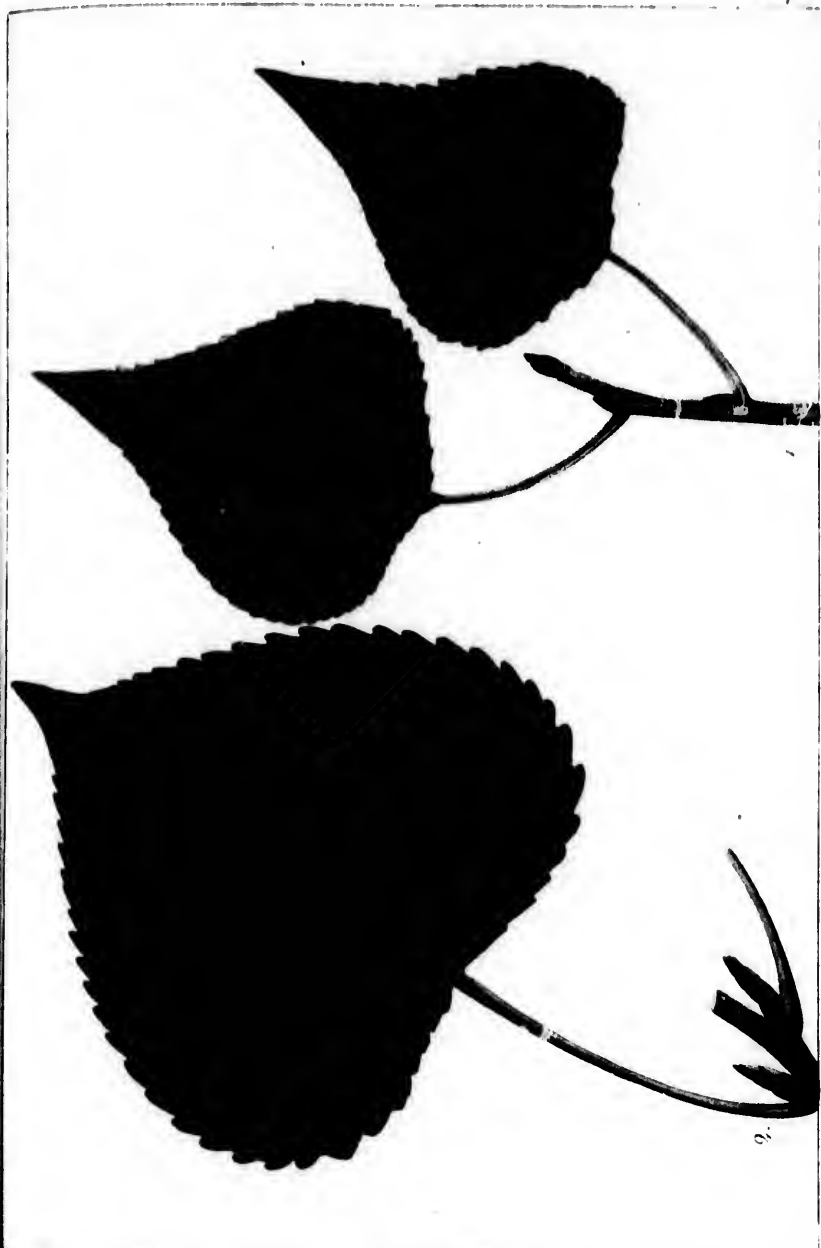
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1. American Black Poplar.  
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2. Virginian Poplar.  
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*Fig. 1*



aments of this Poplar are 4 or 5 inches long and destitute of the hairs which surround those of several other species.

As this tree is rare in the United States, and as I have observed it only on the banks of the Hudson, where it is never used, I can afford no information concerning the quality of its wood; but, if we may judge from its appearance, it is inferior to the Virginian and Lombardy Poplars:

Several large trees of this species are seen growing in New York, near the park, which are called American Black Poplars.

PLATE XCVI.

*Fig. 1, Leaves of the American Black Poplar.*



## VIRGINIAN POPLAR.

POPULUS MONILIFERA. *P. foliis deltoideis, glabris, crenatis, petiolis aspice compressis, in adultis ramis teretibus.*

THOUGH this tree has been found neither by my father and myself, nor by several learned English Botanists, who like us have traversed the Atlantic and a great part of the Western States in every direction, I have thought proper to describe it because it may possibly be indigenous to some part of the United States which we have not visited, and because, on account of its rapid growth, it deserves the attention of the Americans. It has been cultivated in Europe for many years, and is universally considered as a native of North America. It is called Virginian Poplar and Swiss Poplar; the last of which denominations is owing only to its being abundantly multiplied in Switzerland.

The Virginian or Swiss Poplar is 60 or 70 feet high with a proportional diameter. Its trunk is cylindrical, and not sulcated like that of the aged Lombardy Poplar, and the bark upon old stocks is blackish. The leaves are nearly as long as they are broad, slightly heart-shaped, compressed towards the summit, obtusely denticulated and borne by long petioles. On large trees their mean length is from 2 inches and a half to 3 inches, but they vary in size, being twice as large on the

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lower limbs, and on young stocks growing in moist places. On trees equally vigorous and nourished by the same soil, the leaves of this species are observed to be only half as large as those of the Cotton Wood and Carolinian Poplar.

In France we have only the male of this Poplar which is propagated by slips. On the young Virginian Poplar, as on the Cotton Wood and Carolinian Poplars, the annual shoots are angular, and this form subsists during the second and third years on vigorous stocks in a humid soil: on trees which are already 20 or 30 feet high and which grow on dry and elevated lands, the young branches are perfectly round, but in the other species they always retain the angular shape during several years.

As the Swiss Poplar has been and is still confounded with the Cotton Wood, I shall succinctly state the characters which distinguish them, according to the observations of Mr. De Foucault, a Director of the Imperial Administration of the Waters and Forests eminently distinguished by his knowledge of botany applied to this branch of economy. He remarks that the leaves of the Virginian Poplar are much smaller and less distinctly heart-shaped; the young shoots are smaller and less angular, and on high grounds those of the third year are even cylindrical: the limbs also diverge less widely from the trunk. M. De Foucault adds that the wood of the Swiss Poplar is softer than that of the Cotton Wood, but that

its growth is more rapid and that it prospers in a less humid soil. This last consideration explains the profusion with which it is multiplied throughout France, where it is found to yield a more speedy and more abundant product than the Lombardy Poplar.

## PLATE XCVI.

*Fig. 2, Virginian or Swiss Poplar.*



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## COTTON TREE.

POPULUS ARGENTEA. *P. ramulis teretibus; foliis amplis, sinu parvo cordatis, obtusis, leviter dentatis, junioribus tomentosis.*

THIS species is scattered over a great extent of country, comprising the Middle, Western, and Southern States. But it is so rare as to escape the notice of the greater part of their inhabitants, and it has received a specific name only on the banks of the river Savannah in Georgia, where it is called Cotton Wood. The same denomination is applied also to the Carolinian Poplar which grows in the same place.

A swamp in New Jersey near the North river, about two miles above Weehock-ferry, and not far from the city of New York, is the most northern point at which I have observed this tree. I have met with it, too, in Virginia, but less commonly than on the banks of some of the rivers which traverse the maritime parts of the more southern States. My father appears to have found it still more abundant in the Western Country. Among other places, he particularly mentions the environs of Fort Massac, situated on the Ohio near its junction with the Mississippi, and a swamp of more than six miles in diameter, which are entirely covered with it: this swamp is about thirty miles from the river Wabash, on the road from Kaskasias to the Illinois.

This is a towering tree which sometimes equals 70 or 80 feet in height and 2 or 3 feet in diameter. On trunks of these dimensions the bark is very thick and deeply furrowed. The young branches and the annual shoots are round, instead of being angular like those of the Carolinian Poplar and of the Cotton Wood. The leaves, while very young, are covered with a thick, white down, which gradually disappears, leaving them perfectly smooth above and slightly downy beneath. They are borne by long petioles, are often 6 inches in length and as much in breadth, of a thick texture, denticulated and heart-shaped, with the lobes of the base lapped so as to conceal the junction of the petiole. The aments are drooping and about 3 inches long, or only half as long as those of the Carolinian Poplar.

The wood of the Cotton Tree is soft, light, unfit for use, and inferior, in my opinion, to that of the White Poplar and of the Virginian and Lombardy Poplars. The heart is yellowish inclining to red, and the young branches are filled with a pith of the same colour.

This tree flourishes in France, but it is to be regretted that the quality of its wood does not correspond to the interest inspired by its elevated stature and beautiful foliage.

#### PLATE XCVII.

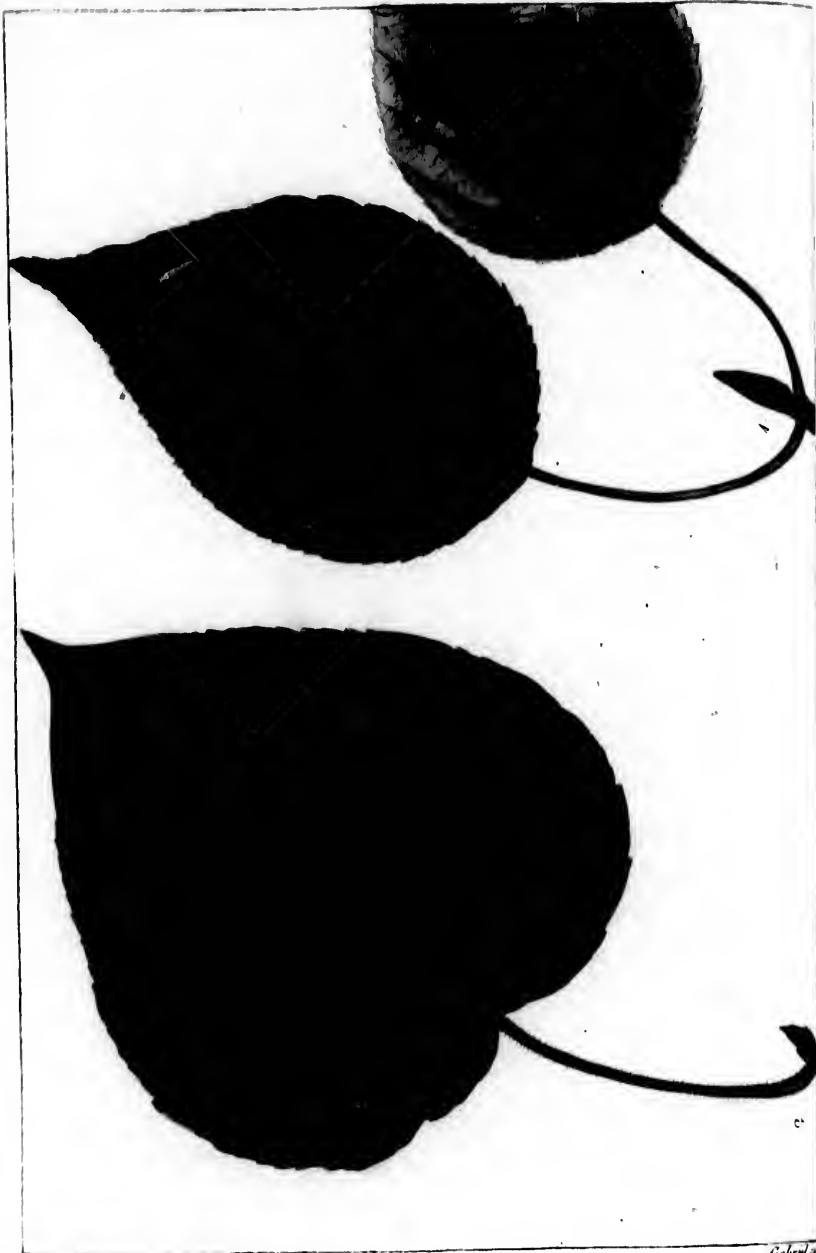
*A leaf of half the natural size. Fig. 1, A small branch with leaves a few days after their unfolding.*



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1. Balsam Poplar.  
*Populus Balsamifera*

2. Heart Leaved Balsam Poplar.  
*Populus canadensis*

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## TACAMAHACA, OR BALSAM POPLAR.

**POPULUS BALSAMIFERA.** *P. foliis ovato-lanceolatis serratis, subtus albidis, stipulis resinosis.*

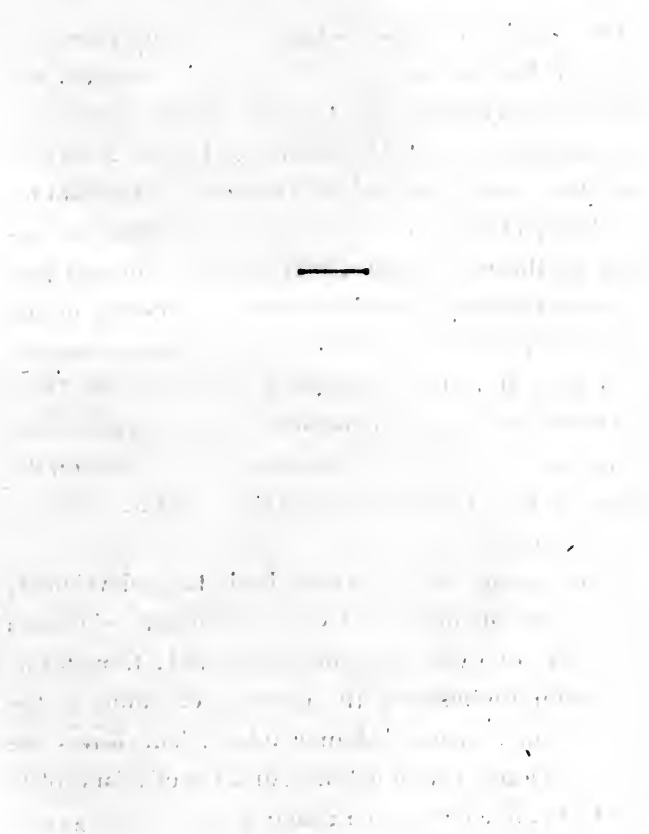
THIS species of Poplar belongs to the northern regions of America to which I have not extended my researches. My father, who traversed Lower Canada and particularly the country lying between Quebec and Hudson's Bay, found the Balsam Poplar very abundant on the shores of Lake St. John, and in all the districts watered by the river Sagney, between the 47th and 49th degrees of latitude. Notwithstanding the severity of the winter, it rises to the height of 80 feet with a diameter of 3 feet. It is multiplied at Taddousack and Malebay near the river St. Lawrence, but, in approaching Montreal, it becomes less common, and is rare on the shores of Lake Champlain. Such are nearly its northern and southern limits.

In the spring, when the buds begin to be developed, they are abundantly coated with a yellowish, glutinous substance, of a very agreeable smell, and, though this exudation diminishes at the approach of summer, the buds retain a strong balsamic odour. The leaves are borne on long, round petioles, and are of a lanceolate oval form, of a deep green colour above, and of a rusty silvery white beneath.

The wood of this tree is white and soft, and is not used by the Canadians.

PLATE XCVIII.

*Fig. 1, A branch of the natural size from a large tree.*



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## HEART-LEAVED BALSAM POPLAR.

**POPULUS CANDICANS.** *P. foliis cordatis; petiolis hirsutis; stipulis resinosis; ramis teretibus.*

In the States of Rhode Island, Massachusetts and New Hampshire, this tree, which is a genuine Balsam Poplar, is commonly seen growing before the houses, both in the towns and in the country, less as an ornament than as a shelter from the sun. I have never found it in the forests of these States, where, if it exists, it must be extremely rare; nor have I discovered whence it was first introduced. This species differs very evidently from the preceding; its leaves are three times as large, perfectly heart-shaped, and, often, they have hairy petioles: but in both species the leaves are of the same colour, and preserve, at all stages of their growth, the same shape, which is invariable upon young sprouts and upon old trees.

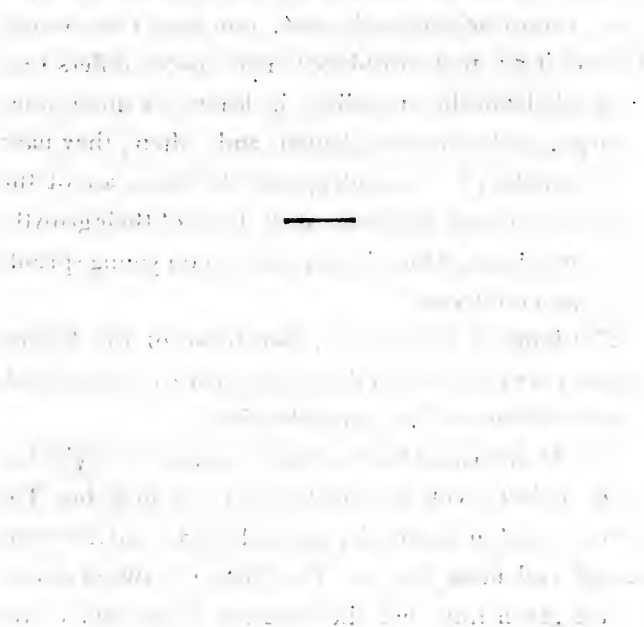
The buds of this species, like those of the Balsam Poplar, are covered, in the spring, with a resinous balsamic substance of an agreeable odour.

The Heart-leaved Balsam Poplar attains the height of 40 or 50 feet, with a diameter of 18 or 20 inches. The trunk is clad in a smooth, greenish bark, and the wood is soft and unfit for use. The foliage is tufted and of a dark green tint, but the irregular disposition of the

branches gives an inelegant appearance to the tree. In the spring the ripe seeds, garnished with down, are borne by the wind into the houses, and alight upon the furniture and upon the food; for this reason some persons have substituted for this species the Lombardy Poplar, a picturesque tree in every respect superior to it, whose limbs are compressed about the trunk so as not to interfere with the walls nor to obstruct the windows.

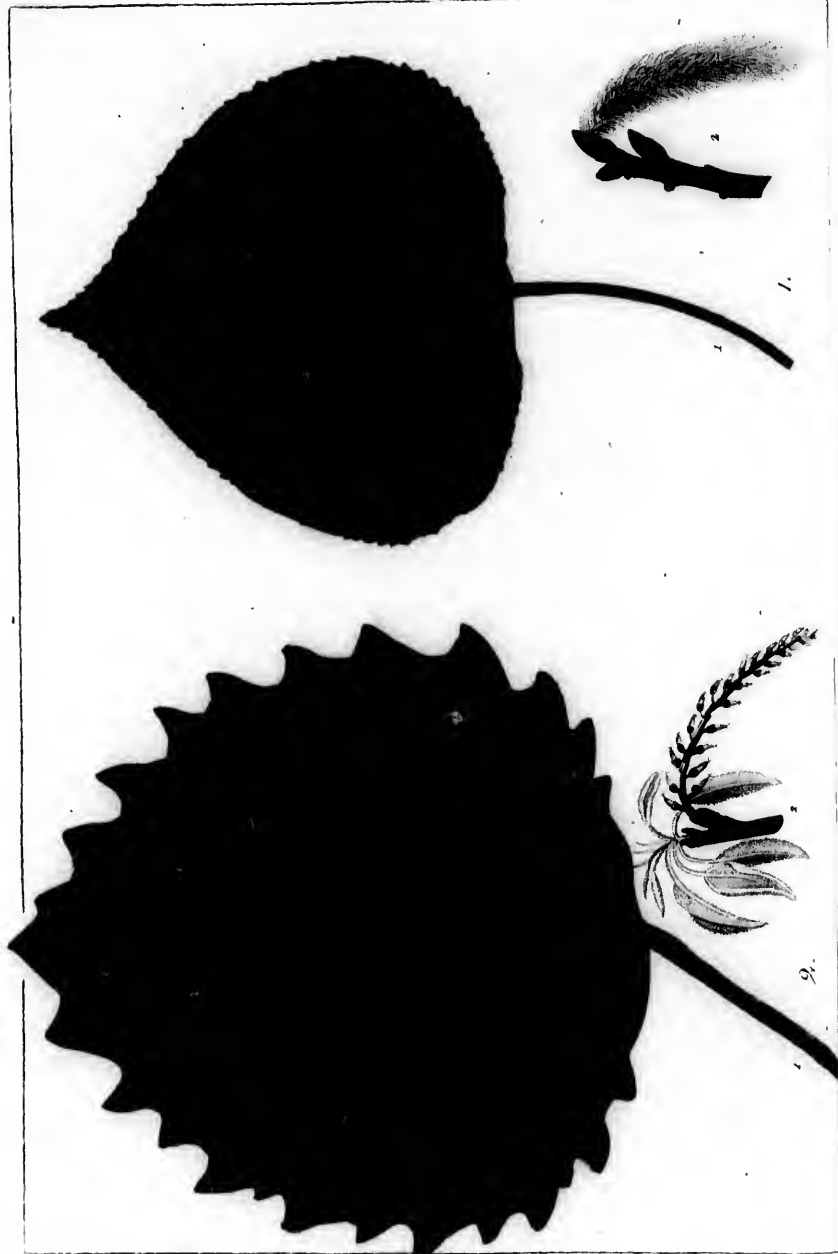
PLATE XCVIII.

*Fig. 2, A branch of the natural size from a large tree.*



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1. American Aspen.  
*Populus tremuloides.*

2. American Large Aspen.  
*Populus grandidentata.*

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## AMERICAN ASPEN.

**POPULUS TREMULOÏDES.** *P. foliis subcordatis, abruptè acuminatis, serrulatis; margine pubescentibus.*

THIS species of Poplar is common in the Northern and Middle Sections of the United States, and, from my father's manuscript notes, it appears to be still more abundant in Lower Canada. In the vicinity of New York and Philadelphia, where I have particularly observed it, I have remarked that it prefers open lands of a middling quality. Its ordinary height is about 30 feet, and its diameter 5 or 6 inches. The bark of the trunk is greenish and smooth, except on the base of the oldest trees, where it becomes furrowed.

The American Aspen blooms about the 20th of April, ten days or a fortnight before the birth of the leaves. The aments, which spring from the extremity of the branches, are composed of silky plumes, and are of an oval form and about an inch in length. The leaves are about 2 inches broad, narrowed at the summit, and supported by long petioles; they are of a dark green colour, and, in the spring, their nerves are reddish: on stocks of 7 or 8 feet in height, they are nearly round, and are bordered with obtuse, irregular teeth; on young shoots, they are of twice this size, heart-shaped, and acuminate at the summit. Of all the American Pop-

lars, this species has the most tremulous leaves, the gentlest air suffices to throw them into agitation.

The wood of the American Aspen is light, soft, destitute of strength and of no utility. These defects are not even compensated by an ample size and rapid growth, and the tree is so much neglected that it is felled only to disencumber lands that are clearing for cultivation. It is greatly inferior to several species of the same genus, such, for example, as the Virginian Poplar, which is three times as large, more rapid in its growth, and of a more pleasing appearance.

*Observation.*—Since the publication of the french edition of this work, I have been informed that the wood of the American Aspen has been successfully divided into very thin *laminæ*, for the fabrication of women's hats. These hats were for a moment fashionable in several towns of the United States.

#### PLATE XCIX.

*Fig. I. 1, A leaf of the natural size. 2, An ament.*



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## AMERICAN LARGE ASPEN.

POPULUS GRANDIDENTATA. *P. petiolis supernè compressis; foliis subrotundò-ovalibus, acuminatis; utrinquè glabris, inæqualiter sinuatò-granditentatis; junioribus villosis.*

THE American Large Aspen belongs rather to the Northern and Middle, than to the Southern States, in the upper parts only of which it is found. In the North of the United States, this Poplar, though not one of the most rare, is not one of the most common trees, and it is so thinly scattered over the face of the country, that sometimes not a single stock is met with by the traveller for several days. For this reason, probably, it has hitherto been confounded by the inhabitants with the preceding species, which is more multiplied: as it surpasses the Aspen in height, I have given it the name of Large Aspen.

It grows as favourably on uplands as on the border of swamps. It is about 40 feet high, 10 or 12 inches in diameter, and its straight trunk is covered with a smooth, greenish bark which is rarely cracked. Its branches are few and scattered; they ramify and become charged with leaves only near the extremity, so that the interior of the summit is void and of an ungraceful appearance.

At their unfolding in the spring, the leaves are covered with a thick, white down, which disappears

with their growth, so that at the beginning of summer they are perfectly smooth. The full-formed leaf is nearly round, 2 or 3 inches in width, smooth on both sides, and bordered with large teeth, from which is derived the latin specific name of *grandidentata*, given to this species by my father in his *Flora Boreali-Americana*. The flowers compose aments about 2 inches long, which appear in the infancy of the leaves, and which, at this period, are thickly coated with down.

The wood is light, soft, and unequal to that of the Virginian and Lombardy Poplars; the tree, also, is inferior to these species in size and in the rapidity of its growth. It thus appears to promise no advantage to the arts, and to be valuable only for its agreeable foliage. While it is less than 15 feet in height, it has a pleasing appearance, and is entitled to a place in ornamental gardens.

PLATE XCIX.

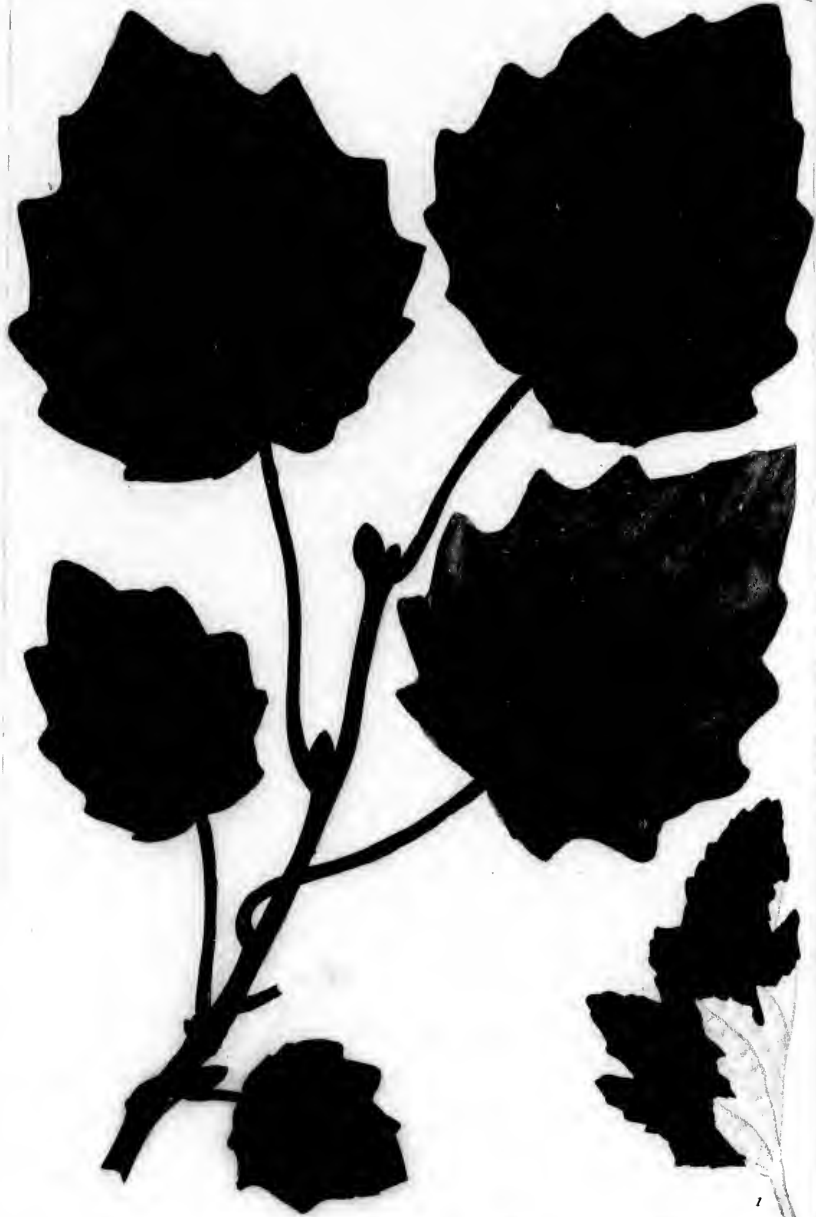
*Fig. II. 1, A leaf of the natural size. 2, A fertile ament with young leaves.*

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Common White or Grey Poplar.  
*Populus canescens.*

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## COMMON WHITE OR GREY POPLAR.

**POPULUS CANESCENS.** *P. foliis subrotundis, angulato-dentatis, subtomentoso-cinereis; amentis cylindraceis, laxis.*

THE Poplars of the Old Continent are less numerous than those of America. The largest among them are the Great White Poplar and the Common White Poplar, which were for a long time confounded, and which have been distinguished only within forty years by the characters of their leaves.

In the *Species Plantarum*, Willdenow thus designates the first of these trees: *Populus alba; foliis cordato-subrotundis, lobatis, dentatis, subtus tomentoso-niveis; amentis ovatis.* In this description, a shorter and more oval ament forms the peculiar character of the fructification; but the principal difference is in the leaves; those of the Great White Poplar are larger, and have the lower surface constantly whitened with thick down.

To this tree must be referred the allusions of the poets to the Poplar of Hercules: *Populus Alcidæ gratissima.* It is less common in France and in England than the White or Grey Poplar, and is inferior in size and in the quality of its wood.

The Grey Poplar, *Peuplier grisaille*, is one of the largest trees of the Old World: it rises to the height of

90 or 100 feet, with a diameter of 5 or 6 feet. On aged trees the bark is thick and deeply furrowed, and on younger stocks it is smooth and greenish. The leaves vary in size, shape and colour, according to the age of the tree and the nature of the soil: in moist grounds they are larger and more downy, and on the summit of old trees they are smooth, round and toothed.

Like other Poplars, this species grows more rapidly in moist grounds, but it is proved to accommodate itself the most easily to a variety of soils. I remember near the house in which I was born, in the vicinity of Versailles, an avenue of these trees which were planted in the reign of Louis XIV, and which, in 1792, when they were felled, were from 90 to 100 feet in height, and from 4 to 6 feet in diameter.

The wood is superior to that of the other species in whiteness, in fineness and in strength; it gives a firmer hold to nails, and is not liable to warp and split. In England and Belgium it is commonly used by turners for bowls, trays, etc. In the south of France it is employed for the floors and wainscots of houses, and in Paris for the cases in which goods are packed for exportation.

The Grey Poplar, therefore, should be preferred in our forests, though its growth is not the most rapid. It may be multiplied by slips or by suckers, which are transplanted the fourth or fifth year, or by branches 6 or 7 feet long and 3 inches in diameter, which do

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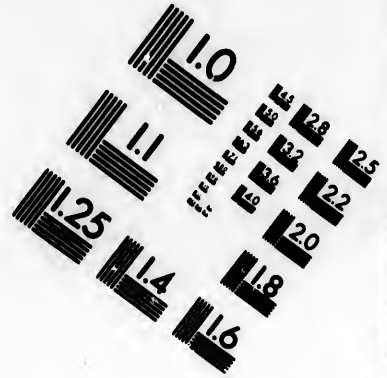
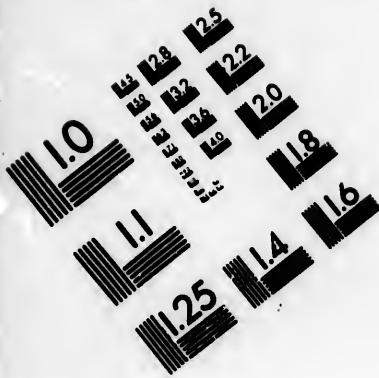
not require to be removed. The larger end of the branch should be cut obliquely, so as to expose the bark for the length of 5 or 6 inches, and set in a moist, cool soil, in a hole 18 inches deep. When the branch is severed from the tree it should be placed in water till it is set in the ground. The most favourable season for forming the plantation is the autumn or the beginning of spring. When slips are sent to distance they should be enveloped in wet moss.

The superior size and majestic form of the Common White Poplar, its rapid growth, and the varied and useful applications of its wood, cause it to be highly esteemed in Europe, and enable me to recommend it with confidence to the inhabitants of North America. East of the river Connecticut there is no tree with light and tender wood that unites these advantages. Among the Poplars of Europe and America, this species is the best substitute for the Tulip Tree, which is rare in the northern part of the United States, and whose reproduction will probably be attended with difficulties that do not accompany the propagation of the Common White Poplar.

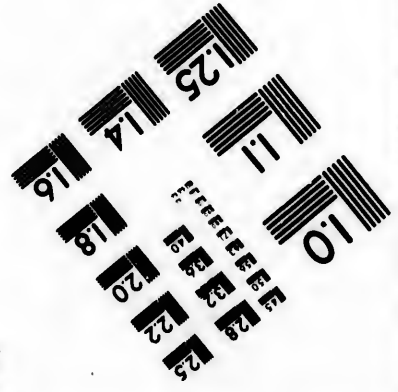
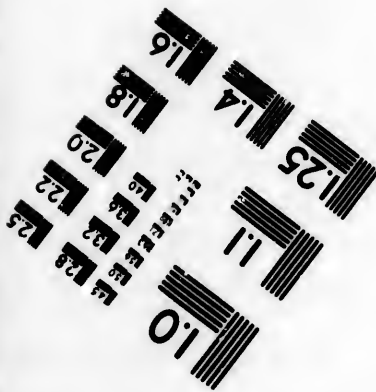
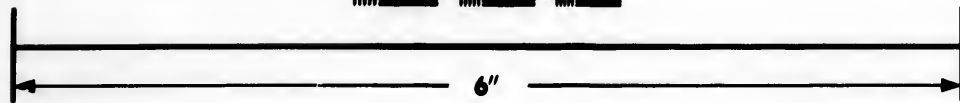
#### PLATE C.

*A branch with leaves of the natural size. Fig. 1, A leaf from a sprout at the foot of an old tree.*





**IMAGE EVALUATION  
TEST TARGET (MT-3)**

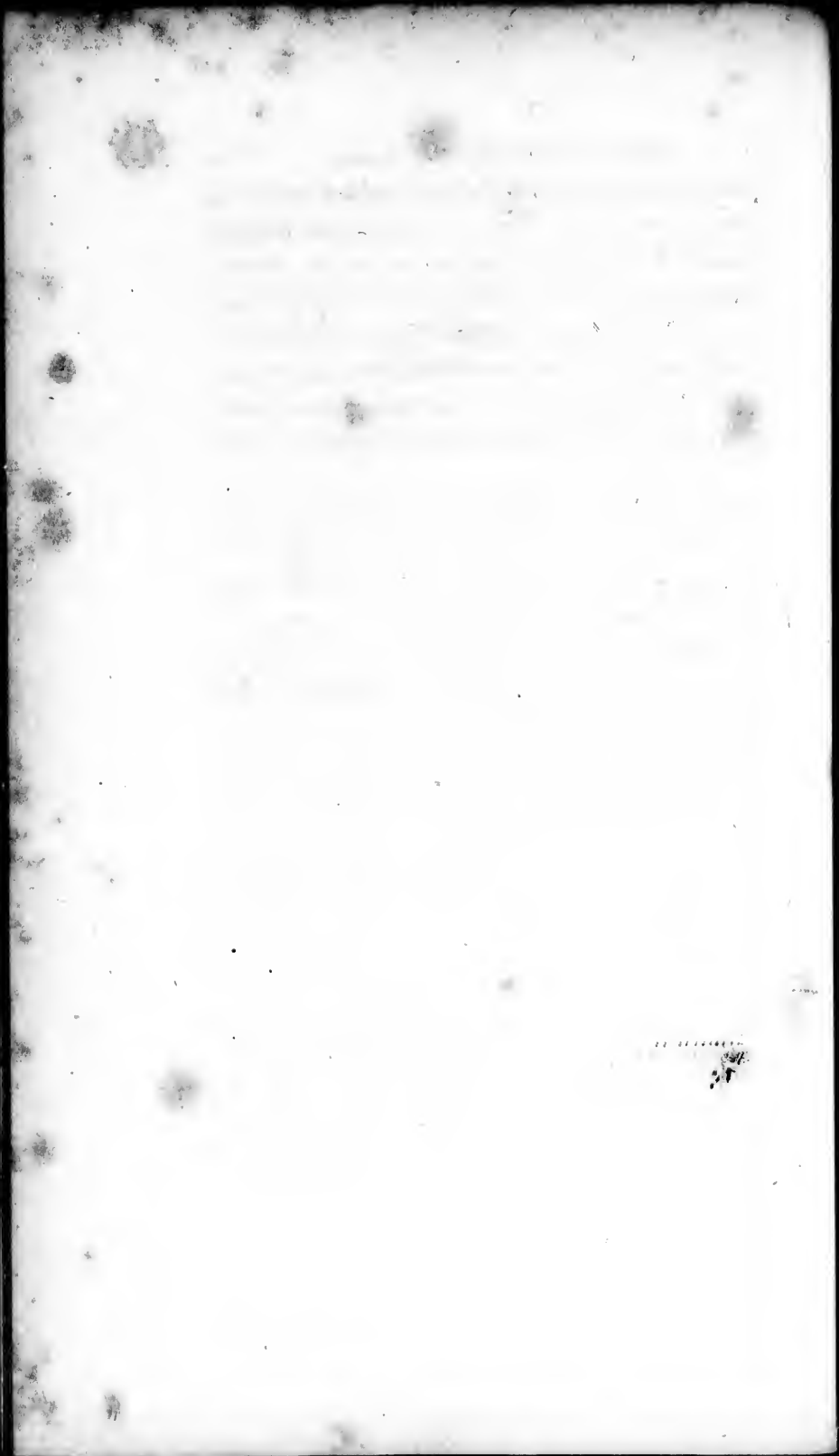


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## CABBAGE TREE.

Hexandria trigynia. Linn.

Palme. Juss.

CHAMEROPS PALMETO. *C. caule arboreo; frondibus palmatis, plicatis, stipitibus non aculeatis.*

FROM its lofty height, this vegetable is considered in the United States as a tree; and upon the shores of the Ocean, where it grows, it is called Cabbage Tree. It belongs to the genus of the Palms, and is found farther north than any other species in America, being first seen about Cape Hatteras, in the 34th degree of latitude, which, in the temperature of the winter, corresponds with the 44th in Europe. From Cape Hatteras it spreads to the extremity of East Florida, and probably encircles the Gulf of Mexico: I have no doubt that it exists also in Cuba and the Bahama Isles; I have seen it in Bermuda, which is more than 600 miles from the coast of North America.

Farther south the Cabbage Tree is not confined, as in the United States, to the immediate vicinity of the sea; on the river St. John, in Florida, a few miles above Lake George, I caused two stocks to be felled at the distance of 40 or 50 miles from the shore.

A trunk from 40 to 50 feet in height, of an uniform diameter, and crowned with a regular and tufted summit, gives the Cabbage Tree a beautiful and majestic ap-





pearance. Its leaves are of a brilliant green, palmated, and borne by petioles from 18 to 24 inches long, nearly triangular and united at the edges; they vary in length and breadth from 1 foot to 5 feet, and are so arranged that the smallest occupy the centre of the summit, and the largest the circumference. Before their development they are folded like a fan, and as they open, the outside sticks break off and fall, leaving the base surrounded with filaments woven into a coarse and flimsy russet web.

The base of the undisclosed bundle of leaves is white, compact and tender; it is eaten with oil and vinegar, and resembles the artichoke and the cabbage in taste, whence is derived the name of Cabbage Tree. But to destroy a vegetable which has been a century in growing, to obtain three or four ounces of a substance neither richly nutritious nor peculiarly agreeable to the palate, would be pardonable only in a desert which was destined to remain uninhabited for ages. With similar prodigality of the works of Nature, the first settlers of Kentucky killed the Buffalo, an animal weighing 12 or 15 hundred pounds, for the pleasure of eating its tongue, and abandoned the carcass to the beasts of the wilderness.

The Cabbage Tree bears long clusters of small, greenish flowers, which are succeeded by a black, *inesculent* fruit, about the size of a pea.

In the Southern States the wood of this tree, though

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extremely porous, is preferred to every other for wharves: its superiority consists in being secure from injury by sea-worms, which, during the summer, commit such ravages in structures accessible to their attacks; but when exposed to be alternately wet and dry in the flowing and ebbing of the tide, it decays as speedily as other wood. This use of the Cabbage Tree is rapidly diminishing its numbers, and probably the period is not distant when it will cease to exist within the boundaries of the United States.

In the war of Independence the Cabbage Tree was found eminently proper for constructing forts, as it closes without splitting on the passage of the ball.

The growth and developement of the Palms have occupied the attention of distinguished botanists, to whose memoirs the reader is referred for more accurate information. The tardy growth of this species will always discourage its propagation.

## PLATE CI.

*A Cabbage Tree with its fruit.*

## PRIDE OF INDIA.

*Decandria monogynia. Linn. Melic. Juss.*

**MELIA AZEDARACH. *M. foliis bipinnatis.***

THIS tree is a native of Persia. For the beauty of its flowers and the elegance of its foliage, it has long been in request in southern climates for embellishing towns and adorning the environs of dwellings. It is propagated for this purpose in India, in the Isles of France and Bourbon, in Syria, Spain, Portugal, Italy and the southern departments of France. In the New World it is found in several towns of the West Indies and of South America; and on the Northern Continent it is so abundant and so easily multiplied in the maritime parts of the Southern States, as to be ranked among their natural productions. This claim upon our attention is enforced by the valuable properties of its bark and of its wood.

The Pride of India rises to the height of 30 or 40 feet, with a diameter of 15 or 20 inches; but, when standing alone, it usually rests at a smaller elevation, and diffuses itself into a spacious summit. Its leaves are of a dark green colour, large, doubly pinnate, and composed of smooth, acuminate, denticulated leaflets. The lilac flowers, which form axillary clusters at the extremity of the branches, produce a fine effect, and exhale a de-

*About Civita Vecchia*

*Melia usadarach**Robert Walp.*

Pride of India.  
*Melia usadarach.*

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licious odour. The ripe seeds are large, round and yellowish; they are sought with avidity by certain birds, particularly by the red-breasts, in their annual migration to the South, which, after gorging themselves immoderately, are sometimes found stupified by its narcotic power. The venomous principle which resides in this tree is taken notice of by Avicenna, an Arabian Physician, who flourished about the year 980. In Persia the itch is cured with an ointment made by pounding its leaves with lard.

The Pride of India prospers in a dry and sandy soil, and magnificent stocks are seen in the streets of Charleston and Savannah. Its foliage, which, as well as the flowers, is developed early in the spring, affords a delightful refreshment to the eye, and yields a shelter from the fervour of the sun during the intemperate season. It grows with such rapidity, that from the seed it attains the height of 12 or 15 feet in four years. This surprising vegetation is chiefly remarked in stocks less than ten years of age, in which the concentric circles are more distant than in any other tree. Like the Locust, it possesses the valuable property of converting its sap into perfect wood in the earliest stages of its growth; a stock 6 inches in diameter has only an inch of sap, and consequently may be employed almost entire. The wood is of a reddish colour, and is similarly organized with that of the Ash: it receives a less brilliant polish than the Red Bay, the Wild Cherry, the Maple and the Sweet

Gum ; but this defect is unimportant in a country which possesses the species just mentioned and can easily procure Mahogany. The Pride of India is sufficiently durable and strong to be useful in building, and it will probably be found adapted to various mechanical uses ; it has already been employed for pullies, which in Europe are made of Elm, and in America of Ash. I have been assured that it is excellent fuel.

This succinct description deserves attention in the southern parts of North America, and in those countries of Europe where the pride of India is considered as an ornamental rather than as an useful tree. Fields exhausted by cultivation and abandoned might be profitably covered with it.

#### PLATE CII.

*A leaf of a third part of the natural size. Fig. 1, Flowers of the natural size. Fig. 2, Seeds of the natural size.*

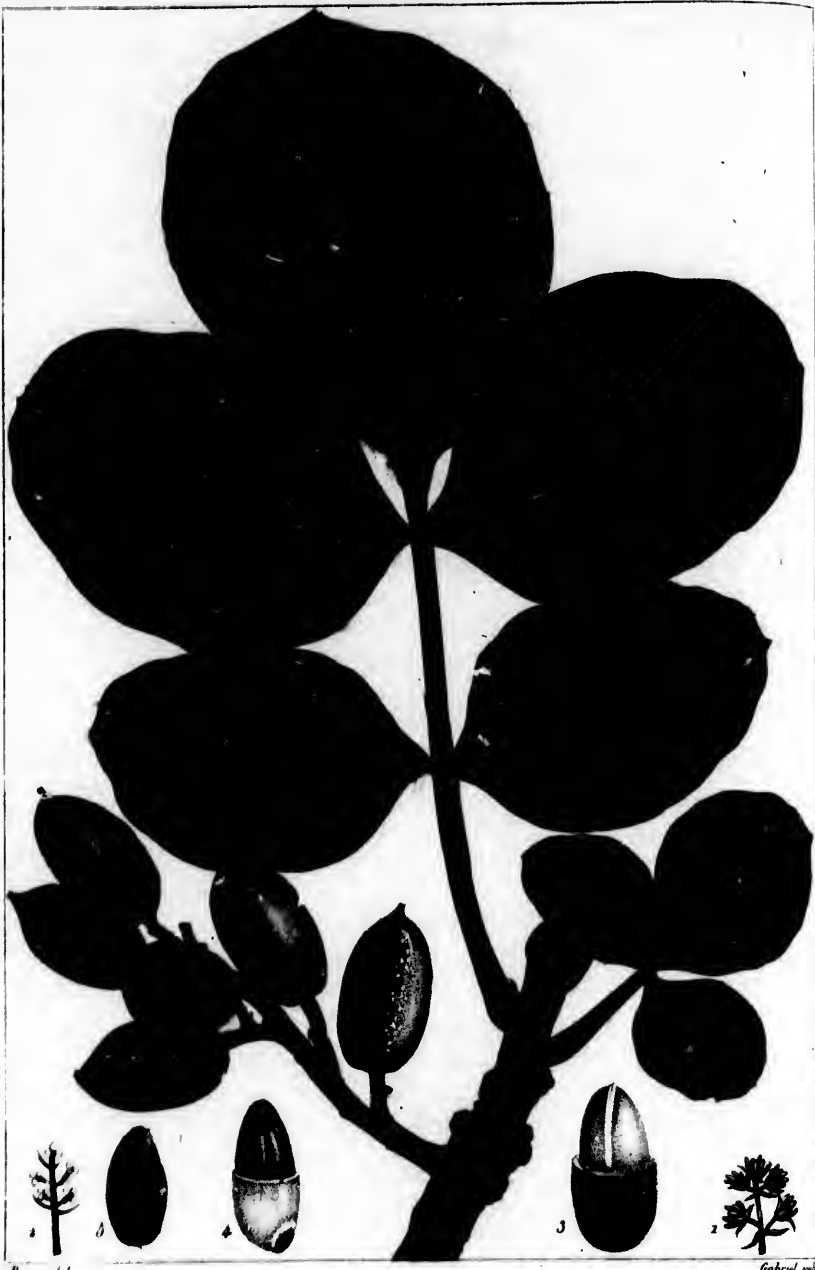
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Pistacia Tree.  
*Pistacia vera.*

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## PISTACIA TREE.

*Dioecia pentandria.* LINN.

*Therebenthacæ.* JUSS.

**PISTACIA VERA.** *P. foliis impari-pinnatis; foliolis subovatis, recurvis, coruceis.*

THE Pistacia Tree is indigenous to Asia Minor and is particularly abundant in Syria. It equals, and sometimes exceeds, 25 or 30 feet in height, and has heavy, crooked limbs clad in a thick, greyish bark, and large leaves composed of one or two pair of coriaceous leaflets, with a terminal odd one. This vegetable belongs to the class of dioecious plants whose sexes are borne by different stocks. The barren flowers are minute and hardly apparent, and the fertile ones are likewise small and of a greenish colour. Its fruit consists of thin-shelled oval-acuminate nuts, about the size of an olive, which are collected in bunches, and are commonly yielded in profusion. They are of a more agreeable flavour than the hazel-nut or almond, and are annually exported to those parts of Europe and Asia where the tree does not flourish.

The Pistacia Tree succeeds in dry, calcareous, stony grounds, but shuns a sandy and a humid soil. In forming plantations care must be taken to possess trees of different sexes, without which the fructification is impossible; one male should be allotted to five or six fe-



*Central only*

males, and to avoid mistake, young grafted stocks should be procured, or suckers from the foot of an old tree.

The wood is hard, resinous, excellent for fuel, and proper for economical purposes.

According to Pliny, pistich-nuts were first brought to Rome about the reign of Tiberius, by Vitellius, Governor of Syria, and probably the tree was introduced into Italy at the same period. It has long been cultivated in Spain, Portugal and the South of France, and, when protected by a wall and favoured with a southern exposure, it yields fruit even at Paris. It is less delicate than the Orange Tree, and prospers in the same soil and climate with the Olive. Though it offers less powerful inducements than the Olive to attempt its introduction in West Tennessee and in the Southern States, it would afford an agreeable addition to the luxuries of the table.

#### PLATE CIII.

*A branch with fruit of the natural size. Fig. 1, A barren flower. Fig. 2, A fertile flower. Fig. 3, Fruit with the nut exposed. Fig. 4, A nut with the kernel exposed. Fig. 5, A kernel without the pellicle.*

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J. H. Jeffrey sculp.

American Chestnut.  
*Castanea vesca.*

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## AMERICAN CHESNUT.

*Monocotyledon.* Linn.      *Amentaceæ.* Juss.

**CASTANEA VESCA.** *C. foliis lanceolatis, acuminatò-serratis, utrinquè glabris; nucibus dimidio superiore villosis.*

THE Chesnut does not venture beyond the 44th degree of latitude. It is found in New Hampshire between the 43d and the 44th degrees, but such is the severity of the winter that it is less common than in Connecticut, New Jersey and Pennsylvania. It is most multiplied in the mountainous districts of the Carolinas and of Georgia, and abounds on the Cumberland Mountains and in East Tennessee.

The coolness of the summer and the mildness of the winter in these regions are favourable to the Chesnut; the face of the country, also, is perfectly adapted to a tree which prefers the sides of mountains or their immediate vicinity, where the soil in general is gravelly, though deep enough to sustain its perfect developement. The Chesnut of the Old World attains its greatest expansion in similar situations: an example is said to exist on Mount Etna of a Chesnut 160 feet in circumference, or about 53 feet in diameter, and large enough to shelter 100 men on horseback beneath its branches; but its trunk is hollowed by time almost to the bark: near it stand several others more than 75 feet in circumference. At

Sancerre in the Department of the Cher, 120 miles from Paris, there is a Chesnut which, at 6 feet from the ground, is 30 feet in circumference; 600 years ago it was called the *Great Chesnut*, and though it is supposed to be more than 1000 years old, its trunk is still perfectly sound, and its branches are annually laden with fruit. I have never met with instances of such extraordinary growth in the United States, but the American species is probably susceptible of an equal developement, since, in the forests of North Carolina, it is commonly as tall and as large as the corresponding species in those of Europe; I have measured several stocks which, at 6 feet from the ground, were 15 or 16 feet in circumference, and which equalled the loftiest trees in stature.

The Chesnut is a stranger to the Province of Maine, the State of Vermont and a great part of Genessee, to the maritime parts of Virginia, to the Carolinas, Georgia, the Floridas and Louisiana as far as the mouth of the Ohio:

Though the American Chesnut nearly resembles that of Europe in its general appearance, its foliage, its fruit, and the properties of its wood, it is treated by botanists as a distinct species. Its leaves are 6 or 7 inches long, an inch and a half broad, coarsely toothed, of an elongated oval form, of a fine brilliant colour and of a firm texture, with prominent parallel nerves beneath. The barren flowers are whitish, unpleasant to the smell, and grouped on axillary peduncles 4 or 5 inches long. The

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fertile aments are similarly disposed, but less conspicuous. The fruit is spherical, covered with fine prickles, and stored with two dark brown seeds or nuts, about as large as the end of the finger, convex on one side, flattened on the other, and coated round the extremity with whitish down. They are smaller and sweeter than the wild chesnuts of Europe, and are sold at 3 dollars a bushel in the markets of New York, Philadelphia and Baltimore.

The wood is strong, elastic, and capable of enduring the succession of dryness and moisture. Its durability renders it especially valuable for posts, which should be made of trees less than 10 inches in diameter and charred before they are planted in the earth. In Connecticut, Pennsylvania and a part of Virginia, it is also preferred for rails, and is said to last more than fifty years. For shingles this wood is superior to any species of Oak, though it has the same defect of warping. It is not extensively used for staves, and its pores, like those of the Red Oak, are so open that it is proper only for dry wares; the European species, which is more compact, is employed in Italy to contain wines and brandy.

Throughout France and the South of Europe, young Chesnuts are almost exclusively chosen for hoops, and they are proved to be better adapted to this important use than any other species, as they last longer in the humidity of the cellar. I have been informed by coopers at New York and Philadelphia that the American Ches-



nut is too brittle for hoops : if such is the fact , the European species has the advantage of superior flexibility. A more probable reason is that it is not strong enough to remain firmly attached , like the Hickory , by crossing the ends , but requires to be bound with osier , which is an additional labour and expense.

The Chesnut is little esteemed for fuel , and is not used in the cities of the United States : like the kindred species in Europe it is filled with air and snaps as it burns. The coal is excellent , and on some of the mountains of Pennsylvania where the Chesnut abounds , the woods in the neighbourhood of the forges have been transformed into copses , which are cut every sixteen years for the furnaces. This period is sufficient to renew them , as the summer is warmer in America than in Europe , the atmosphere more moist , and consequently vegetation more rapid. The proprietors of forges in Virginia , in the upper part of the Carolinas and on the Holston , should imitate the example by establishing copses of Chesnut and Oak. Besides the inducement of private gain , this measure would be attended with public benefit , by the economy of fuel , which is daily becoming scarcer and more costly. Among the Oaks , the Rock Chesnut Oak should be selected for this object , for reasons indicated in describing it.

Chesnut copses are considered in France as the most valuable species of property : every seven years they are cut for hoops , and the largest branches serve for vine-

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props ; at the end of fourteen years they furnish hoops for large tubs , and at the age of twenty-five years they are proper for posts and for light timber. Lands of a middling quality, which would not have produced a rent of more than 4 dollars an acre , in this way yield a mean annual revenue of from 16 to 24 dollars.

Different methods are pursued in forming the copses ; in the New Dictionary of Natural History the following is preferred : After the ground has been carefully loosened with the plough and the harrow, lines are drawn six feet apart, in which holes about a foot in depth and in diameter are formed at the distance of five feet. A chesnut is placed in each corner of the holes, and covered with three inches of earth. As the soil has been thoroughly subdued, the nuts will spring and strike root with facility. Early in the second year three of the young plants are removed from each hole, and only the most thriving is left. The third or fourth year, when the branches begin to interfere with each other, every second tree is suppressed. To insure its success, the plantation should be begun in March or April, with nuts that have been kept in the cellar during the winter in sand or vegetable mould, and that have already begun to germinate.

The European Chesnut would be a valuable acquisition to many parts of the United States. This tree produces the nuts called *Marrons de Lyon*, which are four times as large as the wild chesnuds of America, and which are

sent from the vicinity of Lyons to every part of France and to the north of Europe; they were formerly exported also to the West Indies. Kentucky, West Tennessee, and the upper part of Virginia and the Carolinas are particularly interested in the introduction of this species. It already exists in the nurseries of Philadelphia and New York, and it is only necessary to procure a few stocks to furnish grafts for young Wild Chesnuts transplanted from the woods or reared in the nursery.

The Chesnuts may be grafted by inoculation or the insertion of a shoot. The common method is by lopping a branch of the wild tree, removing a girdle of the bark near the end, from an inch to three inches wide, and replacing it by another from a limb of the cultivated stock of corresponding diameter. The lower edge of the new covering is exactly adjusted to the natural bark, but a portion of the limb is left exposed above, which is scraped down so as to form a species of tent or dressing, and the whole is protected from the weather by a coating of clay.

#### PLATE CIV.

*Leaves and aments of the natural size. Fig. 1, Full-grown fruit. Fig. 2, A chesnut.*

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Chincapin.  
*Castanea pumila.*

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## CHINCAPIN.

*CASTANEA PUMILA. C. foliis ovalibus serratis, subtus incano-  
tomentosis; fructu parvo, in singulis capsulis echinatis  
unico.*

THE Chincapin is bounded northward by the eastern shore of the river Delaware, on which it is found to the distance of a hundred miles from Cape May. It is more common in Maryland, and still more so in the lower part of Virginia, of the Carolinas, Georgia, the Floridas and Louisiana, as far as the river of the Arkansas. In West Tennessee it is multiplied around the *prairies* enclosed in the forests, and it abounds throughout the Southern States wherever the Chesnut is wanting.

In New Jersey, Delaware and Maryland, the Chincapin is a large shrub rarely exceeding the height of 7 or 8 feet; but, in South Carolina, Georgia and Lower Louisiana, it is sometimes 30 or 40 feet high and 12 or 15 inches in diameter.

The leaves are 3 or 4 inches long, sharply toothed, and similar in form to those of the American Chesnut, from which they are distinguished by their inferior size, and by the whitish complexion of their lower surface. The fructification, also, resembles that of the Chesnut in form and arrangement, but the flowers and fruit are

only half as large, and the nut is convex on both sides and about the size of the wild hazel-nut. The nuts of the Chincapin are brought into the markets, and are eaten raw by children. The improvement of the Chesnut or of the Chincapin seems hardly to deserve attention, since the cultivated variety of Europe can easily be procured.

In the South of the United States the Chincapin fructifies on the most arid lands, but it is stunted to 6 or 7 feet in height: its perfect developement requires a cool and fertile soil. As it springs everywhere with facility, except in places liable to be covered with water, it is among the most common shrubs.

The wood of this species is finer-grained, more compact, heavier, and perhaps more durable than that of the Chesnut. It is perfectly fitted for posts, and lasts in the earth more than forty years. Stocks of sufficient size are so rarely found, that it is only accidentally employed for this purpose, and if the method of forming enclosures practised in the centre of the United States should prevail in the South, the Pride of India would merit a decided preference over the Chincapin. The saplings of this species are laden with branches while they are no thicker than the finger and are thus rendered too knotty for hoops. In the Southern States, where the White Oak and the Hickories are comparatively rare, perhaps the Chincapin might be advantageously reared for this purpose in copses. But it is a tree of secondary importance

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which can be recommended only to amateurs desirous of enriching their collections with a species of Chesnut interesting for the beauty of its foliage and the diminutive size of its fruit.

## PLATE CV.

*A branch with leaves and a barren ament of the natural size. Fig. 1, Full-grown fruit. Fig. 2, A nut.*

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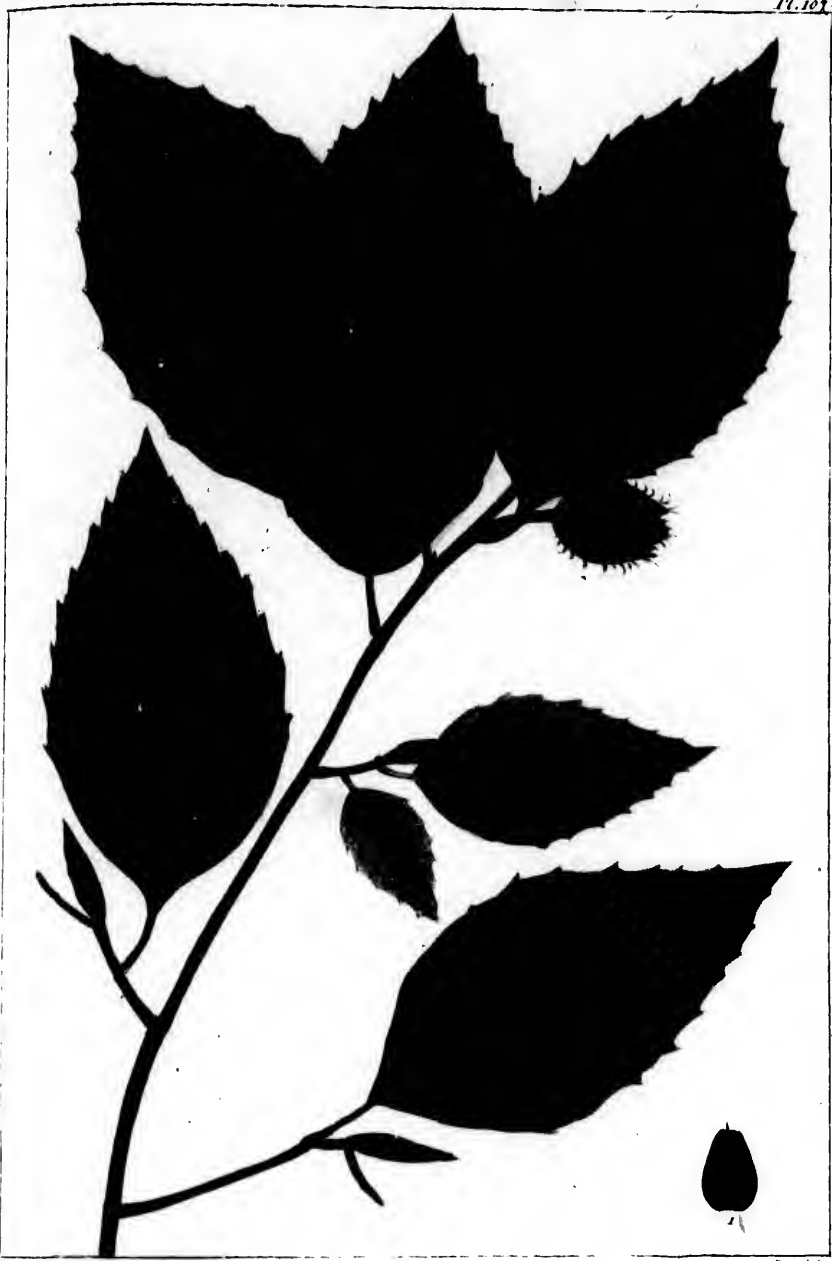
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## WHITE BEECH.

FAGUS SYLVESTRIS. *F. foliis acuminatis, obsolete dentatis, margine ciliatis.*

IN North America and in Europe the Beech is one of the tallest and most majestic trees of the forest. Two species are found in Canada and in the United States, which have hitherto been treated by botanists as varieties; but my own observations confirm the opinion of the inhabitants of the Northern States, who have long since considered them as distinct species and given them the names of White Beech and Red Beech, from the colour of their wood. In the Middle, Western and Southern States, the Red Beech does not exist or is very rare, and the other species is known only by the generic name of Beech. I have retained for the White Beech the latin specific name of *Fagus sylvestris* which corresponds with the short description in the *Flora Boreali-Americana*, and have given to the Red Beech that of *Fagus ferruginea*, which accords with the descriptive phrase in the edition of 1805 of Willdenow's *Species Plantarum*.

A deep, moist soil and a cool atmosphere are necessary to the utmost expansion of the White Beech, and it is accordingly most multiplied in the Middle and Western States. Though it is common in New Jersey,



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White Beech.  
*Fagus sylvestris.*

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Pennsylvania, Maryland, and throughout the country east of the mountains, it is insulated in the forests, instead of composing large masses, as in Genessee, Kentucky and Tennessee. I have found the finest Beeches on the banks of the Ohio between Gallipolis and Marietta, and have measured several stocks growing near each other, which were 8, 9 and 11 feet in circumference, and more than 100 feet high. In these forests, where the Beeches vegetate in a deep and fertile soil, their roots sometimes extend to a great distance even with the surface, and being entangled so as to cover the ground, they embarrass the steps of the traveller and render the land peculiarly difficult to clear.

The White Beech is more slender and less branchy than the Red Beech; but its foliage is superb, and its general appearance magnificent. The leaves are oval-acuminate, smooth, shining, and bordered in the spring with a soft hairy down. The sexes are borne by different branches of the same tree. The barren flowers are collected in pendulous, globular heads and the others are small and of a greenish hue. The fruit is an erect capsule covered with loose, flexible spines, which divides itself at maturity into four parts, and gives liberty to two triangular seeds. The bark upon the trunk of the Beeches is thick, grey, and, on the oldest stocks, smooth and entire. The perfect wood of this species bears a small proportion to the sap, and frequently occupies only 3 inches in a trunk 18 inches in diameter.

The specific name of White Beech is derived from the colour of its alburnum; and it should be observed that trees of the same genus are more frequently distinguished in the United States by the complexion of their wood than by the differences of their foliage and of their flowers. The properties of this wood will be more particularly mentioned in the description of the Red Beech.

On the banks of the Ohio and in some parts of Kentucky, where the Oak is too rare to afford bark enough for tanning, the deficiency is supplied by that of the White Beech; the leather made with it is white and serviceable, though avowedly inferior to what is prepared with the bark of the Oak.

The Beech wood brought for fuel to the market of Philadelphia bears a small proportion to the Oak and the Hickory; hence we presume that it is comparatively little esteemed.

Notwithstanding the beauty of this tree, the properties of its wood are not such as to entitle it to attention in Europe.

#### PLATE CVI.

*A branch with leaves and fruit of the natural size. Fig. 1,  
A beech-nut.*

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## RED BEECH.

**FAGUS FERRUGINEA.** *F. foliis ovato-acuminatis, grosse dentatis; nucibus duabus triquetris; calyce echinato, coriaceo, quadrifido, inclusæ.*

THIS species of Beech is almost exclusively confined to the north-eastern parts of the United States, and to the provinces of Canada, New Brunswick and Nova Scotia. In the District of Maine and in the States of New Hampshire and Vermont it is so abundant as often to constitute extensive forests, the finest of which grow on fertile, level or gently sloping lands, which are proper for the culture of corn. Its name is derived from the colour of its wood and not of its leaves, as might be supposed in Europe, where a species of unknown origin, with dull red and sometimes with purple foliage, is cultivated in the gardens.

The Red Beech bears a greater resemblance to that of Europe than to the kindred American species: it equals the White Beech in diameter, but not in height; and as it ramifies nearer the earth, and is more numerously divided, it has a more massive summit and the appearance of more tufted foliage. Its leaves are equally brilliant, a little larger and thicker, and have longer teeth. Its fruit is of the same form, but is only half as large, and is garnished with firmer and less numerous points. To these differences must be added a more important



one in the wood : a Red Beech 15 or 18 inches in diameter consists of 3 or 4 inches of sap and 13 or 14 inches of heart, the inverse of which proportion is found in the White Beech.

The wood of the Red Beech is stronger, tougher and more compact. In the District of Maine and in British America, where the Oaks are rare, it is employed with the Sugar Maple and Yellow Birch for the lower part of the frame of vessels. As it is extremely liable to injury from worms, and speedily decays when exposed to alternate dryness and moisture, it is rarely used in the construction of houses. In the District of Maine the Hickories are rare and the White Oak does not exist, and when the Yellow Birch and Black Ash cannot be procured in sufficient abundance, the Red Beech is selected for hoops.

This wood is brought to Boston for fuel, but it is less esteemed and is sold at a lower price than the Sugar Maple. It serves for shoe-lasts, the handles of tools, and is especially proper for the tops of cards, because, when perfectly seasoned, it is not liable to warp. It is brought from the river Hudson to Philadelphia for the same uses : I have been informed by mechanics in that city, employed in making plane-handles of the Red Beech, that it is sometimes equal, though usually inferior, in compactness and solidity to the European Beech.

Red Beech planks about three inches thick are exported to Great Britain, for purposes which I am un-

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able to particularize : but whatever may be the consumption, the American forests are extensive enough to supply for a long time the demands of commerce.

The European Beech bears so strict an analogy to the Red Beech, that it may be useful to take notice of its properties, its uses, and the means by which its duration is insured in important structures.

Experience has demonstrated the advantage of felling the Beech in the summer, while the sap is in full circulation : cut at this season, it is very durable, but felled in the winter, it decays in a few years. The logs are left several months in the shade before they are hewn, care being taken that they do not repose immediately upon the ground ; after which they are fashioned according to the use to which they are destined, and laid in water for three or four months. They are said to be rendered in this way inaccessible to worms.

The Beech is very durable when preserved from humidity and incorruptible when constantly in the water ; but it rapidly decays when exposed to alternations of dryness and moisture.

In Europe, where there are not as many trees as in North America with durable and elegant wood, such as the Birches and the Maples, we are dependant upon the Beech for a greater variety of uses. It is employed for tables and bedsteads, for screws, rollers, pestles, dishes, wooden shoes, corn-shovels, etc. ; in the north of France it is taken for the felloes of wheels, and it

was formerly used, instead of pasteboard, in book-binding. In the valley of *Saint-Jean-pied-de-port* in the Pyrenees, oars are made of it to supply the neighbouring ports of the ocean. While the wood retains a portion of its sap, they are pliant and elastic; but for this use no tree can stand in competition with the Black Ash of the United States. Though the Beech is rapidly consumed; it is highly esteemed as a combustible, and its ashes are rich in alkali.

In certain cantons of Belgium, particularly near the village of St. Nicholas, between Ghent and Antwerp, very solid and elegant hedges are made with young Beeches placed 7 or 8 inches apart and bent in opposite directions so as to cross each other and form a trellis, with apertures 5 or 6 inches in diameter. During the first year they should be bound with osier at the points of intersection, where they finally become grafted and grow together. As the Beech does not suffer in pruning, and sprouts less luxuriantly than most other trees, it is perfectly adapted to this object. In the compendium at the close of my work will be found a more particular description of these hedges, which are highly interesting to the farmers of the Northern and Middle States. In the country of *Caux* and in other parts of Normandy, the farms and noblemen's seats are surrounded with Beeches, and curtains of foliage are here and there seen diversifying the landscape which always enclose a human habitation. Planted in a straight line, and breath-

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ing an unconfined air, they grow with greater rapidity, and form a lofty and superb trunk.

This tree is reared without difficulty from the seed. The nuts may be sown at any time between October and February, but the most eligible season is within a fortnight after they fall from the tree. The only necessary precaution is to subdue the ground with the plough and the harrow. As the young plants are liable to suffer by removal, they may be reared on the spot where they are to abide. To obtain straight and well-shaped trees, the nuts should be thickly sown, a part of the young plants plucked up, and the remainder fashioned with the pruning knife.

A very small space suffices to form a nursery for transplantation; as the young stocks increase and require room, the most vigorous of them are removed. In three years they are proper for hedges. The young Beech delights in shady situations and requires a soil unincumbered with herbage.

In France and Germany an oil is extracted from the beech-nut which is next in fineness to that of the olive. The forests of Eu and of Crécy in the Department of the Oise have yielded in a single season more than a million sacks<sup>1</sup> of this fruit, and in 1779 the forest of Compiègne near Verberie, Department of the Somme, afforded oil enough to supply the wants of the district for more than half a century.

<sup>1</sup> A sack contains about two bushels.

The beech-nuts are of a triangular form, with a smooth, tough skin, and a fine interior pellicle adhering to the kernel. They are united in pairs in capsules garnished with soft points, from which they escape about the 1st of October, the season of their maturity.

The fruit should be gathered as soon as it is ripe, as it is liable to be injured by the rain. It is swept together upon the ground, and is afterwards cleansed with fans or in mills; but the harvest is increased by shaking the trees and receiving the nuts upon sheets extended beneath.

Being thus collected in dry weather and thoroughly cleansed, they are spread, like corn, in a garret or other place secure from humidity, and are frequently turned. They are found to be better and more productive when dried insensibly in this manner than when exposed to the sun.

The oil is abundant only when the fruit is perfectly ripe. The season for extracting it is from the beginning of December to the end of March; if the operation is longer delayed, the nuts are liable to be injured by the warmth of the season.

The skin is commonly ground with the kernel, but as the product in this way diminishes a seventh, it would be more advantageous to separate them, which might be done in a flower-mill properly adjusted. The kernel should be immediately reduced to a paste by a vertical stone or by a pestle-mill. As the paste becomes dry in

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the process, water is added in the proportion of one pound to fifteen pounds of fruit, to prevent its being impaired by the heat.

The paste is sufficiently reduced when the oil is discharged by the pressure of the hand. It is submitted to the press in sacks of coarse linen, of wool or of hair, and the force is gradually applied and long continued, so that the oil may be completely distilled: three hours at least are required in an ordinary press. To prepare the paste for a second pressure, it is pulverized, a proportion of water being added smaller than at first, and the whole is warmed by the careful application of a moderate heat. A *wedge-press* is commonly employed in the second operation.

With skill in the process the oil is equal to one sixth of the fruit. Its quality depends upon the care with which it is made, and upon the purity of the vessels in which it is preserved. It should be twice drawn off during the first three months without disturbing the dregs, and a third time at the end of six months: it arrives at perfection only when it becomes limpid; several months after its extraction. It improves by age; lasts unimpaired for ten years, and may be preserved longer than any other oil.

## PLATE CVII.

*A branch with leaves and fruit of the natural size. Fig. 1,  
A nut.*

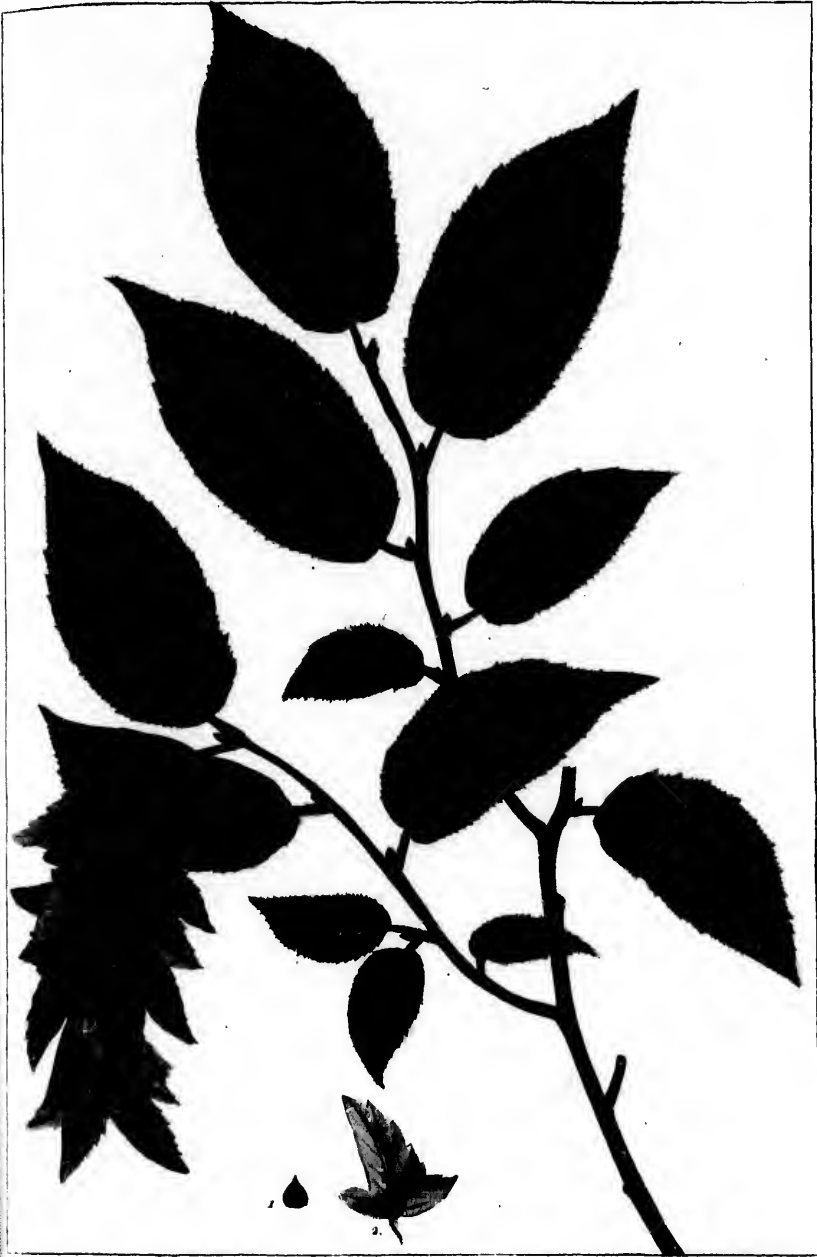
## AMERICAN HORNBEAM.

CARPINUS AMERICANA. *C. foliis oblongo-ovalibus, serratis, involucrem laciniis acute dentatis.*

THE American Hornbeam is found as far north as the provinces of Nova Scotia, New Brunswick and Lower Canada; but it is repressed by the severity of the climate and is less multiplied than in New Jersey, Pennsylvania and the Southern States. By the Americans it is called Hornbeam, and by the French of Upper Louisiana *Charme*.

The Hornbeam prospers in almost every soil and exposure, except in places that are too long inundated, or that are absolutely sterile like the *pine-barrrens* of the Southern States and of the Floridas. Its ordinary stature is from 12 to 15 feet, and it is sometimes 25 or 30 feet high and 6 inches in diameter; but as not more than one stock in a hundred attains these dimensions it must be considered rather as a large shrub than as a tree; I have admitted it among the trees because it is met with at every step in the forests.

The leaves of the Hornbeam are oval-acuminate and finely denticulated. The sexes are united on the same stock, and the fertile flowers are collected in long, loose, pendulous, leafy aments at the extremity of the branches. The scales or leaves which surround them are furnished at the base with a hard, oval seed. The fruc-



*Boiss del.*

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Hornbeam.  
*Carpinus virginiana.*

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tification is always abundant, and the aments remain attached to the tree long after the foliage is shed.

The trunk of the American Hornbeam, like that of the analogous species in Europe, is obliquely and irregularly fluted, frequently through all its length. By its form and the appearance of the bark, which is smooth and spotted with white, it is easily distinguished when the leaves are fallen.

The wood, like that of the European Hornbeam, is white and exceedingly compact and fine-grained. The dimensions of the tree are so small as to render it useless even for fuel, but it is employed for hoops in the District of Maine when better species cannot be procured.

From these particulars it will readily be concluded that we have no interest in propagating the American Hornbeam in Europe, as our own species possesses equal strength and solidity, attains the height of 35 or 40 feet, with a diameter of 15 or 18 inches, and is consequently applicable in the mechanical arts and useful for fuel. The only superiority of the American species is for trellises; as it is naturally dwarfish its growth is more easily repressed, and as its branches are numerous it has a closer and more tufted foliage. The Hornbeam of Europe, on the other hand, would be a valuable acquisition to the forests of America.

#### PLATE CVIII:

*A branch with leaves and fruit of the natural size. Fig. 1,  
A seed.*

## IRON WOOD.

**CARPINUS OSTRYA.** *C. foliis cordato - ovalibus ; amentis  
femineis oblongioribus ; involucris fructiferis , compresso-  
vesicariis.*

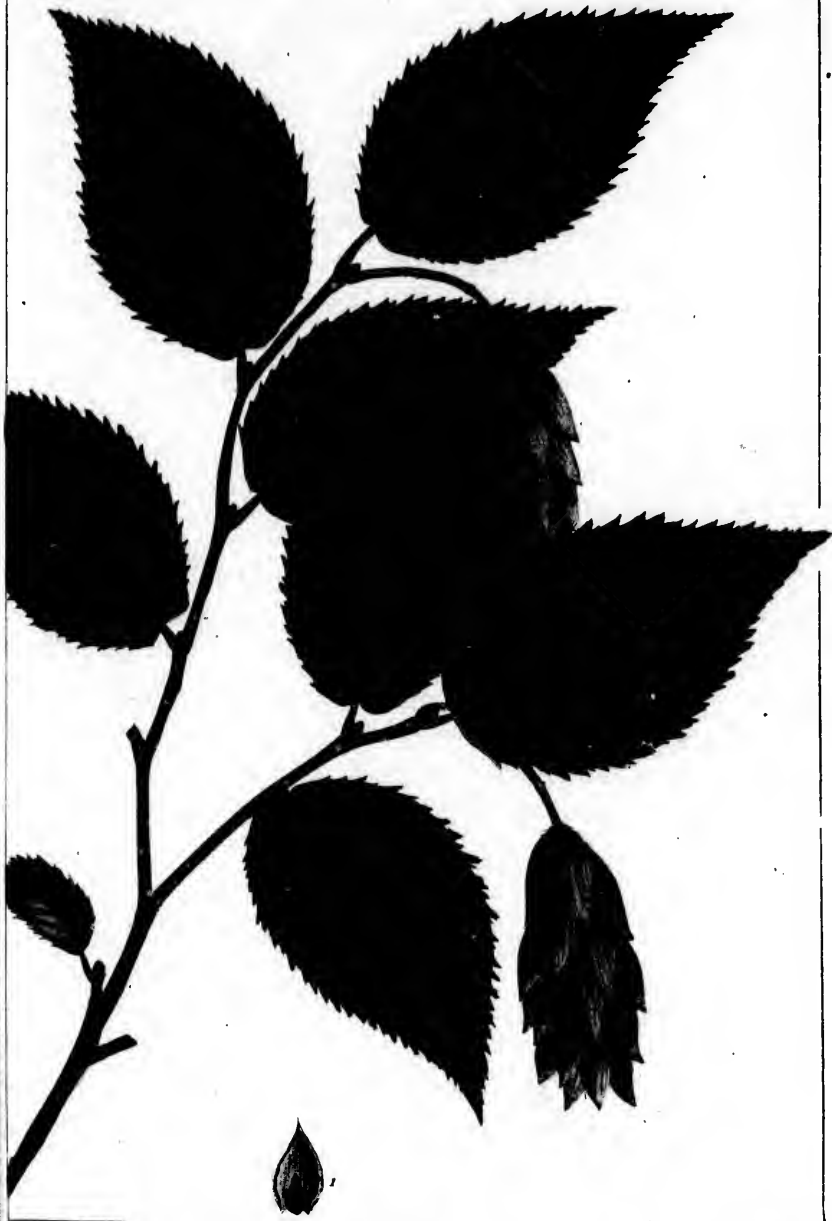
**EAST** of the Mississippi the Iron Wood is diffused throughout the United States and the provinces of New Brunswick, Nova Scotia and Lower Canada. In New York, New Jersey, Pennsylvania and the Southern States, where it is most abundant, it bears the name which I have adopted ; in Vermont, New Hampshire and the District of Maine, it is called Lever Wood, and by the French of Illinois, *Bois dur*, hard wood.

Though the Iron Wood is multiplied in the forests, it nowhere constitutes masses even of inconsiderable extent, but is loosely disseminated, and found only in cool, fertile, shaded situations. I have nowhere seen it more common nor more vigorous than in Genessee, near lake Erie and lake Ontario; but it is always a tree of the second or even of the third order, rarely equaling 35 or 40 feet in height and 12 or 15 inches in diameter, and commonly not exceeding half these dimensions.

The leaves are alternate, oval-acuminate, and finely and unequally denticulated. The fertile and barren flowers are borne at the extremity of different branches



*W. J. Redouté del.*



H. J. Roland del.

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Iron Wood.  
*Carpinus ostrya.*

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of the same tree, and the fruit is in clusters like hops. The small, hard, triangular seed is contained in a species of reddish, oval, inflated bladder, covered at the age of maturity with a fine down, which causes a violent irritation of the skin if carelessly handled.

In the winter this tree is recognized by a smooth, greyish bark, finely divided, and detached in strips not more than a line in breadth.

The wood is perfectly white, compact, fine-grained and heavy. The concentric circles are closely compressed, and their number in a trunk of only 4 or 5 inches in diameter evinces the length of time necessary to acquire this inconsiderable size. To its inferior dimensions must be ascribed the limited use of a tree, the superior properties of whose wood are attested by its name.

In the Northern States, and particularly in the District of Maine, the Iron Wood is used for the levers with which the trees felled in clearing the ground are transported to the piles on which they are consumed. Near New York, brooms and scrubbing-brushes are made of it, by shredding the end of a stick of suitable dimensions. Though its uses are unimportant, they might probably be more diversified; it seems well-adapted for mill-cogs, mallets, etc.

The Iron Wood flourishes in France: several stocks, 15 or 20 feet in height fructify annually on the ancient estate of *Duhamel du Monceau*, and young plants, the produce of self-sown seeds, are found in the vicinity.

This species is among the exotic trees which might be propagated with advantage in Europe.

## PLATE CIX.

*A branch with leaves and fruit of the natural size. Fig. 1,  
A seed.*



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**Black Gum.**  
*Nyssa sylvatica.*

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# BLACK GUM.

*Polygamia dioica.* Linn.

*Elmagnoides.* Juss.

**NYSSA SYLVATICA.** *N. foliis ovalibus, integerrimis, petiolo, nervo medio, margineque villosis; pedunculis femineis longis plerumque 2-floris, nuce brevi, obovata, obtuse striata.*

In the park of Mr. W. Hamilton, at the Woodlands, near Philadelphia, I first observed the Black Gum. The river Schuylkill in this vicinity may be assumed as its northern boundary, though it is common in the woods on the road from Philadelphia to Baltimore. In all the more Southern States, both east and west of the Alleghany Mountains, it is more or less multiplied as the soil is more or less favourable to its growth. It is designated by the names of Black Gum, Yellow Gum and Sour Gum, neither of which is founded upon any of its characteristic properties; but as they have become sanctioned by use, however ill-chosen, I have adopted the first, which is the most common.

The vegetation of this tree exhibits a remarkable singularity: in Maryland, Virginia and the Western States, where it grows on high and level grounds with the Oaks and the Walnuts, it is distinguished by no peculiarity of form; in the lower part of the Carolinas and of Georgia, where it is found only in wet places with the Small Mag-



Gambel's

nolia or White Bay, the Red Bay, the Loblolly Bay and the Water Oak, it has a pyramidal base resembling a sugar-loaf. A trunk 18 or 20 feet high and 7 or 8 inches in diameter at the surface, is only 2 or 3 inches thick a foot from the ground; these proportions, however, vary in different individuals.

The Black Gum is much superior in size to the Tupelo, being frequently 60 or 70 feet high and 18 or 20 inches in diameter. I have observed that on elevated and fertile lands in the upper part of Virginia, in Kentucky and Tennessee it is larger than in marshy grounds in the maritime parts of the Southern States.

The leaves of this species are 5 or 6 inches long, alternate, entire, of an elongated oval form, and borne by short and downy petioles. The flowers are small, not conspicuous, and collected in bunches. The fruit is of a deep blue colour and of a lengthened oval shape, and contains a slightly convex stone, longitudinally striated on both sides.

The bark of the trunk is whitish and similar to that of the young White Oak. The wood is fine-grained but tender, and its fibres are interwoven and collected in bundles; an arrangement characteristic of the genus. The alburnum of stocks growing upon dry and elevated lands is yellow: this complexion is considered by wheel-wrights as a proof of the superior quality of the wood, and has, probably, given rise to the name of Yellow Gum, which is sometimes given to this species.

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Throughout the greater part of Virginia the Black Gum is employed for the naves of coach and waggon wheels ; at Richmond , Baltimore , Philadelphia , etc. , it is preferred for hatters' blocks , as being less liable to split ; and in the Southern States it is used in the rice-mills for the cylinder which receives the cogs , by whose circulation the pestles are lifted and let fall upon the rice to separate it from the husk. These teeth are driven into mortices formed in the wood , and are strongly compressed by the reaction of its interwoven fibres. For its difficulty in splitting the Black Gum is chosen by shipwrights for the *cap* , or the piece which receives the topmast.

Such are the most important uses of this wood , which are equally well subserved by that of the Tupelo. Both species support the temperature of Paris , but they succeed better a few degrees farther south.

## PLATE CX.

*A branch with leaves and fruit of the natural size. Fig. 1 ,  
A stone separated from the pulp.*

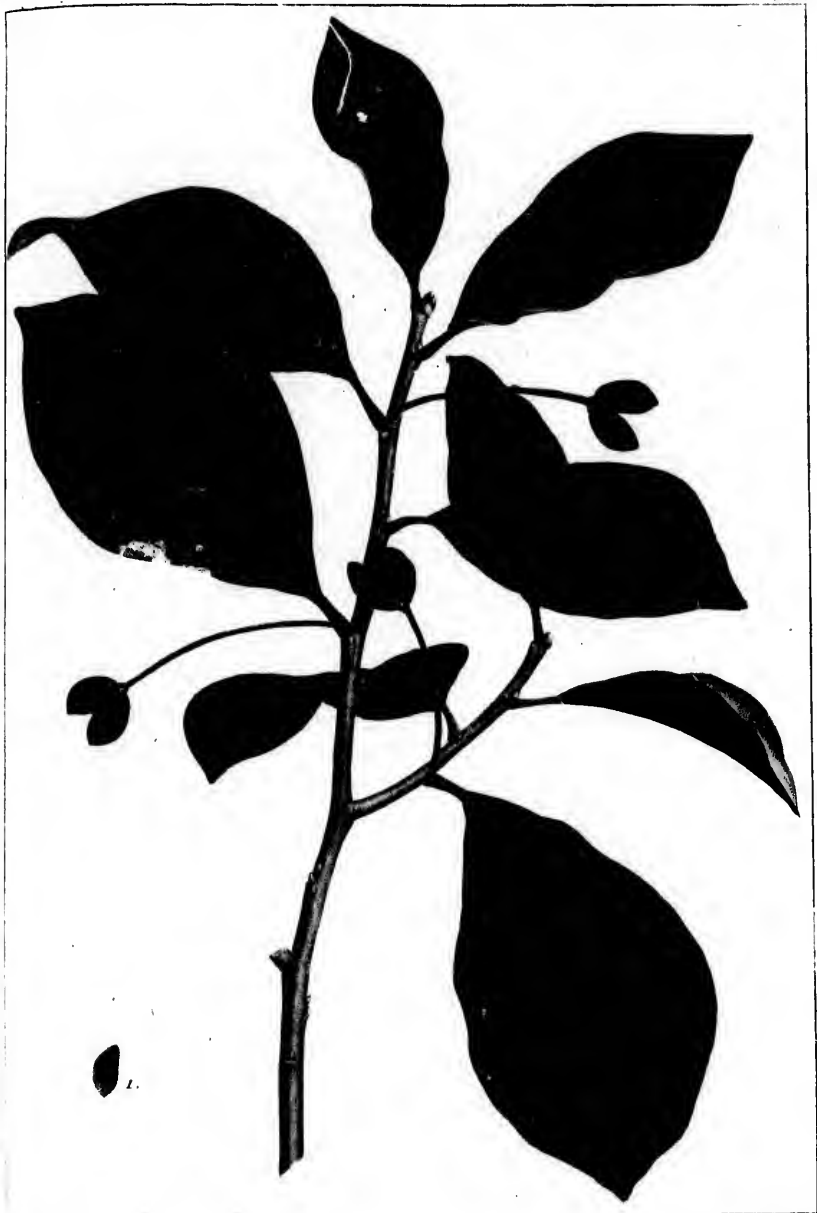
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## TUPELO.

*NYSSA AQUATICA. N. foliis ovalibus, integerrimis; pedunculis femineis bifloris; drupâ brevi, obovatâ; nucè striatâ.*

THE Tupelo begins to appear in the lower part of New Hampshire, where the climate is tempered by the vicinity of the sea, but it is most abundant in the southern parts of New York, New Jersey and Pennsylvania. It is called indiscriminately Tupelo, Gum Tree, Sour Gum and Peperidge; names of whose origin and meaning I am ignorant. The first of these denominations is the most common, the second is wholly misapplied, as no self-condensing fluid distils from the tree, and the third is used only by the descendants of the Dutch settlers in the neighbourhood of New York.

The Tupelo grows only in wet grounds; in New Jersey it is constantly seen on the borders of the swamps with the Sweet Gum, the Swamp White Oak, the Chesnut White Oak and the White Elm. It rarely exceeds 40 or 45 feet in height, and its limbs, which spring at 5 or 6 feet from the ground, affect a horizontal direction. I have remarked that the shoots of the two preceding years are commonly simple, and widely divergent from the branches. The trunk is of an uniform size from its base: while it is less than 10 inches in diameter the bark is not remarkable, but on full-grown and vigorous stocks it is thick, deeply furrowed, and, unlike the



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Tupelo.  
*Nyssa aquatica.*

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bark of any other tree, divided into hexagons, which are sometimes nearly regular.

The leaves are 3 inches long, oboval, smooth, slightly glaucous beneath, alternate, and often united in bunches at the extremity of the young lateral shoots. The flowers are small, scarce, apparent, collected in bunches and supported by petioles one or two inches in length. The fruit, which is always abundant, is of a deep blue colour, about the size of a pea, and attached in pairs. It is ripe towards the beginning of November, and persisting after the falling of the leaf it forms a part of the nourishment of the red-breasts in their autumnal migration to the south. The stone is compressed on one side, a little convex on the other, and longitudinally striated. Bruised in water this fruit yields an unctuous, greenish juice, of a slightly bitter taste, which is not easily mingled with the fluid. I do not know that any attempt has been made to convert it to economical uses, and I believe it would be difficult to obtain from it a spirituous liquor, or even to convert it into vinegar.

The Tupelo holds a middle place between trees with soft and those with hard wood. When perfectly seasoned the sap is of a light reddish tint, and the heart of a deep brown. Of trees exceeding 15 or 18 inches in diameter more than half the trunk is hollow; a fact which I have repeatedly witnessed.

The ligneous fibres which compose the body of trees in general are closely united, and usually ascend in a



perpendicular direction. By a caprice of nature which it is impossible to explain, they sometimes pursue an undulating course, as in the Red and Sugar Maples, or, as in the last mentioned species, form ripplings so fine that the curves are only 1, 2 or 3 lines in diameter; or, lastly, they ascend spirally, as in the *Orme tortillard*, Twisted Elm, following the same bent for 4 or 5 feet. In these species, however, the deviation is only accidental, and to be sure of obtaining this form it must be perpetuated by grafting or by transplanting young stocks from the shade of the parent tree. The genus which we are considering exhibits, on the contrary, a constant peculiarity of organization; the fibres are united in bundles, and are interwoven like a braided cord; hence the wood is extremely difficult to split, unless cut into short billets. This property gives it a decided superiority for certain uses: in New York, New Jersey, and particularly at Philadelphia, it is exclusively employed for the naves of wheels destined for heavy burthens. It must be acknowledged that, in some parts of New Jersey and Pennsylvania, the White Oak is preferred, which, as I have already remarked, appears, from its liability to split, to be little calculated for this object. From the difference of opinion on this subject we may conclude that the Tupelo is esteemed solely for its difficulty in splitting, and not for its solidity and strength. The absence of these properties would be a still more essential defect in France, where the wheels of heavy vehicles

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have naves 20 inches in diameter at the insertion of the spokes, with an axle-tree of 350 pounds weight, and are laden for distant transportation with 9000 pounds, which is twice the burthen ever laid upon them in America. The Tupelo, therefore, from its inferiority in size and strength, can never be substituted for the Twisted Elm. But if to its own organization it joined the solidity of the Elm, a more rapid vegetation and the faculty of growing on dry and elevated lands and of expanding to three or four times its present dimensions, it would be the most precious to the mechanical arts of all the forest-trees of Europe and North America. In New Jersey and Pennsylvania many farmers prefer the Tupelo for the *sideboards* and bottom of carts, as experience has evinced its durability. Wooden bowls are made of it which are heavier than those of Poplar, but less liable to split. As a combustible it is esteemed for consuming slowly and diffusing a great heat: at Philadelphia many persons, in making their provision of wood for the winter, select a certain proportion of the Tupelo, which is sold separately for logs.

The preceding remarks will enable the Europeans to appreciate the value of the Tupelo, while they suggest to the Americans the importance of introducing the Twisted Elm.

## PLATE CXI.

*A branch with leaves and fruit of the natural size. Fig. 1.  
A stone separated from the pulp.*

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## LARGE TUPELO.

**NYSSA GRANDIDENTATA.** *N. foliis longè petiolatis, ovalibus, acuminatis; pedunculis femineis 1-floris; fructibus cæruleis.*

THIS is the most remarkable species of its genus for height and diameter. According to my own observations it is unknown to the Northern and Middle States, and is found only in the lower part of the Carolinas, of Georgia and of East Florida, where it is designated by the name of Large Tupelo. I have been assured that it abounds, also, in Lower Louisiana on the banks of the Mississippi, where it is called Wild Olive. In fine, it exists in all parts of the United States which produce the Long-leaved Pine. I am induced also to believe, though with less conclusive evidence of the fact, that it grows wherever we find the Cypress, and consequently that it extends northward beyond the limits of Virginia, as the Cypress abounds in the swamps of Maryland, at a little distance from the sea. In South Carolina and Georgia I have seen them constantly united, and, with the Overcup Oak, Water Locust, Cotton Wood, Carolinian Poplar and Water Bitternut Hickory, they compose the dark and impenetrable forests which cover the miry swamps on the border of the rivers, to the distance of one or two hundred miles from the ocean. The exten-

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Large Tupelo.  
*Nyssa grandidentata.*

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sive swamps still enclosed in the forests produce the same trees, whose presence is an infallible proof of the depth and fertility of the soil, and, consequently, of its fitness for the culture of rice.

The rivers, at their annual overflowing, sometimes cover these marshes to the height of 5 or 6 feet, as is shown by the marks left upon the trees by the retiring waters. Vegetation seems only to acquire new energy from these inundations, and the Large Tupelo sometimes attains the height of 70 or 80 feet with a diameter of 15 or 20 inches immediately above its conical base and 6 or 7 feet from the ground. This size continues uniform to the height of 25 or 30 feet : at the surface the trunk is 8 or 9 feet thick, which is a greater disproportion than we observed in the preceding species.

I cannot attribute this extraordinary swelling of the trunk entirely to the humidity of the soil ; if such was the cause we should probably witness the phenomenon in other trees which accompany the Tupelos.

The leaves of the Large Tupelo are commonly 5 or 6 inches long and 2 or 3 inches broad ; on young and thriving stocks they are of twice these dimensions. They are of an oval shape, and are garnished with two or three large teeth irregularly placed, and not opposite, like those of other leaves. At their unfolding in the spring they are downy, but they become smooth on both sides as they expand. The flowers are disposed in bunches, and are succeeded by a fruit of considerable

size and of a deep blue complexion, of which the stone is depressed and very distinctly striated. Bruised in water this fruit yields a fine purple juice whose colour is tenacious; but the quantity is too minute to afford resources in dying.

The wood of the Large 'Tupelo is extremely light and softer than that of any tree of the United States with which I am acquainted. In the arrangement of its fibres it resembles the other species of the genus. Its only use is for bowls and trays, for which it is well adapted as it is wrought with facility. Its roots, also, are tender and light, and are sometimes employed by fishermen to buoy up their nets: but no part of the tree affords a substitute for cork.

The only merit of this species resides in its agreeable form and beautiful foliage. It endures the temperature of Paris, and does not exact, in Europe, as moist a soil as it constantly requires in the United States:

#### PLATE CXII.

*A branch with leaves and fruit of the natural size. Fig. 1,  
A stone separated from the pulp.*

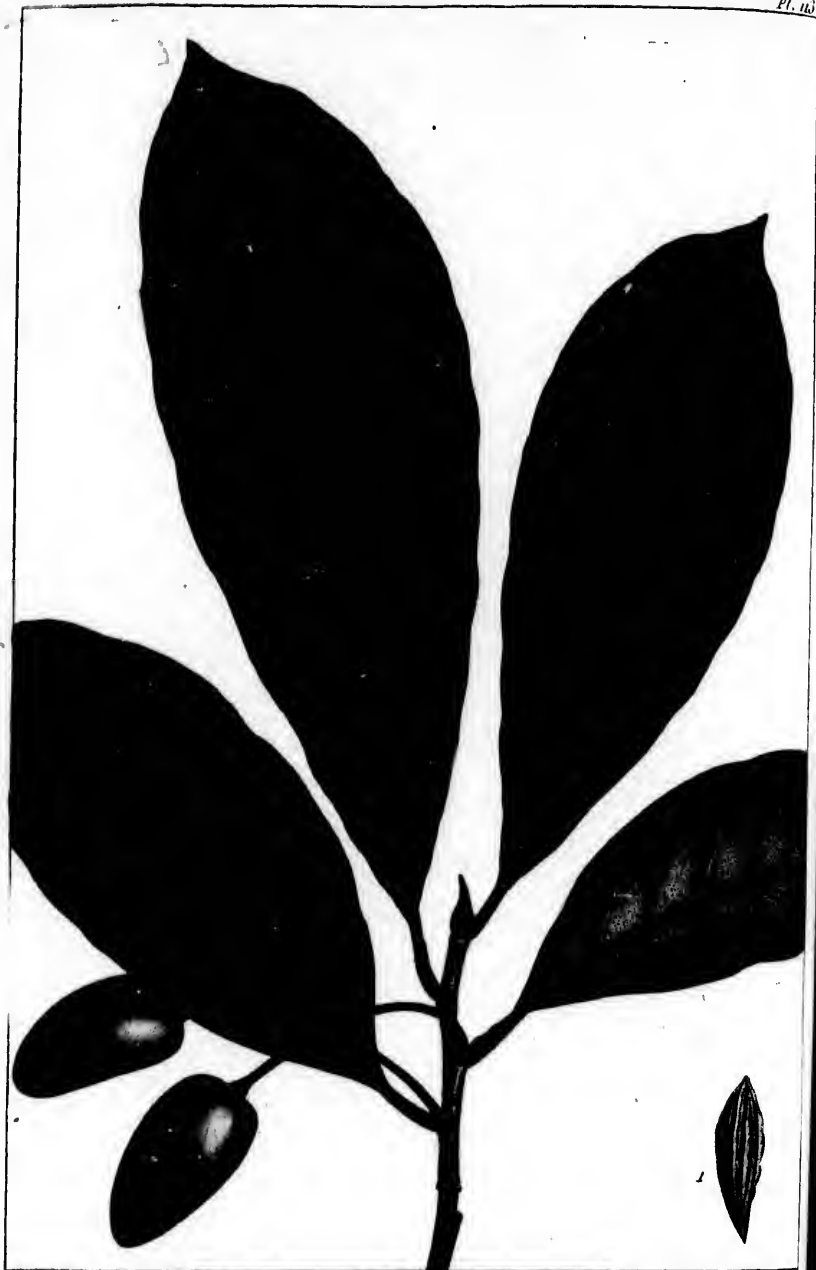
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Sour Tupelo.  
*Nyssa capitata.*

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## SOUR TUPELO.

*NYSSA CAPITATA. N. foliis brevissimè petiolatis, subcuneato-oblongis, subtus subcandicantibus; pedunculis fœmineis 1-floris; fructibus rubris.*

THE Sour Tupelo first makes its appearance on the river Ogechee, near the road from Savannah to Sunbury, and in going southward it is seen in every favourable situation. I have been told that it exists in Lower Louisiana, which is probable from the analogy in soil and climate between the ancient Southern States and the country watered by the lower part of the Mississippi.

In Georgia this tree is known by the name of Sour Tupelo and Wild Lime, the first of which I have preferred, though the last is more common, because this vegetable bears no resemblance to the Lime Tree in the form of its leaves or of its flowers.

The leaves are 5 or 6 inches long, oval, rarely denticulated, of a light green above and glaucous beneath. The flowers are similar to those of the Large Tupelo, but the sexes are borne by separate stocks, and I have remarked, as a peculiarity witnessed in no other tree of North America, that the male and female trees are easily distinguished by their general appearance when the leaves are fallen. The branches of the male are more compressed about the trunk, and rise in a direction



Gabriel only

more nearly perpendicular ; those of the female diffuse themselves horizontally and form a larger and rounder summit.

The fruit is supported by long petioles, and is from 15 to 18 lines in length, of a light red colour and of an oval shape. It is thick-skinned, intensely acid, and contains, like that of the Large Tupelo, a large oblong stone deeply channelled on both sides. An agreeable acidulous beverage might be made of it ; but the Lime Tree, which is found in the same country, is superior in the size and abundance of its fruit, and has, besides, the advantage of flourishing on barren, sun-beaten lands.

This species is the smallest of the Tupelos, being rarely more than 30 feet high and 7 or 8 inches in diameter. It accompanies the Large Tupelo in the swamps which are found upon the borders of the rivers or in the midst of the forests. As its wood is soft and its dimensions too small to be applicable in the arts, it falls exclusively within the province of the amateurs of exotic plants.

#### PLATE CXIII.

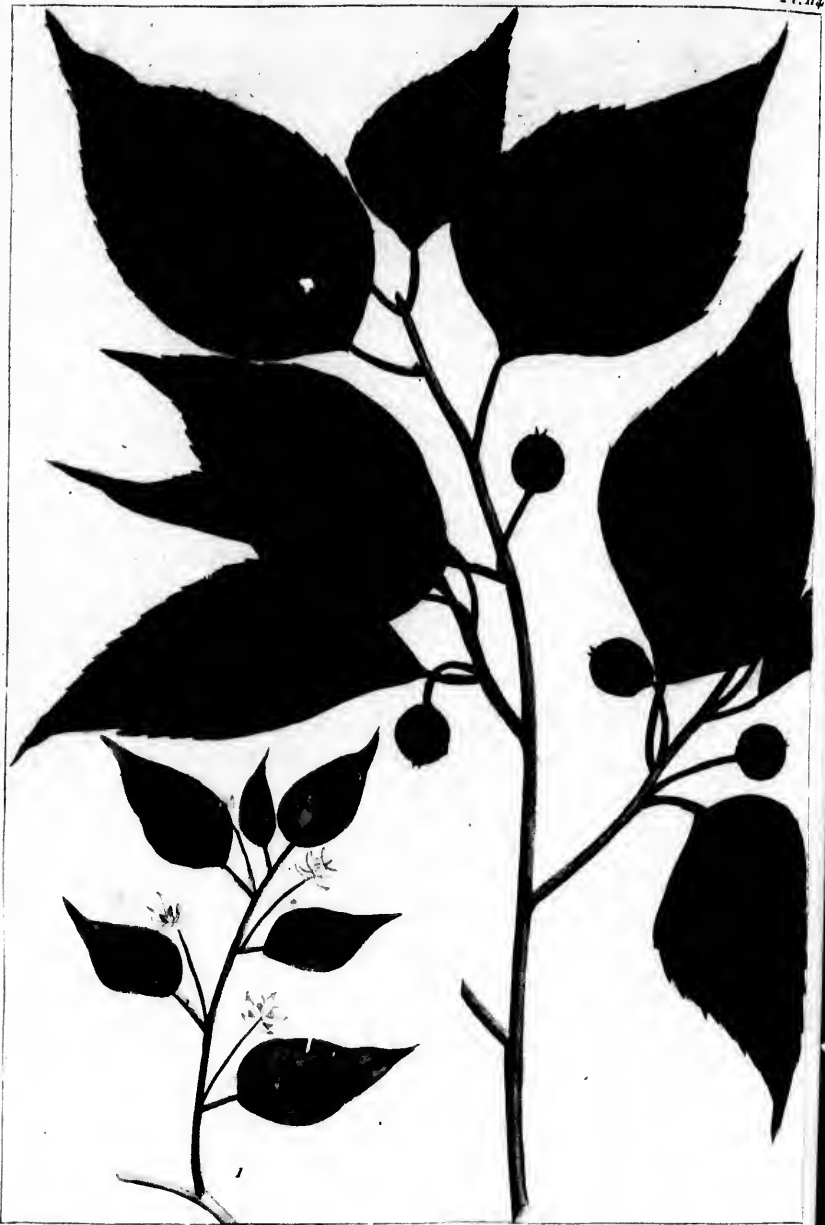
*A branch with leaves and fruit of the natural size. Fig. 1,  
A stone separated from the pulp.*

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*Fig. 1.*



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American Nettle Tree.  
*Celtis occidentalis.*

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## AMERICAN NETTLE TREE.

*Polygamia dioecia.* LINN.

*Amontacæ.* JUSS.

*CELTIS OCCIDENTALIS. C. foliis ovatis, acuminatis, serratis, basi inæqualibus, supra scabris, subtus hirtis; fructibus rubris.*

THE American Nettle Tree, if not rare, is little multiplied in comparison with the Oaks, the Walnuts and the Maples. As it is scattered singly through the forest, it is difficult to fix the point at which it ceases towards the North, but I believe it is not found beyond the river Connecticut. In the Middle, Western and Southern States it bears the name which I have adopted, and among the French of Illinois, that of *Bois inconnu*, Unknown wood.

The Nettle Tree prefers a cool and shady situation, with a deep and fertile soil: I have observed the largest stocks on the banks of the Savannah, some of which were 60 or 70 feet high and 18 or 20 inches in diameter. This species is similar in its foliage and general appearance to the European Nettle Tree; the branches of both are numerous and slender, and the limbs take their rise at a small distance from the ground and seek a horizontal or an inclined direction. The leaves are alternate, about 3 inches long, of a dark green colour, oval-oblique at the base, very acuminate at the summit, denti-

culated, and somewhat rough. The flowers open early in the spring, and are small, white, single and axillary: the fruit, also, is small and single, of a round form, and of a dull red colour.

The bark is rough and entire upon the trunk, and smooth and even on the secondary branches. I have never seen the wood employed in any part of the United States and cannot speak of its uses; as the American and European species are analogous in other respects, they are probably alike in the properties of their wood.

The European Nettle Tree is a robust vegetable which endures the most inclement weather, bears transplanting without injury, and grows with rapidity in almost every soil. When perfectly seasoned the wood is of a dark brown colour, hard, compact, supple and tenacious: it makes excellent hoops, whip-stocks and ram-rods, is used by wheel-wrights for shafts and for other purposes, and is proper for sculpture. The Ancients assert that it is durable and secure from worms.

#### PLATE CXIV.

*A branch with leaves and fruit of the natural size. Fig. 1.  
A sprig with flowers.*

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*Fig. 1.*





H. J. Redouté del.

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Hack Berry.  
*Celtis crassifolia.*

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## HACK BERRY.

*CELTIS CRASSIFOLIA. C. foliis subcordatis, serratis, acuminatis; fructibus nigris.*

THE banks of the Delaware above Philadelphia may be considered as the north-eastern limit of the Hack Berry. East of the mountains it is restricted within narrow boundaries, and is a stranger to the lower part of Virginia and to the more Southern States: I have found it abundant only on the banks of the Susquehannah and of the Potowmack, particularly on the Susquehannah near Columbia and Harrisburgh. It is profusely multiplied, on the contrary, in the Western Country in all the vallies that stretch along the rivers, and wherever the soil is fertile throughout Kentucky and Tennessee. On the Ohio, from Pittsburgh to Marietta, it is called Hoop Ash, and in Kentucky, Hack Berry; a name whose origin I am unable to trace.

This is one of the finest trees that compose the dusky forests on this part of the Ohio. It associates with the Button Wood, Black Walnut, Butternut, Bass Wood, Black Sugar Maple, Elm and Sweet Locust, which it equals in stature but not in bulk, being sometimes more than 80 feet high with a disproportionate diameter of 18 or 20 inches.

The Hack Berry is easily distinguished by the form of

its trunk, which is straight and undivided to a great height, and by its bark, which is greyish, unbroken and covered with asperities unequally distributed over its surface. Its leaves are larger than those of any other species of Nettle Tree, being 6 inches long and 3 or 4 inches broad. They are oval-acuminate, denticulated, cordiform at the base, of a thick, substantial texture, and of a rude surface. The flowers are small, white, and often united in pairs on a common peduncle. The fruit is round, about as large as a pea, and black at its maturity. The wood is fine-grained and compact, but not heavy, and when freshly exposed it is perfectly white: sawn in a direction parallel or oblique to its concentric circles it exhibits the fine undulations that are observed in the Elm and the Locust. On laying open the sap of this tree in the spring, I have remarked, without being able to account for the phenomenon, that it changes in a few minutes from pure white to green. On the Ohio and in Kentucky, where the best opportunity is afforded of appreciating this wood, it is little esteemed on account of its weakness and its speedy decay when exposed to the weather. It is rejected by wheelwrights, but is sometimes employed in building for the covering which supports the shingles. As it is elastic and easily divided it is used for the bottom of common chairs, and by the Indians for baskets. On the banks of the Ohio it is frequently taken for the rails of rural fence, and is wrought with the greatest ease, as it is

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straight-grained and free from knots : it is said also to afford excellent charcoal.

The Hack Berry is certainly one of the most beautiful trees of its genus, and one of the most remarkable for height and for majesty of form. In rich soils the luxuriance of its vegetation is shown by sprouts 6, 8 and 10 feet in length, garnished on each side with large, substantial leaves. In France it is principally esteemed for the rapidity of its growth, and it is to be wished that its wood may be found valuable enough to entitle it to a place in our forests:

PLATE CXV:

*A branch with leaves and fruit of the natural size.*

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## RED MULBERRY.

*Monœcia tetrandria.* LINN.

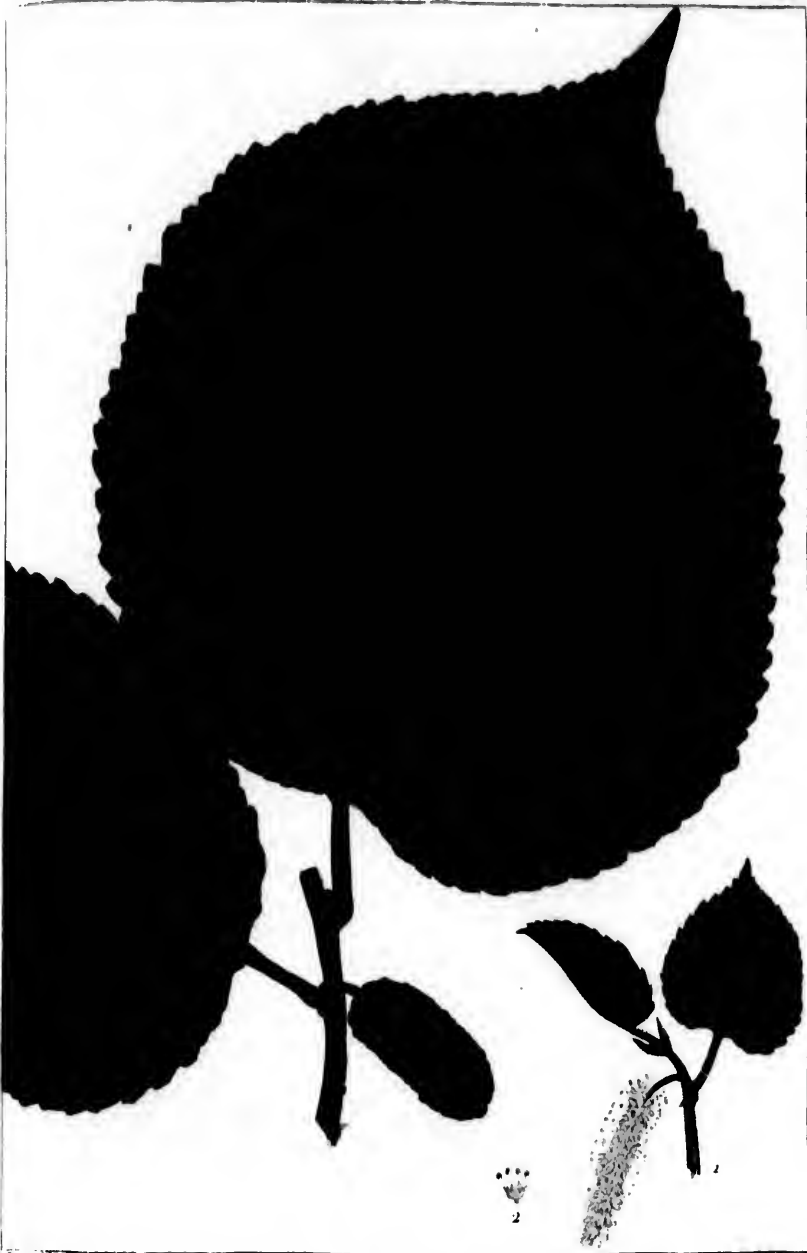
*Urticæ.* Juss.

**MORUS RUBRA:** *M. foliis cordatis, orbiculatis trilobisve, æqualiter serratis, scabris; spicis femineis cylindricis.*

THE northern extremity of lake Champlain and the banks of the river Connecticut, which I have assigned as the limits of the Tulip Tree, may also be assumed as those of the Red Mulberry. As a temperate climate is favourable to its increase, it is more multiplied farther south; but in the Atlantic States it is proportionally less common than many other trees which still do not constitute the mass of the forests: the Sweet Gum, the Tulip Tree, the Sassafras, the Red Beech and the Maples are far more abundant.

In the lower part of the Southern States this tree is much less frequently seen than at a distance from the sea, where the soil and vegetable productions wear a different character. I have found it most abundant in the States of Ohio, Kentucky and Tennessee, and on the banks of the Wabash, the Illinois and the Missouri; which is attributable to the superior fertility of the soil.

In these regions, and in the upper parts of Pennsylvania and Virginia, the Red Mulberry often exceeds 60 or 70 feet in height and 2 feet in diameter. Its leaves are large, sometimes entire, and sometimes divided into



W. H. C. S. 1877.

C. B. S. 1877.

Red Mulberry.  
*Morus rubra*.

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2 or 3 lobes, rounded, cordiform and denticulated, of a dark green colour, a thick texture and a rough, uneven surface.

The sexes are usually separate, though sometimes they are found upon the same tree. The male flowers form pendulous, cylindrical aments, about an inch in length; the female blossoms are small and scarcely apparent; the fruit is of a deep red colour, an oblong form and an agreeable, acidulous, sugary taste: it is composed by the union of a great number of small berries, each of which contains a minute seed.

The trunk of the Red Mulberry is covered with a greyish bark more furrowed than that of the Oaks and the Hickories. The perfect wood is of a yellowish hue, approaching to lemon colour. The concentric circles are distant and distinct; the wood is, nevertheless, fine-grained and compact, though lighter than that of the White Oak. It possesses strength and solidity, and, when perfectly seasoned, it is almost as durable as the Locust, to which, by many persons, it is esteemed perfectly equal. At Philadelphia, Baltimore, and in the more southern ports, as much of it as can be procured is employed for the upper and lower parts of the frame of vessels, for the knees, the floor-timbers, and, in preference to every other wood except the Locust, for trunnels. But it grows more slowly, requires a richer soil, and is less multiplied than the Locust, and it is found in the ship-yards in a smaller proportion than any



other timber. In South Carolina it is selected for the ribs of the large boats in which the productions of the upper districts of both Carolinas are brought down the Catawba. For posts it is almost as durable and as much esteemed as the Locust. Such are its most important uses, which should engage the American proprietors to preserve with care the stocks growing naturally on their estates:

It is a common opinion among ship-wrights and carpenters that the wood of the male Mulberry is more durable and of a better quality than that of the female: I must be pardoned for considering this opinion as a prejudice till experiments have demonstrated its truth. In America, as well as in Europe, unlearned people fall into the same error concerning the Mulberry Tree as concerning Hemp, of giving the name of male to the productive and of female to the barren plant, so that if a difference is shown to exist, it is the female tree which affords the best timber.

The Black Mulberry of Europe, which bears a great resemblance to the Red Mulberry, and whose fruit is three or four times as large, would be a valuable acquisition to the Middle and still more to the Western States, where it would flourish in perfection. The fruit of the American species, too, might easily be augmented in size and quantity by careful cultivation; a very sensible improvement is witnessed in trees left standing in cultivated fields.

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As the leaves of both these species are thick, rough and hairy while young, they are improper for the nourishment of silk-worms, which feed only on the smooth, thin and tender foliage of the White Mulberry. On several deserted plantations 15 or 20 miles from Savannah are seen large White Mulberries, which were set out a century ago, when attempts were made to introduce the raising of silk-worms. Experience quickly detected the error of the calculation: this branch of industry is adapted only to a populous country, where there are hands not required for the cultivation of the earth that may be employed in manufactures so as to afford their products at moderate prices. In the United States this period is still remote; the extensive and scarcely inhabited regions of Upper Louisiana, favoured with a fertile soil and a genial climate, will offer resources to the redundant population of the Atlantic and Western States. These regions will probably produce the finest silk, as their soil and climate are peculiarly adapted to the White Mulberry.

The Red Mulberry has been cultivated for many years in France and England, where it succeeds perfectly and is esteemed for its thick and shady foliage. The excellent properties of its wood should induce the Europeans to propagate it in their forests.

## PLATE CXVI.

*A branch with leaves and fruit of the natural size. Fig. 1; A young shoot with a barren ament. Fig. 2, A barren flower detached from the ament.*

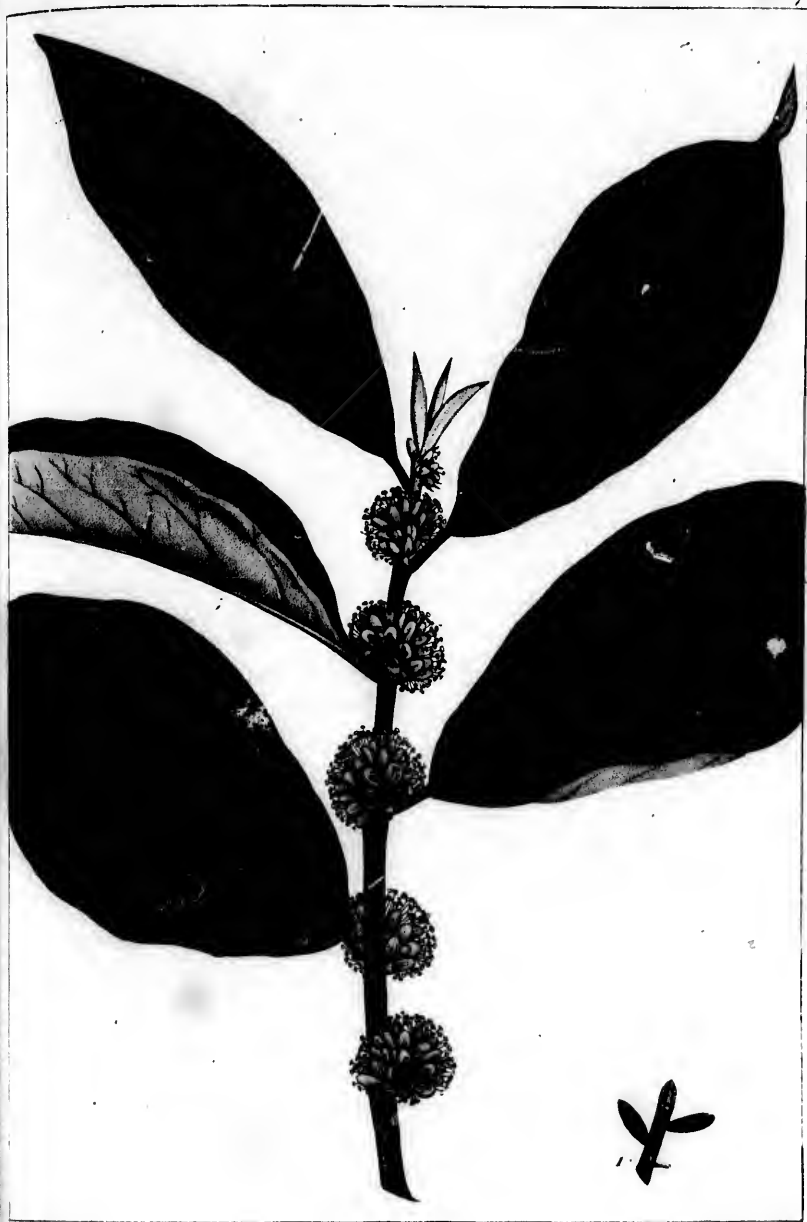
## SWEET LEAF.

*Polyadelphia polyandria*. Linn.      *Gumicana*. Juss.

**HOPEA TINCTORIA.** *H. foliis lanceolato-ovatis, subserratis, nitidis; floribus luteis; fructibus cœruleis.*

I first observed the Sweet Leaf near Petersburg in Virginia. It is common in West Tennessee and in the upper part of the Carolinas and of Georgia; but it is still more abundant within the limits which I have assigned to the *pine-barrens*, where the soil is light and the winter less rigorous than at a greater distance from the sea.

This tree is known only by the name of Sweet Leaf. It varies in size according to the situation in which it grows: on the banks of the Savannah and on the borders of the large swamps, where the soil is deep, loose and fertile, I have seen it 25 or 30 feet high and 7 or 8 inches in diameter at the height of 5 feet. Commonly it does not exceed half these dimensions, and in the *pine-barrens*, where it is profusely multiplied, it is sometimes only 3 or 4 feet in height. The sprouts from the trunks consumed in the annual conflagration of the forests never surpass this height, and, as they do not fructify, the tree is multiplied by its running roots, which shoot at the distance of a few feet.



H. J. Radenti del

Gabriel sculp

Sweet Leaf.  
*Hlopa tinctoria.*

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The trunk of the Sweet Leaf is clad in a smooth bark, and, if wounded in the spring, it distils a milky fluid of an unpleasant odour. The wood is not hard and is totally useless. The leaves are 3 or 4 inches long, smooth thick, alternate, of an elongated oval shape, slightly denticulated, and of a sugary taste. In sheltered situations they persist during two or three years, but in the *pine-barrens* they turn yellow with the first frost and fall towards the beginning of February. In the meantime they are eagerly devoured by horses and cows turned loose into the forests after the herbage has perished.

The flowers spring from the base of the leaves, and appear early in the season: they are yellowish, sweet-scented, and composed of a great number of stamina shorter than the petals and united in separate groups at the base. The fruit is cylindrical, minute, and of a deep blue colour at its maturity.

The foliage is the only part of this tree which promises to be of any utility; when dry it affords, by decoction, a beautiful yellow colour, which is rendered permanent by the addition of a little alum and is used to dye wool and cotton. But if these leaves had possessed any considerable value they would doubtless have found their way into commerce. The first obstacle to their use is the expense, in a country where labour is dear, of collecting them in sufficient quantities. Of this I can

judge from the difficulty I experienced in collecting a few pounds.

PLATE CXVII.

*A branch with leaves and flowers of the natural size.*  
*Fig. 1, A young shoot with fruit of the natural size.*

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## ASHES.

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EXCEPT the Oak, no tree of Europe or of North America is so generally useful as the Ash. The distinguishing properties of its wood are strength and elasticity; and it unites them in so high a degree, that, for many valuable purposes, it could be but imperfectly replaced by any other tree. This remark is particularly applicable to the Common Ash of Europe and to the White Ash of the United States, which are the largest species, the most multiplied, and the most useful in the arts.

Eight species of Ash are mentioned by botanists as indigenous to Europe, and a much greater number exist in America, as I am convinced by my own observations, and by examples, contained in my father's herbarium or cultivated in our gardens and nurseries, of species which have escaped my researches in America. Probably more than thirty species will be found east of the Mississippi.

As a close analogy reigns throughout this genus, each species should be raised from the seed, in order to study the developement of its vegetation as well as the characters of its flowers and its fruit. By observing them while young, we shall be able to ascertain the compara-

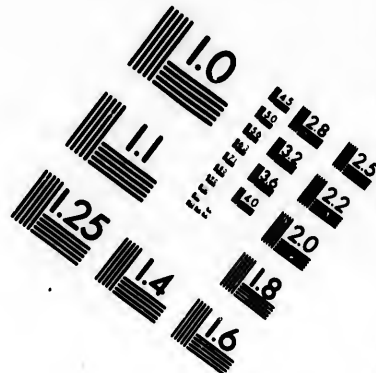
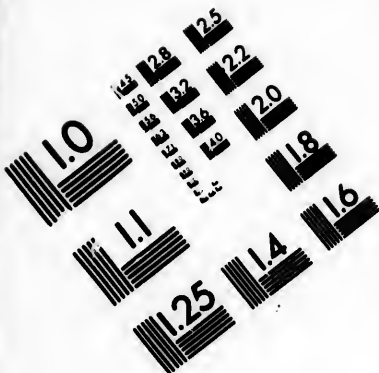


tive rapidity of their growth. My residence in the United States was not long enough for the execution of this interesting task; I have confined myself, therefore, to the description of those species which are the most remarkable for their utility or for the form of their seeds.

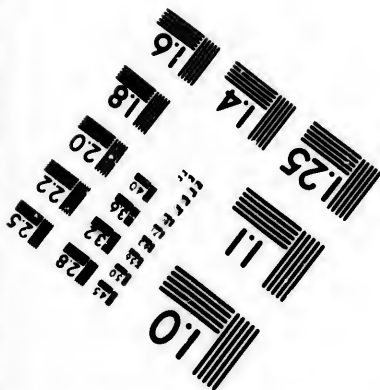
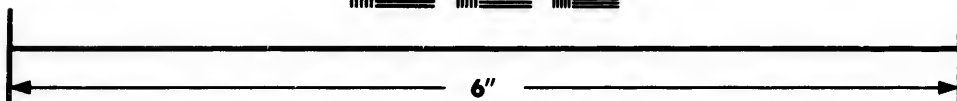
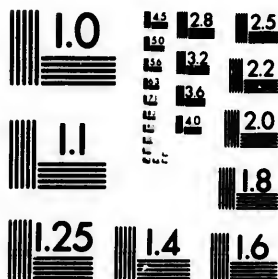
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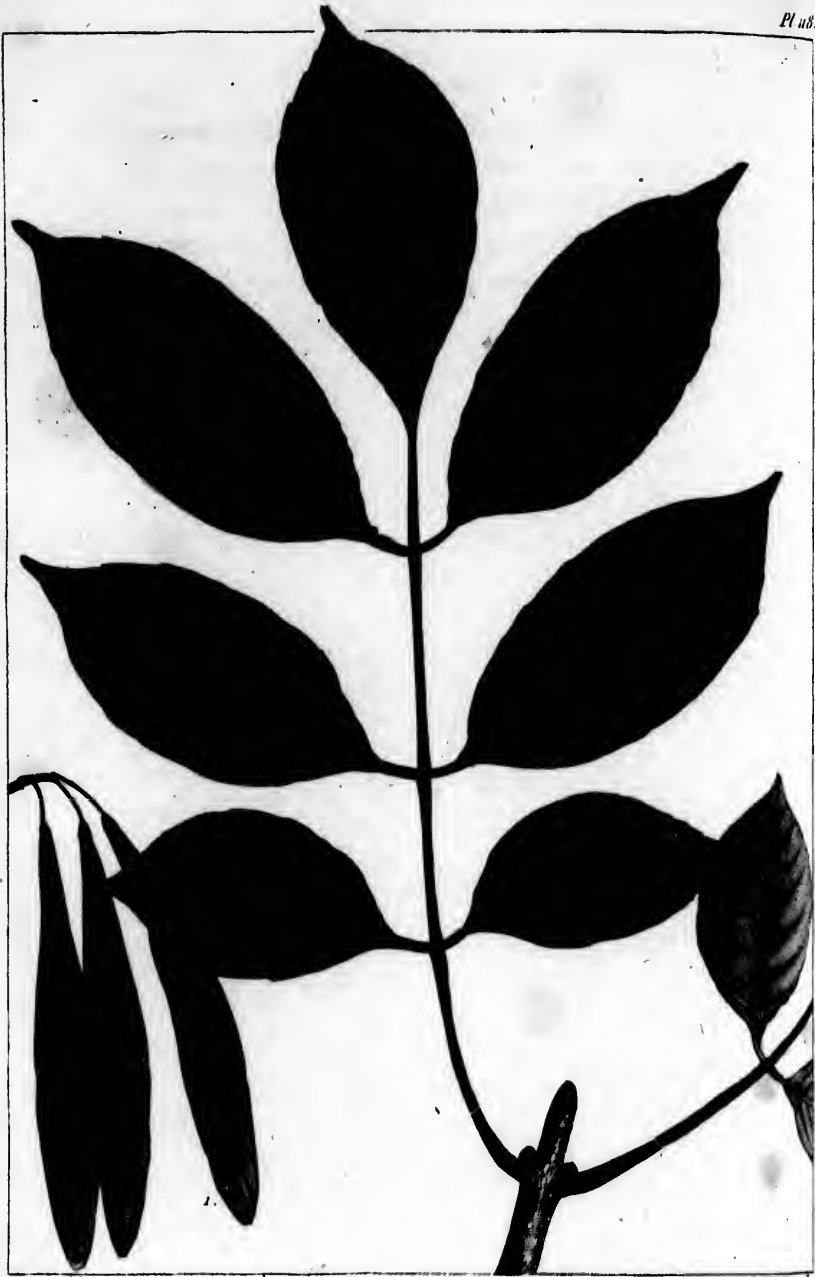


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White Ash.  
*Fraxinus americana.*

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## WHITE ASH.

*Polygamia dioica.* Linn.

Jasminif. Juss.

**FRAXINUS AMERICANA.** *F. foliis integerrimis, longè acuminatis, petiolatis, subtis glaucis.*

THE White Ash is one of the most interesting among the American species for the qualities of its wood, and the most remarkable for the rapidity of its growth and for the beauty of its foliage. It abounds in New Brunswick and Canada; in the United States it is most multiplied north of the river Hudson, and is more common in Genessee than in the southern parts of New York, in New Jersey and Pennsylvania. A cold climate seems most congenial to its nature. It is everywhere called White Ash, probably from the colour of the bark, by which it is easily distinguished. I have observed, too, that on large stocks the bark is deeply furrowed, and divided into small squares from 1 to 3 inches in diameter.

The situations most favourable to the White Ash are the banks of rivers and the edges and surrounding acclivities of swamps. It sometimes attains the height of 80 feet with a diameter of 3 feet, and is one of the largest trees of the United States. In the District of Maine and in the upper part of New Hampshire it is always accompanied by the White Elm, Yellow Birch, White Maple, Hemlock Spruce and Black Spruce; and in New

Jersey it is mingled with the Red Maple, Shell-bark Hickory and Buttonwood, in places that are constantly wet and occasionally inundated.

The White Ash is a fine tree with a trunk perfectly straight and often undivided to the height of more than 40 feet. The leaves are 12 or 14 inches long, opposite, and composed of three or four pair of leaflets surmounted by an odd one. The leaflets, which are borne by short petioles, are 3 or 4 inches long, about 2 inches broad, oval-acuminate, rarely denticulated, of a delicate texture and an undulated surface. Early in the spring they are covered with a light down, which gradually disappears, and at the approach of summer they are perfectly smooth, of a light green colour above and whitish beneath. As the contrast of colour between the surfaces is remarkable, and is peculiar to this species, Dr. Muhlenberg has denominated it *Fraxinus discolor*.

The seeds are 18 inches long, cylindrical near the base, and gradually flattened into a wing, the extremity of which is slightly notched. They are united in bunches 4 or 5 inches long, and are ripe in the beginning of autumn. The shoots of the two preceding years are of a bluish grey colour and perfectly smooth: the distance between their buds sufficiently proves the vigour of their growth.

In large trees the perfect wood is reddish and the sap is white. This wood is highly esteemed for its strength, suppleness and elasticity, and is employed with advan-

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tage for a great variety of uses of which I shall mention only the most common. It is always selected by coach-makers for shafts, for the felloes of wheels, and at New York and Philadelphia for the frame of carriage-bodies; by wheel-wrights it is used for sledges and for the handles of wheel-barrows; in the District of Maine it replaces the White Oak for the circular back of windsor-chairs; scythe and rake handles, the hoops of water-pails, the circular piece of butter-boxes, sieves and large spinning-wheels, which are manufactured principally at Hingham near Boston, are of White Ash; and in Connecticut it is usually preferred for wooden bowls. In the District of Maine it is extensively used for staves, which are of a quality between those of White and those of Red Oak, and are esteemed the best for containing salted provisions. It is admitted also into the lower frame of vessels, but is considered inferior to the Yellow Birch and to the heart of the Red Beech. In all the Atlantic States the blocks used in ships and the pins for attaching the cordage are of Ash, for which purpose the White Ash is employed in the northern and the Red Ash in the southern ports. On account of its strength and elasticity, the White Ash is esteemed superior to every other wood for oars and second only to the Hickory for *hand-spikes*. In these forms it is exported to England and to the West Indies. It is also sent to England in planks, and is acknowledged by Oddy, in his treatise on European Commerce, to be superior in many respects to the Common Ash.

The White Ash has long been known in France, England and Germany, where it is propagated with success from the seed and by grafting; I have even remarked that in moist grounds its vegetation is more rapid than that of any indigenous species: its leaves are, at the same time, less liable to injury from the spanish-fly. Besides the beauty of its foliage, in which it surpasses the Common European Ash, it may be recommended for the excellence of its wood as a valuable acquisition to the north of Europe.

PLATE CXVIII:

*A branch with leaves of half the natural size. Fig. 1,  
Seeds of the natural size.*

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Fig. 1.



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*Gambel sculp.*

Red Ash.  
*Fraxinus tomentosa.*

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## RED ASH.

*Fraxinus pubescens*. LITW.

**FRAXINUS TOMENTOSA.** *F. foliolis subnoensis, dentatis, petiolatis; ramulis petiolisque pubescenti-tomentosis.*

OF all the Ashes this species is the most multiplied in Pennsylvania, Maryland and Virginia. It is commonly called Red Ash, and frequently Ash. Like the White Ash it prefers swamps and places frequently inundated or liable to be covered with water by copious rains, and in these situations it is accompanied by the Shell-bark Hickory, Bitternut Hickory, Swamp White Oak, Red Maple, Sweet Gum and Tupelo.

The Red Ash is a beautiful tree, rising perpendicularly to the height of 60 feet with a diameter of 15 or 18 inches. It is inferior to the White Ash not only in size but in the rapidity of its growth; the length of the annual shoots and the distance of the buds are but half as great as in the preceding species.

The leaves are from 12 to 15 inches long and are composed of three or four pair of very acuminate, denticulated leaflets, with an odd one. Their lower surface, as well as the shoots of the same season to which they are attached, is covered with thick down: on insulated trees this down is red at the approach of autumn, whence, probably, is derived the name of Red Ash. The seeds



are shorter than those of the White Ash, but similar in form and arrangement.

The bark upon the trunk is of a deep brown, and the perfect wood is of a brighter red than that of the White Ash. The wood of this species possesses all the properties for which the other is esteemed, and in the parts of the Middle and Northern States they are indifferently applied to the same diversified uses; that of the Red Ash, however, is somewhat harder and consequently less elastic. Notwithstanding its inferiority of size, the Red Ash is perhaps more valuable for the regions to which it has been assigned by Nature: of this the Americans will be able to judge by experience; both species are of such general utility that the utmost pains should be bestowed upon their preservation and increase.

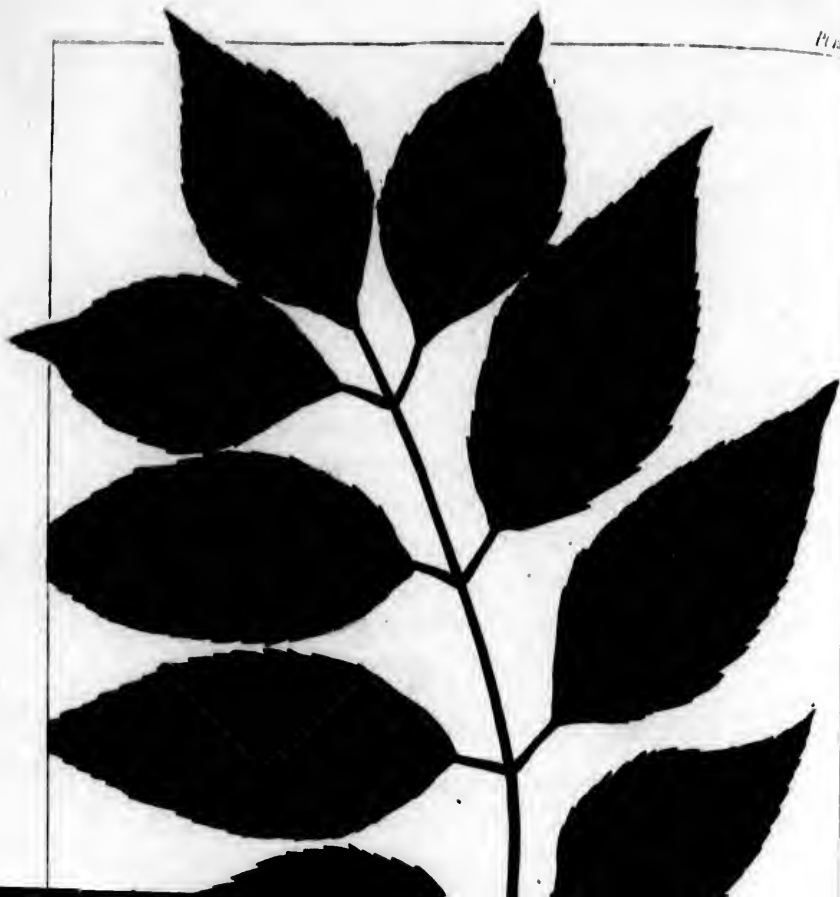
PLATE CXIX.

*A branch with leaves of half the natural size. Fig. 1, Seeds of the natural size.*

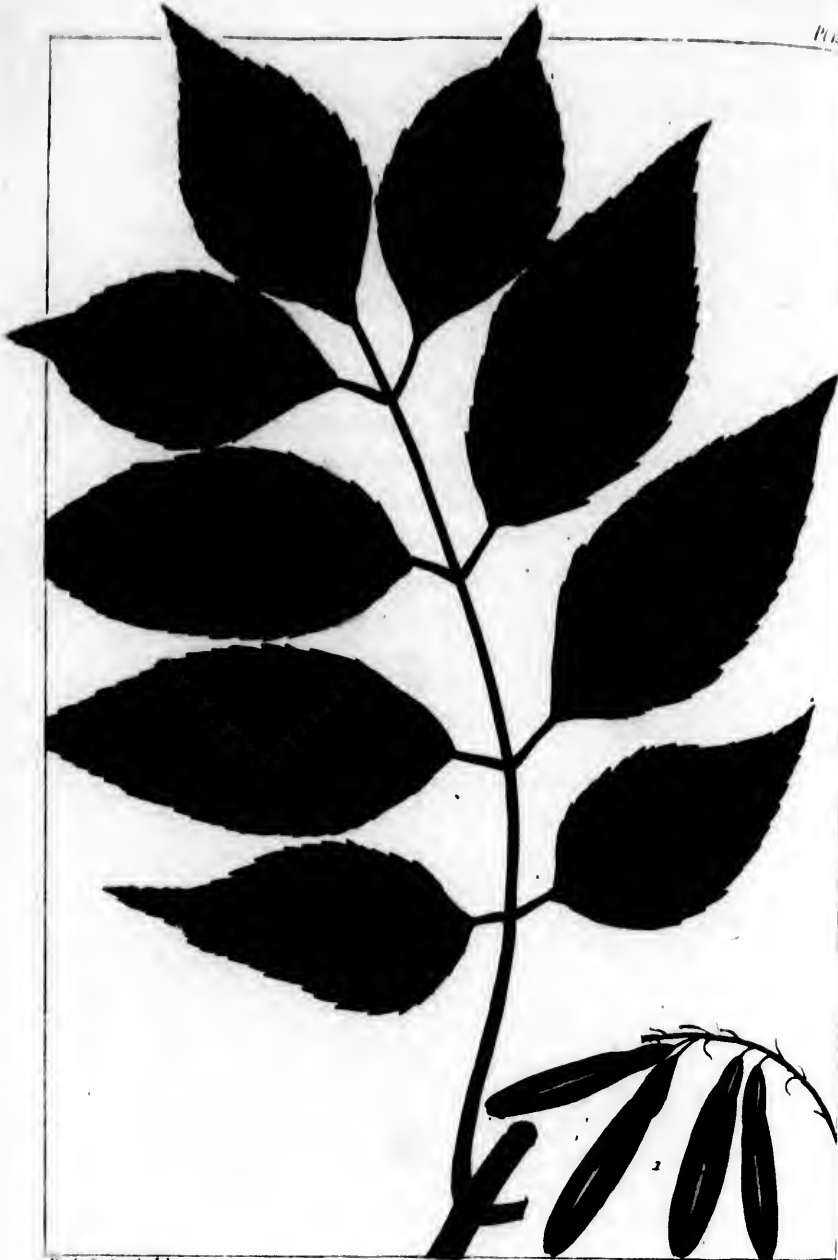
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Pl. 120

H. J. Roland del.

Gardner col.

Green Ash  
*Fraxinus viridis.*

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## GREEN ASH.

*Fraxinus juglandifolia*. Linn.

**FRAXINUS VIRIDIS.** *F. foliis septenis, dentatis, petiolatis, viridibus; ramulis petiolisque glabris.*

THE Green Ash is more common in the western districts of Pennsylvania, Maryland and Virginia than in any other part of the United States; but even here it is less multiplied than the White Ash and the Black Ash. Dr. Muhlenberg has particularly observed it on the islands of the Susquehannah near Columbia, and I have found it most abundant on the banks of the Monongahela and the Ohio between Brownsville and Wheeling. Probably this species is of moderate dimensions, for I have seen it laden with seeds while only 25 or 30 feet high, and 4 or 5 inches in diameter.

The Green Ash is easily recognized by the brilliant colour of its young shoots and of its leaves, of which the two surfaces are nearly alike. From this uniformity, which is rarely observed in the foliage of trees, Dr. Muhlenberg has given the species the name of *Fraxinus concolor*, and, for the same reason, as it has received no popular specific name, I have called it Green Ash.

The leaves vary in length from 6 to 15 inches, according to the vigour of the tree and to the coolness of the soil, and are composed of 3, 4 or 5 pair of petiolated,



oval-acuminate and distinctly denticulated leaflets, surmounted by an odd one. The seeds are only half as large as those of the White Ash, but are similar in form. The wood of the Green Ash is distinguished by the same properties with that of the preceding species; but as the others are common in the same regions, and are so much superior in size it is only accidentally employed.

This species has been multiplied in France from seeds sent home by my father in 1785. It supports the inclemency of our winter, and is esteemed by amateurs for the singular tint of its foliage, which is strikingly contrasted with that of the surrounding trees.

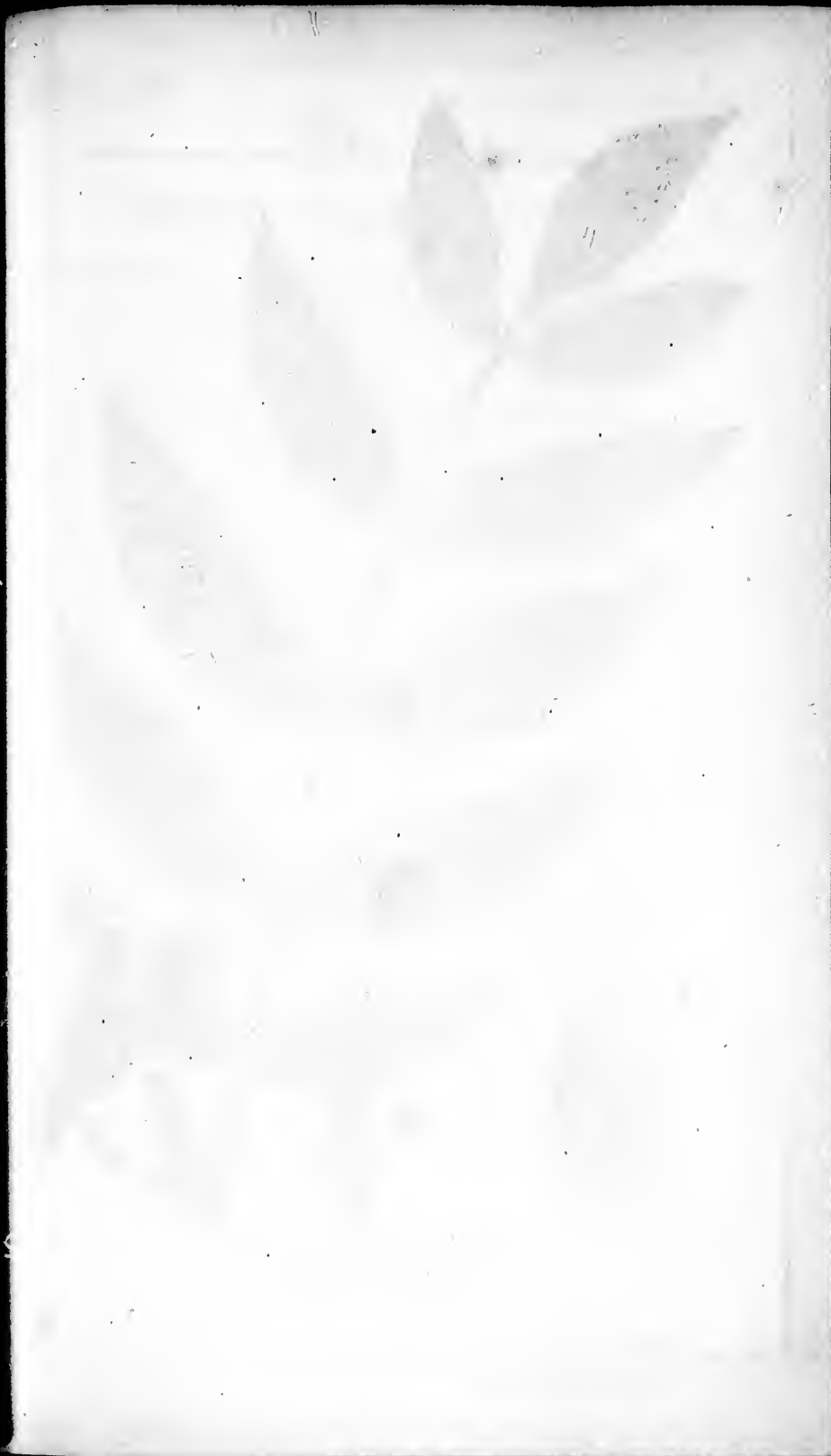
PLATE CXX:

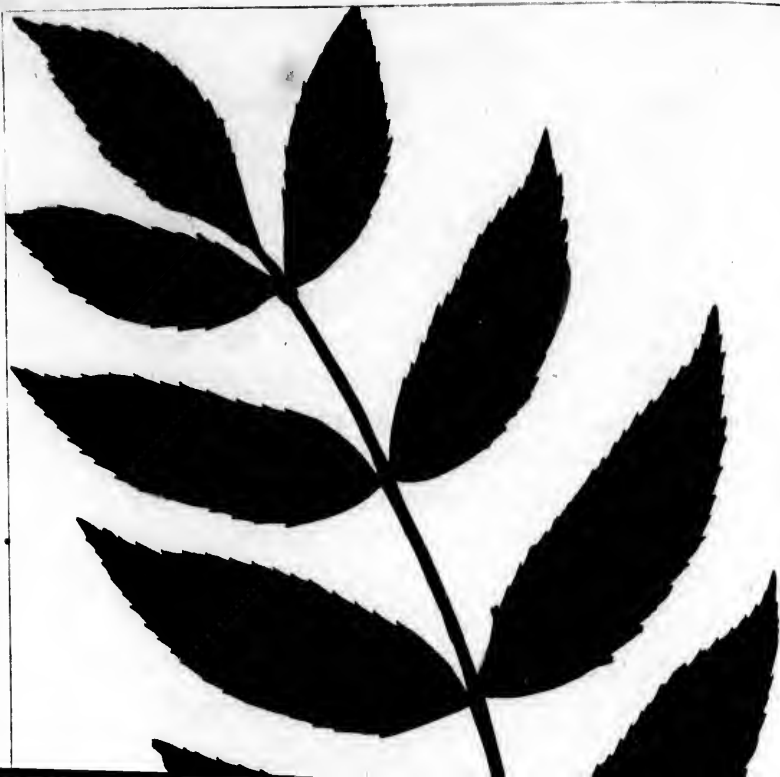
*A branch with leaves of half the natural size. Fig. 1, Seeds of the natural size.*

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D. C. P. 1898

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Common European Ash.

*Fraxinus excelsior.*

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## COMMON EUROPEAN ASH.

**FRAXINUS EXCELSIOR.** *F. foliis subsessilibus, lanceolato-oblongis, attenuatis, serratis; floribus nudis; seminibus apice emarginatis.*

THIS Ash is the most common and the most useful species of its genus upon the Old Continent. Like the Common Oak and the White Oak it is found throughout Europe and the North of Asia, and as it is less sensible to cold it would probably be more multiplied than the Oaks if it was not restricted to certain soils. It is found almost exclusively on the borders of rivers and swamps, and in places constantly cool and shaded, without being exposed to inundation; in a word, in situations analogous to those which, in the United States, produce the White Ash and the Red Ash.

The Common Ash is ranked among trees of the first order. It is sometimes 90 feet high and 9 or 10 feet in circumference; but when 60 or 70 feet in height it is in perfection for all the uses to which it is applied. The trunk is straight and well-proportioned; the branches are opposite, covered, while young, with a smooth, greenish bark, and garnished with short, round buds, nearly black like those of the Black Ash. The leaves, which consist of 4 or 5 pair of leaflets with an odd one, are opposite like the branches, of a dark green colour, smooth, acuminate and slightly toothed. The flowers



are not conspicuous and are united in bunches : barren, fertile and hermaphrodite flowers are found upon the same tree. The seeds are of a lanceolate oval shape, and terminated by a flat wing which is usually notched at the end : they are ripe towards the beginning of autumn.

In the properties and uses of its wood the European Ash resembles the White Ash of America. In France handsome articles of furniture are made with the pieces immediately below the first ramification, and with the knobs from the trunk of old trees, which exhibit more varied and more agreeable accidents in the direction of the fibres. The Common Ash is subject to be worm-eaten, and is rarely employed in building houses. It burns better than any other wood before it is seasoned, and affords excellent coal.

In the Department of the Cantal, and in some other parts of France, the branches of the Ash are given both dry and green to sheep and cows, without imparting a disagreeable taste to the milk and butter.

Spanish flies are very fond of the leaves of this tree, upon which they sometimes swarm in such numbers as to diffuse an offensive odour.

The ancients, as we are informed by Pliny, believed that serpents had an antipathy to the Ash, and that they never approached it ; this prejudice, which is still entertained, has given rise to the belief that a decoction of its roots or leaves in milk is an antidote for the poison of reptiles.

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The general utility of its wood causes great attention to be bestowed, in every part of Europe, upon the propagation of the Ash. For this purpose, nurseries are formed from the seed, and the young plants, at the age of 2 or 3 years, are set out wherever the soil is cool and moist enough for their reception: they are capable of succeeding on uplands which are not too dry and sandy, or composed in too great a proportion of clay.

There are several varieties of the European Ash, the most remarkable of which is the drooping Ash: its branches decline towards the earth, and the effect is peculiarly picturesque in solitary trees which have been formed by grafting this variety upon the Common Ash.

Many medicinal properties have been ascribed to the Ash, and more accurate observations lead me to believe that if these virtues exist they can reside only in the inner bark, which is bitter and astringent.

The White Ash and the Blue Ash of the United States are superior to the Common European Ash in the very properties for which this species is most esteemed; there is no motive, therefore, for introducing it into the American woods: that it would flourish there is evinced by a beautiful example in the garden of Mr. W. Bartram in the vicinity of Philadelphia.

## PLATE CXXI.

*A leaf of half the natural size. Fig. 1, Seeds of the natural size.*

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## BLACK ASH.

**FRAXINUS SAMBUCIFOLIA.** *F. foliolis sessilibus, acuminatis, serratis; ramis punctatis.*

IN the extensive country comprising the Northern Section of the United States and the provinces of New Brunswick and Nova Scotia the White Ash and the Black Ash, which is sometimes called Water Ash, are the most abundant in the forests and the most perfectly known to the inhabitants.

The Black Ash is 60 or 70 feet in height and about 2 feet in diameter. It requires a moister soil exposed to longer inundations than the White Ash, and is usually accompanied by the Red-flowering Maple, the Yellow Birch, the Black Spruce and the Arbor Vitæ; in the Middle States it associates of preference with the Red-flowering Maple and the Red Ash.

The buds of the Black Ash are of a deep blue, and the young shoots of a bright green sprinkled with dots of the same colour which disappear as the season advances. The leaves at their unfolding are accompanied by stipulæ which fall after two or three weeks: they are 12 or 15 inches long when fully developed, and composed of 3 or 4 pairs of leaflets with an odd one. The leaflets are sessile, oval-acuminate, denticulated, of a deep green colour, smooth on the upper surface, and

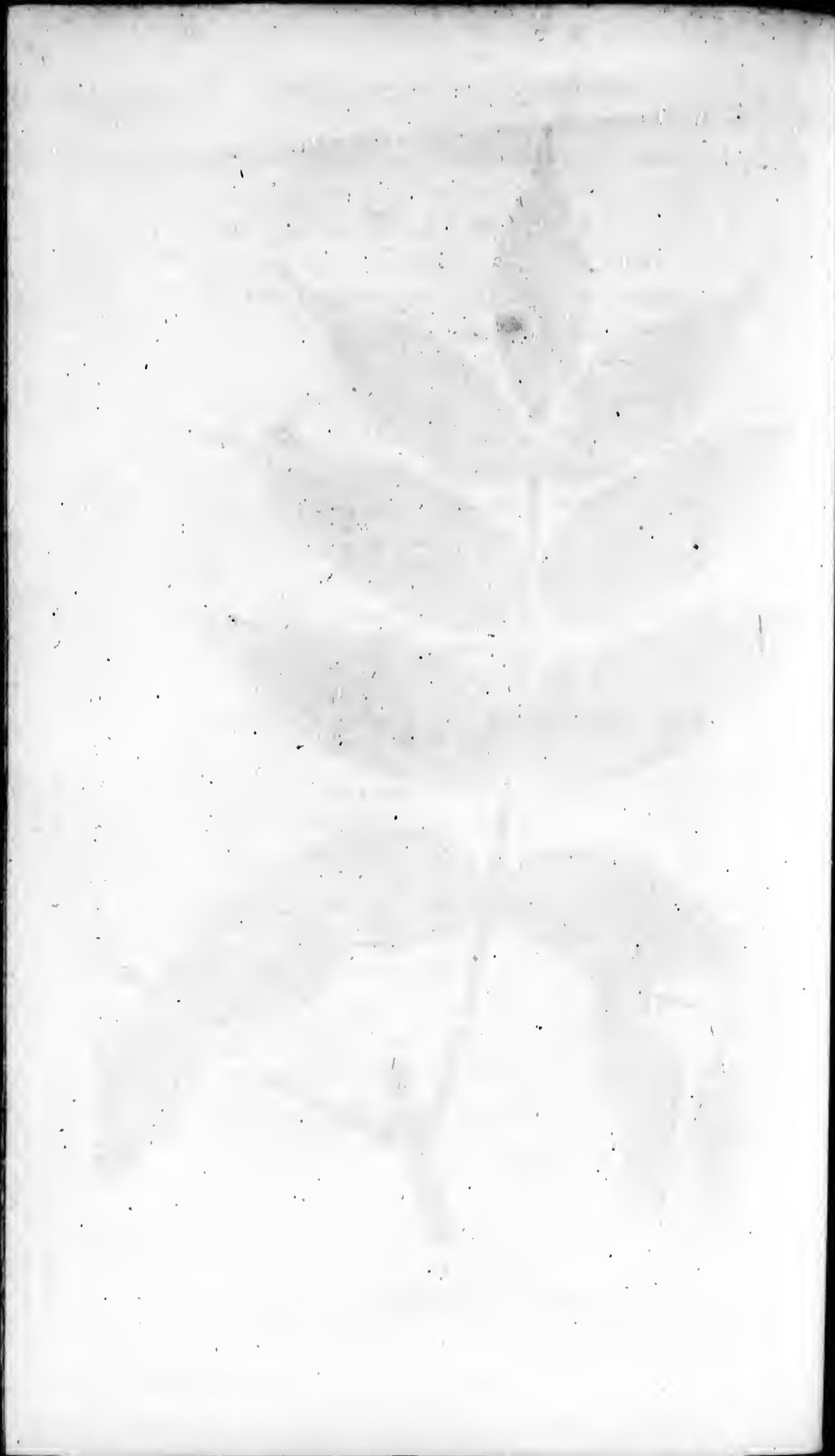


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Black Ash.

*Fraxinus sambucifolia* ?



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coated with red down upon the main ribs beneath : when bruised they emit an odour like that of Elder leaves. The seeds, which are disposed in bunches 4 or 5 inches long, are flat, and, like those of the Blue Ash, are nearly as broad at the base as at the summit.

The Black Ash is easily distinguished from the White Ash by its bark, which is of a duller hue, less deeply furrowed, and has the layers of the epidermis applied in broad sheets. The perfect wood is of a brown complexion and fine texture; it is tougher and more elastic than that of the White Ash, but less durable when exposed to the vicissitudes of dryness and moisture, and for this reason it is less extensively used. Coach-makers do not employ it, and it is never wrought into oars, hand-spikes and pullies. In the District of Maine it is preferred to the White Ash for hoops, which are made of saplings from 6 to 10 feet in length split in the middle. As this wood may be separated into thin, narrow strips, it is selected in the country for chair-bottoms and riddles.

The Black Ash is more liable than any other species to be disfigured with knobs, which are sometimes of considerable size and are detached from the body of the tree to make bowls. The wood of these excrescences has the advantage of superior solidity, and, when carefully polished exhibits singular undulations of the fibre; divided into thin layers it might be employed to embellish mahogany.

In Vermont and New Hampshire, which furnish great quantities of potash, I have been informed that the ashes of this tree are singularly rich in alkali.

Such are the principal uses of the Black Ash, from which a general idea may be formed of its properties. It deserves a place in the forests of the North of Europe, and by employing its wood we shall learn to estimate its value with greater precision.

*Observation.* Another lofty species of Ash exists in Kentucky which is also called Black Ash; but I am too imperfectly acquainted with it to attempt a description.

#### PLATE CXXII.

*A branch with leaves of half the natural size. Fig. 1, Seeds of the natural size.*

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Blue Ash.

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## BLUE ASH.

**FRAXINUS QUADRANGULATA.** *F. ramulis quadrangulatis, foliis ad summum 4-jugis, subsessilibus, ovali-lanceolatis, arguè serratis, subtus pubescentibus, capsulis utrinquè obtusis.*

THE Blue Ash is unknown to the Atlantic parts of the United States, and is found only in Tennessee, Kentucky and the Southern part of Ohio. The climate of these countries is mild, and the soil in some places is so fertile that it is difficult, without having witnessed them, to form an idea of the luxuriance of vegetation and the productiveness of agriculture. The richness of the soil proves a substitute for that degree of moisture which, in the Atlantic States, seems indispensable to the Ash. In Kentucky and West Tennessee the forests upon dry and uneven lands, at a distance from the rivers, are composed of the Walnuts, the Red Maple, the Moose Wood, the Hackberry, the American Nettle and the Oaks, several species of which, east of the mountains, grow only in the most humid soils.

The Blue Ash frequently exceeds 60 or 70 feet in height and 18 or 20 inches in diameter. Its leaves are from 12 to 18 inches long, and are composed of 2, 3 or 4 pair of leaflets with an odd one. The leaflets are large, smooth, oval-acuminate, distinctly toothed and sup-

ported by short petioles. The young shoots to which the leaves are attached are distinguished by four opposite membranes, 3 or 4 lines broad and of a greenish colour, extending through their whole length: this character disappears the third or fourth year, leaving only the traces of its existence. The seeds are flat from one extremity to the other, and a little narrowed towards the base.

The wood of the Blue Ash possesses the characteristic properties of the genus, and of all the species of the Western States it is the most extensively employed and the most highly esteemed. Besides the habitual use that is made of it for the frame of carriages and for the felloes of wheels, it is generally selected for the flooring of houses, frequently for the exterior covering, and sometimes for the shingles of the roof; but for the last purpose the Tulip Tree is preferred. I have been told that a blue colour is extracted from the inner bark of this tree; but I have never seen it employed, and do not know by what process it is obtained. Milk in which the leaves have been boiled is said to be an unfailing remedy for the bite of the rattle-snake; we may be allowed however to doubt its efficacy till it is attested by enlightened physicians.

My father first described the Blue Ash in his *Flora Boreali-Americana*, and from the seeds which he sent home have sprung the beautiful stocks that are now growing in Europe: but they are still too young to yield

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fruit, and are propagated by grafting upon the Common Ash.

The various uses to which the wood of the Blue Ash is appropriated in America, should induce the Europeans to multiply it in their forests, till they are enabled to appreciate its comparative value.

## PLATE CXXIII.

*A branch with leaves of half the natural size. Fig. 1, Seeds of the natural size.*



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## CAROLINIAN ASH.

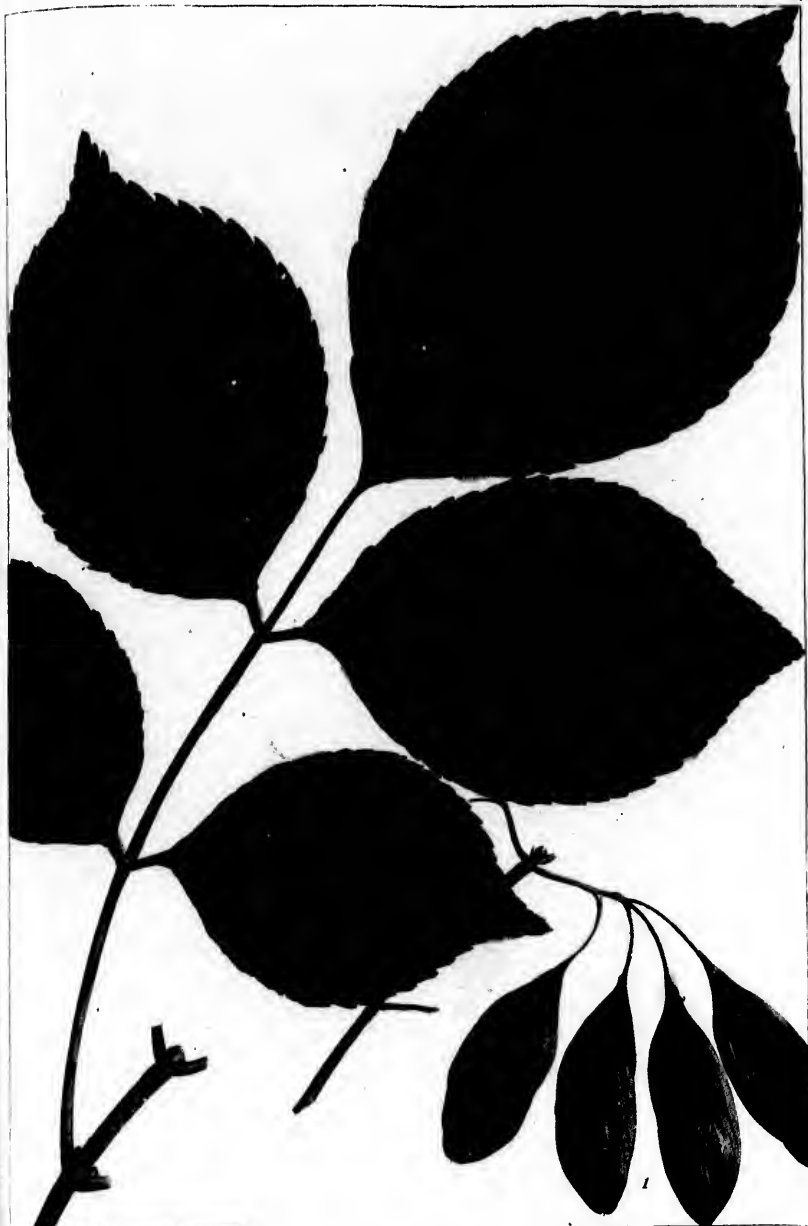
**FRAXINUS PLATICARPA.** *F. foliis petiolatis, ovalibus, serratis; capsulis lato lanceolatis.*

THIS species of Ash, which is very distinctly characterised by the form of its leaves and seeds, is confined to the Southern States. It abounds particularly on the river Cape Fear in North Carolina, and upon the Ashley and the Cooper in South Carolina. As it has received no specific name from the inhabitants, I have given it that of Carolinian Ash.

The marshy borders of creeks and rivers, and all places exposed to long inundations, are congenial to this Ash, which delights in more abundant moisture than the other species. Its vegetation is beautiful, but its stature rarely exceeds 30 feet, and it fructifies at half this height. In the spring the lower side of the leaves and young shoots is covered with thick down, which disappears at the approach of summer. The leaves commonly consist of two pair of leaflets with a terminal odd one. The leaflets are large, nearly round, petiolated and distinctly toothed. The flowers, as in the other species, are small and not very conspicuous; the seeds, unlike those of any Ash with which we are acquainted, are flat, oval, and broader than they are long.

From its inferior dimensions the Carolinian Ash is





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Carolinian Ash.  
*Fraxinus platycarpa.*

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totally neglected; but accurate experiments on the nature of different species of wood in America will perhaps evince that this tree, as well as others that are regarded as worthless, possesses properties of eminent utility.

## PLATE CXXIV.

*A branch of half the natural size. Fig. 1, Seeds of the natural size.*



## BLACK WILLOW.

Amentacem. Juss.

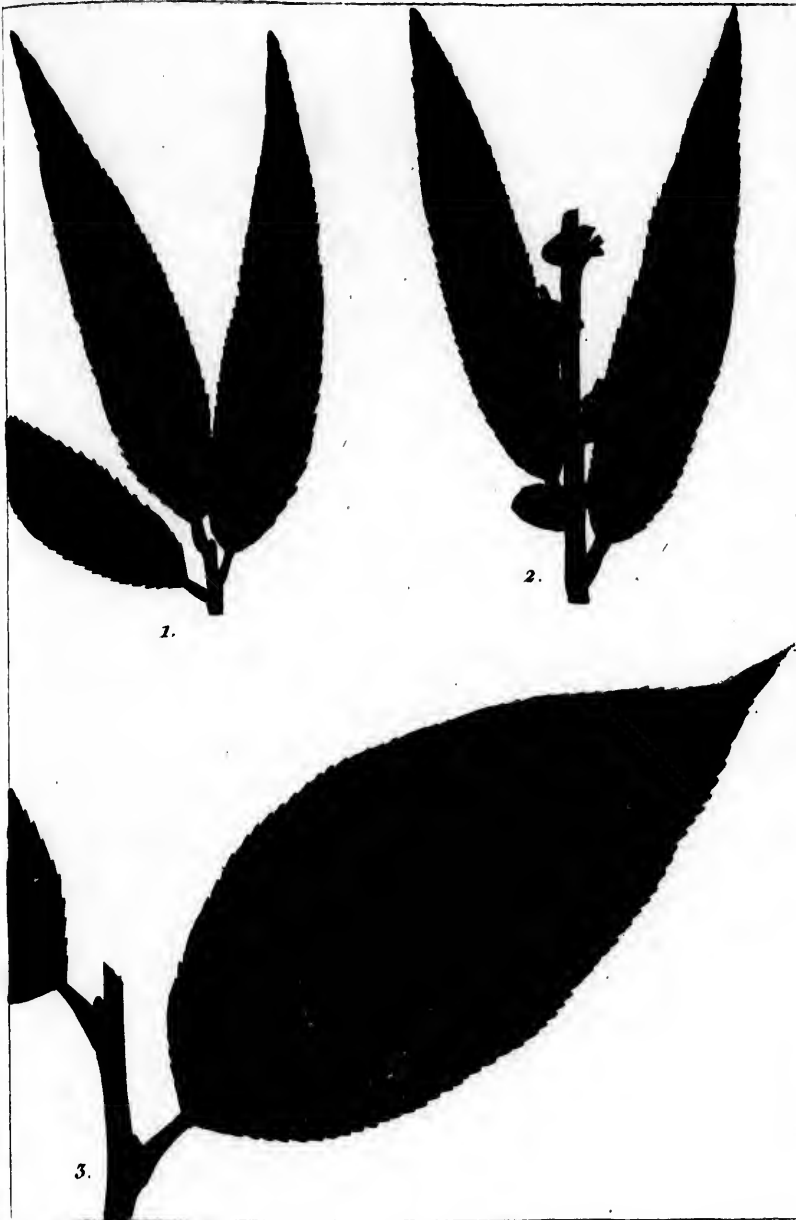
**SALIX NIGRA.** *S. foliis lanceolatis, acuminatis, serratis, glabris; petiolis pubescentibus.*

THIS species is the most common of the American Willows, and the most analogous to that of Europe. It is less multiplied in the Northern and Southern than in the Middle and especially in the Western States. It is found on the banks of the great rivers, such as the Susquehannah and the Ohio, and is called Black Willow, or simply Willow.

The Black Willow is rarely more than 30 or 35 feet high and 12 or 15 inches in diameter. It divides at a small height into several divergent but not pendant limbs, and forms a spacious summit. The leaves are long, narrow, finely denticulated, of a light green, and destitute of stipulæ. In the uniformity of its colouring the foliage of this species differs from that of the European Willow, the lower surface of which is glaucous.

Upon the trunk the bark is greyish and finely chapt; upon the roots it is of a dark brown, whence may have been derived the specific name of the tree. The roots afford an intensely bitter decoction, which is considered in the country as a purifier of the blood, and as a preventive and a remedy for intermittent fevers.





1. Black Willow.  
*Salix nigra.*

2. Champlain Willow.  
*Salix ligustrina.*

3. Shining Willow.  
*Salix lucida.*

*A. Bolander del.*

*Edwin Long sculp.*

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*Fig*

**BLACK WILLOW.**

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The wood is white and soft, and the branches are easily broken from the tree. Neither the wood nor the twigs are applied to any useful purpose.

**PLATE CXXV.**

*Fig. 1, Leaves of the natural size.*



## CHAMPLAIN WILLOW.

*SALIX LIGUSTRINA. S. foliis lanceolato-linearibus, acuminatis, serratis; stipulis inæqualiter cordatis; petiolis villosis.*

I HAVE found this Willow on the shores of Lake Champlain, particularly near the village of Skeensborough. It is about 25 feet high and 7 or 8 inches in diameter: its first aspect resembles that of the Black Willow, but its leaves are longer, narrower, and accompanied at the base by cordiform, serrate stipulæ. Its wood and branches are appropriated to no use.

### PLATE CXXV.

*Fig. 2, Leaves of the natural size.*



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## SHINING WILLOW.

*SALIX LUCIDA. S. foliis oblongis, cuspidato-acuminatis, nitidis; argutè serratis; serraturis glandulosis.*

I HAVE observed the Shining Willow, which is so called by some persons on account of the brilliancy of its foliage, only in the Northern and Middle States. It is found in moist but open grounds, and is more common on the edges of the salt meadows than in the interior of the forests; it is also seen on the islands, not covered with woods, in the rivers and near the shores of the lakes.

This species is easily distinguished by the superior size of its leaves, which are oval-acuminate, denticulated, and sometimes 4 inches in length.


The Shining Willow attains the height of 18 or 20 feet; but its ordinary elevation is 9 or 10 feet. Baskets are made of its branches, when those of the European Willow, which are preferable, cannot be obtained; but it possesses no property that recommends it to attention.

*Observation.* Many species of Willow are found in the United States and in Canada, the greater part of which are susceptible of no useful employment. The three species which I have described are distinguished only by their superior height; but even these are greatly inferior

to the European Willow in size and in the properties of their wood. In the Northern and Middle States, particularly in Pennsylvania and in some townships in the lower part of New Jersey, great numbers of the European Willow have been planted, of which light baskets are fabricated for the market of Philadelphia. This tree furnishes the charcoal for the manufacture of gunpowder.

## PLATE CXXV.

*Fig. 3, A leaf of the natural size.*



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White Elm.  
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## WHITE ELM.

*Pentendria digynia*. Linn.

Amentaceæ, Jusq.

**ULMUS AMERICANA.** *U. ramis lævibus, pendulis; foliis subuniformiter serratis; floribus manifestè pedicellatis; fructibus densissimo fimbriatis.*

THIS tree, which is known throughout the United States by the name of White Elm, is found over an extensive tract of the North-American Continent. Towards the North, my father indicates its first appearance in about the latitude of  $48^{\circ} 20'$ , 18 miles from the mouth of the river Mistassin, which empties into lake St. John in Canada. I have myself observed it from Nova Scotia to the extremity of Georgia, a distance of 1200 miles. It abounds in all the Western States, and I have learned that it is common in the neighbourhood of the great rivers that water Upper Louisiana and discharge themselves into the Mississippi. But it appeared to be the most multiplied and of the loftiest height between the 42nd and 46th degrees of latitude, which comprise the provinces of Lower Canada, New Brunswick and Nova Scotia, the North-Eastern *Section* of the United States, and Genessee in the State of New York.

The leaves of the White Elm are 4 or 5 inches long, borne by short petioles, alternate, unequal at the base, oval-acuminate and doubly denticulated. They are gene-



rally smaller than those of the Red Elm, of a thinner texture and a smoother surface, with more regular and prominent ribs.

This species differs, also, essentially from the Red Elm and the European Elm in its flowers and seeds: the flowers appear before the leaves, and are very small, of a purple colour, supported by short, slender footstalks, and united in bunches at the extremity of the branches. The seeds are contained in a flat, oval, fringed capsule, notched at the base: the season of their maturity is from the 15th of May to the first of June.

The White Elm delights in low, humid, substantial soils, such as in the Northern States are called *interval lands*. In the Middle States it grows in similar situations, and on the borders of swamps, where it is usually accompanied by the White Oak, the Sweet Gum, the Tupelo, the Red Maple and the Shag-bark Hickory. West of the mountains it abounds in all the fertile bottoms watered by the great rivers that swell the Ohio and the Mississippi; I have constantly observed it on their brink with the White Maple and the Buttonwood, where its base is inundated at the rising of the waters in the spring. On the banks of these rivers it is sometimes 4 feet in diameter. In the Middle States it stretches to a great height, but does not approach the magnificence of vegetation which it displays in the countries peculiarly adapted to its growth. In clearing the primitive forests a few stocks are sometimes left stand-

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ing; insulated in this manner it appears in all its majesty, towering to the height of 80 or 100 feet, with a trunk 4 or 5 feet in diameter, regularly shaped, naked, and insensibly diminishing to the height of 60 or 70 feet, where it divides itself into two or three primary limbs. The limbs, not widely divergent near the base; approach and cross each other 8 or 10 feet higher, and diffuse on all sides long, flexible, pendulous branches, bending into regular arches and floating lightly in the air. A singularity is observed in this tree which I have witnessed in no other; two small limbs 4 or 5 feet long grow in a reversed position near the first ramification, and descend along the trunk.

The Buttonwood astonishes the eye by the size of its trunk and the amplitude of its head; but the White Elm has a more majestic appearance, which is owing to its great elevation, to the disposition of its principal limbs, and to the extreme elegance of its summit. In New Hampshire, between Portsmouth and Portland, a great number of young White Elms are seen detached in the middle of the pastures; they ramify at the height of 8, 10 or 12 feet, and their limbs springing at the same point cross each other and rise with an uniform inclination, so as to form of the summit a sheaf of regular proportions and admirable beauty.

The trunk of this Elm is covered with a white, tender bark very deeply furrowed. The wood, like that of the Common European Elm, is of a dark brown, and,

cut transversely or obliquely to the longitudinal fibres; it exhibits the same numerous and fine undulations; but it splits more easily, and has less compactness; hardness and strength. This opinion was given me by several English wheel-wrights established in the United States, and I have since proved its correctness by a comparison of the two species. The White Elm is used, however, at New York and farther north for the naves of coach-wheels, because it is difficult to procure the Black Gum, which at Philadelphia is preferred for this purpose. It is not admitted into the construction of houses or of vessels, except occasionally in the District of Maine for keels, for which it is adapted only by its size. Its bark is said to be easily detached during eight months of the year; soaked in water and suppled by pounding, it is used in the Northern States for the bottoms of common chairs.

Such are the few and unimportant uses of the White Elm in the United States; it is far inferior to the European Elm, which is a tree of very extensive utility, and it deserves attention in the Old World only as the most magnificent vegetable of the temperate zone.

PLATE CXXVI.

*A branch with leaves of the natural size. Fig. 1, Flowers.  
Fig. 2, Seeds.*

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## WAHOO.

*Ulmus pumila.* WALTER.

**ULMUS ALATA.** *U. ramis passim ex utroque latere in alam suberosam corticalem dilatatis; foliis oblongo-ovalibus, sensim acutis, basi subæqualibus; fructu pubescente et confertius cilioso.*

THE Wahoo is a stranger to the Northern and Middle States, and to the mountainous regions of the Alleghanies; it is found only in the lower part of Virginia, in the maritime districts of the Carolinas and Georgia, in West Tennessee and in some parts of Kentucky. Probably it grows also in the two Floridas and in Lower Louisiana, of which the soil and climate are analogous to those of the maritime parts of the Southern States, and of which the vegetable productions, with some exceptions, are the same.

The name of Wahoo, given to this species of Elm in South Carolina and Georgia, is derived from the Indians; but I am ignorant of its meaning.

The Wahoo grows of preference on the banks of rivers and in the great swamps enclosed in the pine-barrens: it has always appeared to me to be less multiplied than the trees by which it is accompanied. It is of a middling stature, commonly not exceeding 30 feet, with a diameter of 9 or 10 inches; the two largest stocks that I have seen were at Wilmington, N. C.: they were



perhaps 40 or 45 feet high, 15 inches in diameter, and seemingly very old.

The flowers, like those of other Elms, open before the leaves. The seeds are fringed and differ from those of the White Elm only by a little inferiority of size. The leaves are borne by short petioles, and are oval, denticulated, and smaller than those of the White and Red Elms.

The branches are furnished throughout their whole length, on two opposite sides, with a fungous appendage, 2 or 3 lines wide, from which the name of *alata*, winged, has been given to the species.

The wood of the Wahoo is fine-grained, more compact, heavier, and, I believe, stronger than that of the White Elm. The heart is of a dull red approaching to chocolate-colour, and always bears a large proportion to the sap. At Charleston, S. C., and in some other towns of the Southern States, it is employed for the naves of coach-wheels, and is even preferred, for this object, to the Tupelo, as being harder and tougher; but it is appropriated to no other use.

For economical purposes this species is uninteresting to the Europeans, as the Common Elm is greatly superior in size and in the quality of its wood; these advantages should engage the Americans to introduce the European species into their forests.

#### PLATE CXXVII.

*A branch with leaves of the natural size. Fig. 1, Seeds of the natural size.*



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## RED ELM.

**ULMUS RUBRA:** *U. foliis plerumque ovalibus oblongis, rarius cordato-ovalibus, utrinque rugosis; gemmis sub explicacione densâ fulvâque lanâ tomentosis; floribus sessilibus.*

EXCEPT the maritime districts of the Carolinas and Georgia, this species of Elm is found in all parts of the United States and of Canada. It bears the names of Red Elm, Slippery Elm and Moose Elm, of which the first is the most common: the French of Canada and Upper Louisiana call it *Orme gras*.

The Red Elm, though not rare, is less common than the Oaks, the Maples, the Sweet Gum and the Sassafras; it is also less multiplied than the White Elm, and the two species are rarely found together, as the Red Elm requires a substantial soil free from moisture, and even delights in elevated and open situations, such as the steep banks of rivers, particularly of the Hudson and the Susquehannah. In Ohio, Kentucky and Tennessee it is more multiplied than east of the mountains, and with the Hickories, the Wild Cherry Tree, the Red Mulberry, the Sweet Locust, the Coffee Tree and some other species, it constitutes the growth upon the richest lands of an uneven surface.

This tree is 50 or 60 feet high and 15 or 20 inches in diameter. In the winter it is distinguished from the

White Elm by its buds, which are larger and rounder, and which, a fortnight before their developement, are covered with a russet down.

The flowers are aggregated at the extremity of the young shoots. The scales which surround the bunches of flowers are downy like the buds. The flowers and seeds differ from those of the preceding species; the calyx is downy and sessile, and the stamina are short and of a pale rose colour; the seeds are larger, destitute of fringe, round, and very similar to those of the European Elm; they are ripe towards the end of May. The leaves are oval-acuminate, doubly denticulated, and larger, thicker and rougher than those of the White Elm.

The bark upon the trunk is brown; the heart is coarser-grained and less compact than that of the White Elm, and of a dull red tinge. I have remarked that the wood, even in branches of 1 or 2 inches in diameter, consists principally of perfect wood. This species is stronger, more durable when exposed to the weather, and of a better quality than the White Elm; hence in the Western States it is employed with greater advantage in the construction of houses, and sometimes of vessels on the banks of the Ohio. It is the best wood of the United States for blocks, and its scarceness in the Atlantic States is the only cause of its limited consumption in the ports. It makes excellent rails, which are of long duration and are formed with little labour, as the trunk

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divides itself easily and regularly : this is probably the reason that it is never employed for the naves of wheels.

The Red Elm bears a strong likeness to a species or a variety in Europe known by the name of Dutch Elm. The leaves and the bark of the branches, macerated in water, yield, like those of the Dutch Elm, a thick and abundant mucilage, which is used for a refreshing drink in colds, and for emollient plasters in place of the marsh mallow root, which does not grow in the United States.

Though the Red Elm is superior to the White Elm, it is not equal to our European species, and its culture cannot be generally recommended.

*Observation.* In the District of Maine and on the banks of Lake Champlain I have found another Elm which I judged to be a distinct species. Its leaves were oval-acuminate, rough and deeply toothed, but I have not seen its flowers or its seeds. The length of its young shoots announced a vigorous vegetation. It is confounded in use with the White Elm, to which it is perhaps superior; it is found in the nurseries of France, and, probably, it came originally from Canada.

#### PLATE CXXVIII.

*A branch with leaves and seeds of the natural size.*

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## COMMON EUROPEAN ELM.

**ULMUS CAMPESTRIS.** *U. foliis duplicato-serratis, basi inæqualibus; floribus subsessilibus, conglomeratis, pentandris; fructibus glabris.*

UPON the Old Continent one of the most useful trees in the mechanical arts is the Elm, which is indigenous to the centre of Europe and to the north of Asia. It was formerly most abundant in Germany, and the town of Ulm in Suabia is said to derive its name from the vast forests of Elm that existed in its vicinity.

This tree was cultivated by the Ancients, and highly esteemed for the excellence of its wood: it is frequently mentioned by Virgil, Pliny and Theophrastus.

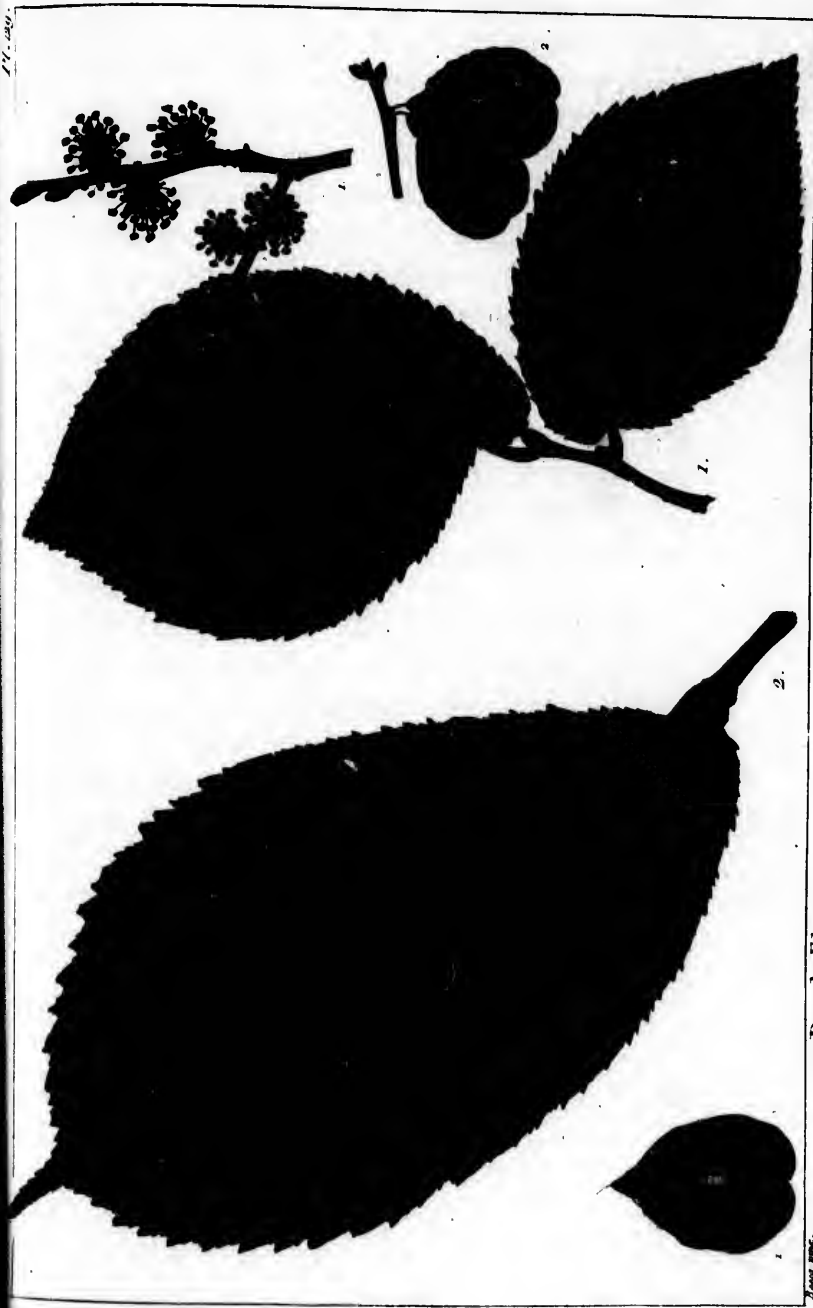
No forests consisting wholly of Elm are found in England, Germany, France or Italy; but the habitual use and superior fitness of its wood for certain valuable purposes, cause it to be propagated on private estates, by the sides of high-ways, and in the large forests which in different countries are kept on foot by the governments. Thus cultivated and artificially multiplied it has produced numerous varieties, like the fruit trees, which are distinguished principally by their foliage: in some of them the leaves are small, shining and coriaceous; in others, large, downy and supple. To this dif-

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English elm

1. Common European Elm.  
*Ulmus campestris*.

2. Dutch Elm.  
*Ulmus latifolia*.

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ference must be added that of the bark : upon a trunk 6 inches in diameter, in some varieties, the bark is smooth ; in others it is rough and scaly upon saplings less than two inches thick. Distinctions are also founded upon the rapidity of vegetation and the quality of the wood. Nursery-men assure us that new varieties are constantly appearing among the young plants reared from the seed ; hence it becomes impossible to compose invariable definitions, or to harmonize the confusion of botanical writers.

But all these varieties may be referred to two types, in which remarkable differences are found and constantly reproduced. One of these is the Common Elm, under which are ranged all the ordinary varieties ; the other is the Large-leaved or Dutch Elm.

The Common Elm is one of the tallest and finest trees of the temperate zone of Europe ; several stocks yet survive in France which were planted in the reign of Henry IV, about the year 1580, by the orders of Sully, and which are 25 or 30 feet in circumference and 80 or 90 feet high.

The leaves of the Common Elm are oblong, pointed, doubly serrate and unequal at the base. The flowers appear in the beginning of March, about three weeks before the leaves ; they are small, reddish, not conspicuous, and are united in clusters on the shoots of the preceding year ; they are succeeded by oval, bordered capsules, containing a single flat, roundish seed, which

varies in size in different varieties, and is ripe towards the end of April.

The wood of the Elm has less strength than the Oak; and less elasticity than the Ash; but it is tougher and less liable to split. In France it is usually employed for mounting artillery, and for this purpose it is selected with the greatest care. The trees are cut according to the use to which they are destined, and the pieces are stored under shelter to dry during six or seven years; the precaution is even observed of turning them every six months, that the seasoning may proceed more uniformly. Thus perfected the wood is used for the carriages of cannon, and for the gunwale, the blocks, etc., of ships. It is every where preferred by wheel-wrights for the naves and felloes of wheels and for other objects.

The quality of this wood depends in a singular degree on the situation in which it grows: high ground and a strong soil are necessary to its perfection; and when planted in such a soil on the side of roads or on the ramparts of fortified towns, where it is vexed by the winds and exposed to all the influences of the seasons, it is still firmer and more solid.

The knobs which grow upon old trunks are divided into thin plates by cabinet-makers, and when polished they exhibit very diversified accidents in the arrangement of the fibre, and form beautiful articles of furniture.

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wood is an excellent combustible, and in some countries the leaves are given for food to sheep and larger cattle.

In fertile and humid soils the Elm is subject to a species of ulceration which appears on the body of the tree at the height of 3 or 4 feet, and which discharges a great quantity of sap. The disease penetrates gradually into the interior of the tree and corrupts its substance. Many attempts have been made to cure it in the beginning or to arrest its progress, but hitherto without success: the best treatment is to pierce the tree to the depth of 2 or 3 inches with an auger, in the very heart of the malady, which is declared by the flowing of the sap.

The English writers on forest trees, Evelyn, Miller, Marshall, etc., mention twenty varieties of the Elm, seven of which are particularly remarkable and may serve as types of the rest; these are the true English Elm, the narrow-leaved Cornish Elm, the Dutch Elm, the black Worcestershire Elm, the narrow-leaved Witch Elm, the broad-leaved Witch Elm, and the upright Witch Elm. On the Continent we possess these principal varieties and those that are referred to them; but we consider the Dutch Elm as a distinct species, not derived, like the others, from the Common Elm.

In England the true English Elm is recognized as the best wood; and to avoid mistake, in forming plantations, grafted stocks are procured from the nurseries;

for neither the foliage nor the wood offers any peculiar appearance by which it may be certainly distinguished.

In the description of the *Tupelo* particular mention has been made of a precious variety of the Common Elm, the *Twisted Elm*, omitted by the German and English writers, which is propagated in the Departments about Paris, in that of the North, and in Belgium.

It is an object of importance to multiply this invaluable variety, which can be done only by grafting or by transplanting suckers. It is reared with the greatest care at Meaux and Meudes, a few leagues from Paris, and thence it is procured with the greatest certainty.

The Curled Maples, till they are 7 or 8 inches in diameter, exhibit no undulations of the fibre, and a similar fact is observed in the *Twisted Elm*; the fibres do not assume the spiral direction till the trunk is 9 or 10 inches thick. In comparing attentively young *Twisted Elms* less than 8 inches in diameter with other varieties planted at the same time in the same soil, the only difference I observed was that the vegetation of the *Twisted Elm* was more vigorous, its foliage of a lighter green, and its bark perfectly smooth, while that of the other stocks, even when only 2 inches in diameter, was thick and chapt.

In France, Belgium, and some parts of Germany, many of the high-ways, as well as the public walks in the neighbourhood of large towns, are planted with the Elm, which, besides the value of its wood, has a tufted

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foliage, and suffers the pruning-hook without injury. The trees destined for this purpose are reared in nurseries, and when about 2 inches in diameter are set out, in the autumn, at the distance of 24 feet. During the first years the ground is kept loose, that the rain may penetrate more easily to their roots.

The seeds are sown soon after they are gathered, in a loose and kindly soil; a part of them come up the same year, and a part the following spring. The second year the young stocks are transplanted to another spot, well tilled like the first, and placed at the distance of 18 inches. To produce a straight and regular trunk they should be annually pruned. The sixth year they may be removed and permanently fixed.

## PLATE CXXIX.

*Plate 1, Leaves of the natural size. Fig. 1, Flowers of the natural size. Fig. 2, Seeds of the natural size.*

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## DUTCH ELM.

ULMUS SUBEROSA. *U. foliis duplicato-serratis, rugosis; floribus subsessilibus, conglomeratis, tetrandris; fructibus glabris; cortice ramulorum suberoso-alato.*

THIS species is easily distinguished from the Common European Elm by its leaves, which are larger, thicker, rugged on both surfaces, and borne by short petioles. The flowers, also, are of a lighter tint and the seeds are larger. In the winter, when stripped of its foliage, the Dutch Elm is recognized by its round buds, and by the thickness of its shoots of the preceding year:

The bark of its young branches, as in the Red Elm, is full of mucilage, which, 30 years ago, was celebrated in cutaneous affections. It was preserved and given in decoction, in doses of 2 ounces, steeped in a quart of river water reduced by boiling to a pint. This practice was long prevalent; but, notwithstanding some authentic attestations of its success, it has fallen into disuse.

The Dutch Elm so nearly resembles the Red Elm of the United States in its flowers, foliage and fruit, that it is not always easy to distinguish them: the most striking difference is in the buds; those of the Red Elm are covered in the spring with a thick, reddish down; those of the Dutch Elm, on the contrary, are smooth, or, at

most, are lightly powdered on the edges of the scales. This European species attains a very lofty height and a considerable diameter. Its wood is softer than that of the Common Elm; but the writers on forest trees speak variously of its qualities, and I have consulted wheelwrights without obtaining satisfactory information; on the most favourable supposition, it is greatly inferior to the Twisted Elm.

## PLATE CXXIX.

*Plate 2, A branch with a leaf of the natural size. Fig. 1, A seed of the natural size.*

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## PLANER TREE.

**PLANERA ULMIFOLIA.** *P. foliis petiolatis, oblongo-ovalibus, sensim angustatis, acutis, basi obtusis, æqualiter serratis; capsulâ scabrâ.*

KENTUCKY, Tennessee, the banks of the Mississippi and the Southern States are the only parts of the American Republic where my father and myself have found the Planer Tree. Its wood is not used, and probably for this reason the tree has attracted no attention from the inhabitants, and has received no distinctive denomination; to supply the deficiency, I have adopted the botanical name.

I have more particularly observed the Planer Tree in the large swamps on the borders of the river Savannah in Georgia. It is a tree of the second order, and is rarely more than 35 or 40 feet high and 12 or 15 inches in diameter. Its bloom is early and not conspicuous. Its minute seeds are contained in small, oval, inflated, uneven capsules. The leaves are about an inch and a half long, oval-acuminate, denticulated, of a lively green and a little like those of the European Elm, to which this species bears the greatest analogy.

The wood of the Planer Tree is hard, strong, and seemingly proper for various uses; it is probably similar





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Planer Tree.  
*Planera Unifolia.*

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in its characters to the analogous species in the north of Asia, the *Siberian Elm*; but, as I have already remarked, the tree is rare and the wood is neglected.

## PLATE CXXX.

*A branch with leaves and seeds. Fig. 1, A small shoot with male flowers.*



## AMERICAN LIME, OR BASS WOOD.

*Polyandria monogynia.* LINN.

*Tiliaceæ.* Juss.

*TILIA AMERICANA.* *T. foliis suborbiculato-cordatis, abruptè acuminatis, argutè serratis, glabris; petalis apice truncatis; nucè ovatâ.*

AMONG the Lime Trees of North America east of the Mississippi, this species is the most multiplied. It exists in Canada, but is more common in the northern parts of the United States, where it is usually called Bass Wood; it becomes less frequent towards the South, and in Virginia, the Carolinas and Georgia, it is found only on the Alleghany Mountains.

I have found this species of Lime Tree most abundant in Genessee, which borders on lake Erie and lake Ontario. In some districts, particularly between Batavia and New Amsterdam, it frequently constitutes two thirds, and sometimes the whole, of the forests. The Sugar Maple, the White Elm and the White Oak are the trees with which it most frequently associates.

In newly cleared lands the remains of the Lime Trees are distinguished by the numerous sprouts which cover the stumps and the large roots, whose growth can be prevented only by stripping off the bark or by the operation of fire. The stumps of other large trees, the

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Elm, the Sugar Maple and the Ash, left at the same height of 3 feet, do not produce shoots.

The presence of the Lime Tree indicates a loose, deep and fertile soil. It is sometimes more than 80 feet high and 4 feet in diameter, and its straight, uniform trunk, crowned with an ample and tufted summit, forms a beautiful tree. The leaves are alternate, large, nearly round, finely denticulated, heart-shaped at the base, and abruptly terminated in a point at the summit. The flowers are borne by long peduncles, pendulous, subdivided at the extremity, and garnished with a long, narrow, floral leaf. The seeds, which are ripe about the first of October, are round and of a grey colour. The flowers of the American Lime Tree are probably endowed with the same antispasmodic and cephalic properties which are ascribed to those of the European species.

The trunk is covered with a very thick bark; the cellular integument, separated from the epidermis and macerated in water, is formed into ropes, which are used only in the country; in Europe they are sold for certain purposes in the cities, particularly for well-cords.

The wood is white and tender: in the Northern States, where the Tulip Tree does not grow, it is used for the pannels of carriage-bodies and the seats of windsor-chairs; but as it is softer and splits more easily, it is less proper for these objects; it is in Boston and the more

northern towns that I have observed the Lime Tree beginning to be substituted for the Tulip Tree. On the Ohio the images affixed to the prow of vessels are made of this wood instead of the White Pine.

The American Lime Tree has long been cultivated in Europe, and it is distinguished from our native species by the superior size of its leaves:

PLATE CXXXI.

*A branch with leaves diminished one half, and with flowers of the natural size.*

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White Lime.  
*Tilia Alba.*

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## WHITE LIME.

*TILIA ALBA. T. foliis majoribus, ovatis, argutè serratis; basi obliquè aut æqualiter truncatis; subtùs incanis.*

I HAVE not met with the White Lime Tree east of the river Delaware, but it is abundant in Pennsylvania, Maryland, Delaware and the Western States. It does not grow, like the preceding species, in elevated places nor amidst other trees in the forests, and is rarely seen except on the banks of rivers; I have particularly observed it on those of the Susquehannah, the Ohio, and the streams which empty into them.

The height of the White Lime Tree rarely exceeds 40 feet, and its diameter 12 or 18 inches. Its young branches are covered with a smooth, silver-grey bark, by which it is recognized in the winter. The leaves are very large, denticulated, obliquely heart-shaped and pointed, of a dark green on the upper surface and white beneath, with small reddish tufts on the angles of the principal nerves. This whitish tint is most striking on solitary trees exposed to the sun.

The flowers come out in June, and, as well as the floral leaf, are larger than those of any other Lime Tree with which I am acquainted. The petals are larger and whiter, and are impregnated with an agreeable odour. The seeds are round, or rather oval, and downy.

The wood of this tree is white and tender, and I believe it is never employed in the arts.

This and the following species have received no popular specific names, but are both called Lime Tree and Bass Wood : that of White Lime, which I have given to the subject of the present article on account of the colour of its foliage, is peculiarly appropriate.

PLATE CXXXII.

*A branch with leaves and flowers of the natural size.*  
*Fig. 1, Seeds.*

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Downy lime tree.  
*Tilia pubescens.*

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## DOWNY LIME TREE.

**TILIA PUBESCENS.** *T. foliis basi truncatis, obliquis, denticulato-serratis, subtus pubescentibus; petalis emarginatis, nucis globosæ.*

THE Downy Lime Tree belongs to the southern parts of the United States and to the Floridas. It grows of preference on the borders of rivers and large marshes, where the soil is cool and fertile, but not exposed to inundation. It is little multiplied, and consequently is not taken notice of by the inhabitants; for this reason; and because it is the only species of its kind in the maritime parts of the Carolinas and of Georgia, it has received no specific denomination, and is called simply Lime Tree, to which I have added the epithet *downy*, derived from a character of its foliage not observed in the preceding species.

This tree is 40 or 50 feet in height with a proportional diameter. In its general appearance it resembles the American Lime Tree, which grows farther north, more than the White Lime Tree, which belongs to the Middle and Western States. Its leaves differ widely in size according to the exposure in which they have grown; in dry and open places they are only 2 inches in diameter, and are twice as large in cool and shaded situations. They are rounded, pointed at the summit,

very obliquely truncated at the base, edged with fewer and more remote teeth than those of the other Lime Trees, and very downy beneath. The flowers, also, are more numerous and form larger bunches, and the seeds are round and downy.

The wood is very similar to that of the other species, and I do not know that it is ever employed.

This tree was introduced long since into France; its vegetation is vigorous and is uninjured by the severest winters of Paris, which leads me to believe that it exists in upper Louisiana and in the Western States.

PLATE CXXXIII.

*A branch with leaves and fruit of the natural size.*



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## PINES.

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**THE Pines** are evergreen trees, and are usually of elevated stature. They form a most interesting genus, and are highly valuable for the resinous matter which they afford, as well as for the excellent properties of their wood. The most striking difference between the Pine and the Spruce is in the arrangement of their foliage: the leaves of the Pines, which resemble pieces of coarse thread, vary in length in different species, and are united to the number of two, three or five in the same sheath; those of the Spruces, on the contrary, are only a few lines long, and are attached singly round the circumference of the branch or upon its opposite sides.

To facilitate the distinction of these trees, of which the species are more numerous in the United States than in Europe, I have grouped the Pines according to the roughness of their cones and to the number of leaves united in the same sheath, and the Spruces according to the disposition of their foliage.

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METHODICAL DISPOSITION  
OF THE PINES AND SPRUCES  
OF NORTH AMERICA,

INCLUDING THREE EUROPEAN SPECIES.

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*Monœcia monadelphia.* LINN. *Coniferæ.* JUSS.

TWO-LEAVED PINES.

*Cones smooth.*

1. Red (Norway) Pine. . . *Pinus rubra.*
2. Stone Pine. . . . . *Pinus pinea.*
3. Grey Pine. . . . . *Pinus rupestris.*
4. Yellow Pine. . . . . *Pinus mitis.*
5. Wild Pine, or Scotch Fir. *Pinus sylvestris.*

*Cones thorny.*

6. Jersey Pine. . . . . *Pinus inops.*
7. Table Mountain Pine. . *Pinus pungens.*

THREE-LEAVED PINES.

*Cones smooth or with small thorns.*

8. Long-leaved Pine. . . . *Pinus australis.*
9. Pond Pine. . . . . *Pinus serotina.*

*Cones thorny.*

10. Pitch Pine. . . . . *Pinus rigida.*
11. Loblolly Pine. . . . . *Pinus taeda.*

FIVE-LEAVED PINES.

12. White Pine. . . . . *Pinus strobus.*

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## SPRUCES.

*Leaves short and disposed singly round the branches.*

13. Norway Spruce Fir. . . . *Abies picea*,
14. Black or Double Spruce. *Abies nigra*.
15. White or Single Spruce. *Abies alba*.

*Leaves lateral.*

16. Hemlock Spruce. . . . *Abies canadensis*.
  17. American Silver Fir. . . *Abies balsamifera*.
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## RED PINE, OR NORWAY PINE.

**PINUS RUBRA.** *P. arbor maxima; cortice rubente; foliis binis 4-5 uncialibus; strobilis ovato-conicis, basi rotundatis, folio demidio-brevioribus, squamis medio dilatatis, inermibus.*

*Pinus resinosa, Ait. Hort. Kew.*

THIS tree is called by the French inhabitants of Canada *Pin rouge*, Red Pine, and the name has been preserved by the English colonists. In the northern parts of the United States it is called Norway Pine, though differing totally from that tree, which is a species of Spruce. The first of these denominations should be adopted by the Americans, especially as it is founded on a distinguishing character of the species, which will be taken notice of in its place.

In a journey made by my father in 1792 to Hudson's Bay, for the purpose of remarking as he returned the points at which the vegetables of this northern region appear and disappear, he first observed the Red Pine near Lake St. John in Canada, in the 48th degree of latitude. Towards the South I have not seen it beyond Wilkesborough in Pennsylvania, in latitude  $41^{\circ} 30'$ ; and it is rare in all the country south of the river Hudson. It is found in Nova Scotia, where it bears the same name

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as in Canada, and also that of Yellow Pine. Mackenzie, in the narrative of his journey to the Pacific Ocean, mentions it as existing beyond Lake Superior.

But the Red Pine does not, like the Black Spruce, the Hemlock Spruce and the White Pine, constitute a large proportion of the extensive forests which cover these regions, but occupies small tracts of a few hundred acres, alone or mingled only with the White Pine. Like most species of this genus, it grows in dry and sandy soils, by which the luxuriance of its vegetation is not checked, for it is 70 or 80 feet in height and 2 feet in diameter. It is chiefly remarkable for the uniform size of its trunk for two thirds of its length.

The bark upon the body of this tree is of a clearer red than upon that of any other species in the United States; hence is derived its popular name, and hence I have substituted the specific epithet *rubra* for that of *resinosa*, employed by Aiton, and adopted by Sir A. B. Lambert. Another motive for the change was to prevent a mistake to which many persons would be liable, of supposing that this species affords the resinous matter so extensively used in ship-building.

The leaves are of a dark green, 5 or 6 inches long, united in pairs and collected in bunches at the extremity of the branches, like those of the Long-leaved Pine and Maritime Pine, *Pinus maritima*, instead of being dispersed like those of the Jersey and Wild Pines. The female flowers are bluish during the first months after

their appearance, and the cones, which are destitute of thorns and which shed their seeds the first year, are about 2 inches long, rounded at the base and abruptly pointed.

The concentric circles are crowded in the Red Pine, and the wood, when wrought, exhibits a fine compact grain. It is rendered heavy by the resinous matter with which it is impregnated, and in Canada, Nova Scotia and the District of Maine, it is highly esteemed for strength and durability, and is frequently employed in naval architecture, especially for the deck of vessels, for which it furnishes planks 40 feet long without knots. Stript of the sap it makes very lasting pumps. The main-mast of the St. Lawrence, a ship of fifty guns built by the French at Quebec, was of this Pine, which confirms my observation concerning its stature.

The Red Pine is exported to England in planks from the District of Maine and the shores of Lake Champlain. I have lately learned that this commerce is diminished, because the timber is said to consist in too great a proportion of sap: but the objection appears to me unfounded; several trunks a foot in diameter, that I have examined, contained only one inch of sap.

While young, the Red Pine has a beautiful aspect, and its vegetation is always vigorous; it would doubtless succeed in France and throughout the north of Europe, and the useful properties of its wood and the resinous matter that might be extracted from it are sufficient in-

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Fig.



duancements to its cultivation. I by no means agree with Sir A. B. Lambert, that its wood is always of an inferior quality.

## PLATE CXXXIV.

*A branch with a cone of the natural size. Fig. 1, A leaf.  
Fig. 2, A seed.*



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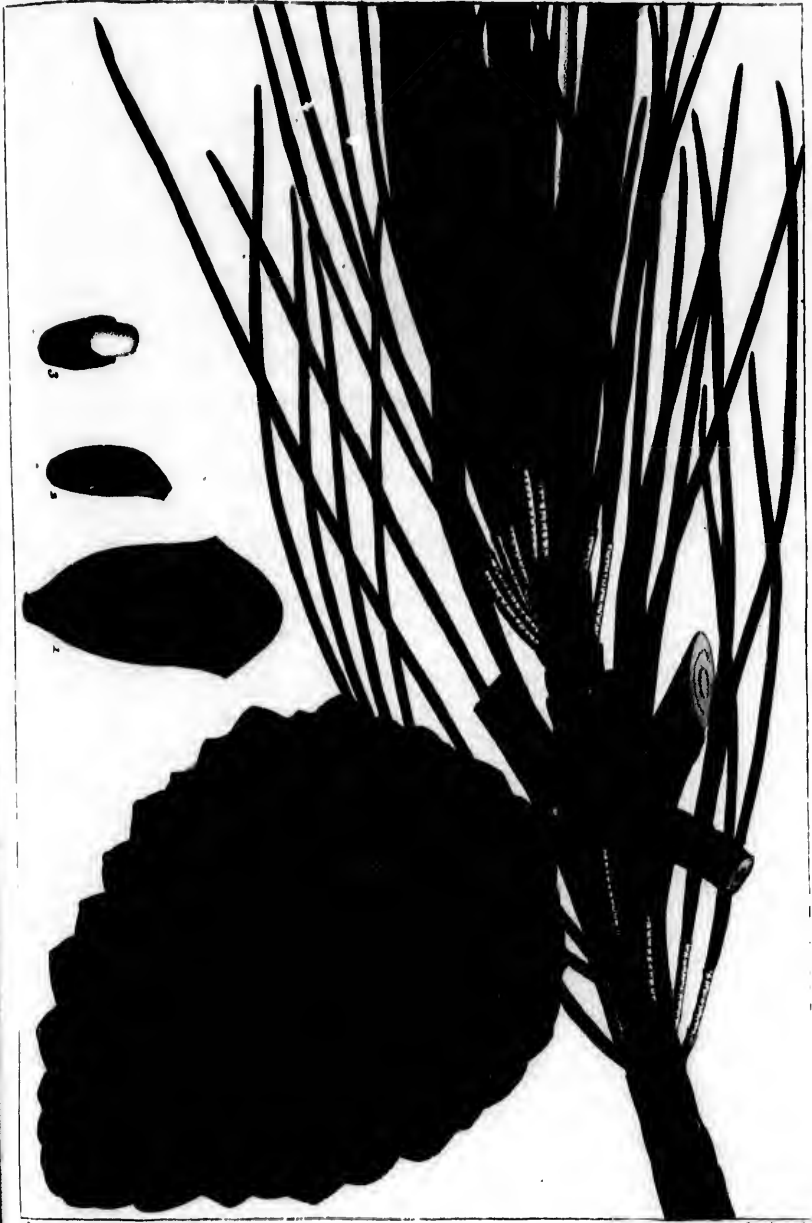
## STONE PINE.

**PINUS PINEA.** *P. foliis geminis ; strobilis ovatis, obtusis, subinermibus ; foliis longioribus ; nucibus duris.*

THE Isles of the Mediterranean Sea, the shores of European Turkey, and the South of Europe in general produce this species of Pine. It grows with difficulty in more northern climates, and requires to be protected from the cold while young ; in this manner have been reared the stocks that exist in the botanical garden of Paris, which support a winter as rigorous as that of Richmond in Virginia.

The Stone Pine attains the height of 55 or 60 feet, with a diameter of 15 or 20 inches, and is easily distinguished by its wide and depressed summit. The leaves are about 5 inches in length, united in pairs, and of a bright green. The cones are 5 inches long, 4 inches broad, and very obtuse. On the inner side of each scale, at the base, are two pits containing a hard seed of a deep blue colour surmounted by a short wing. The seeds enclose a white kernel, of an agreeable taste when fresh, which is served upon the table : but there is a Pine known in Portugal by the name of *Pinhao molar*, and in Naples by that of *Piniolo molese*, of which the kernel is tender and in every respect preferable.

The Stone Pine is a conquest of civilised man from



*Pinus Pinaster*  
*Stone Pine*

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*Fig. 2.*

savage Nature ; and a long course of uninterrupted cultivation has been necessary to perfect its fruit. To assign the period at which this process was begun is perhaps impossible ; it must, however, be remote, for these cones are found, as an architectural ornament, in the Greek and Roman antiquities.

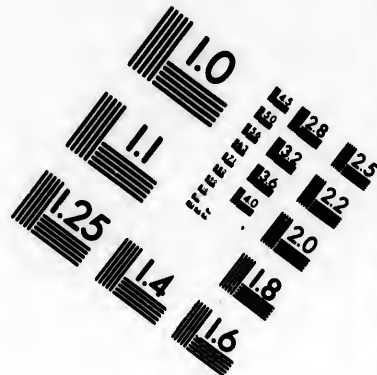
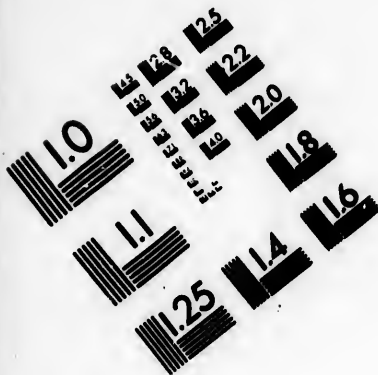
Though this tree can be of little value to the United States, it deserved to be mentioned, as it grows in the poorest soils, has a picturesque appearance, and is associated with recollections that are cherished by every lover of the Arts and Sciences.

## PLATE CXXXV.

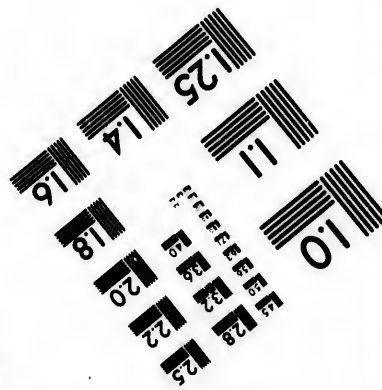
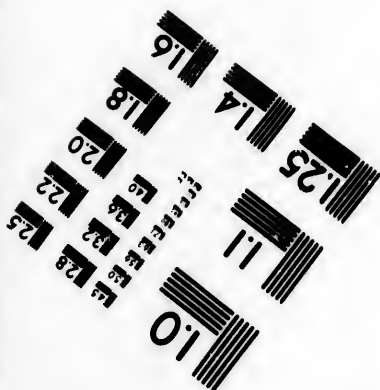
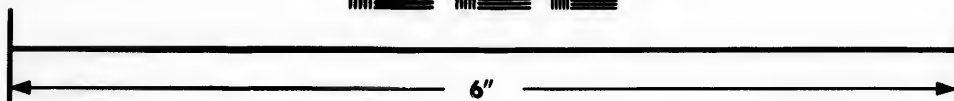
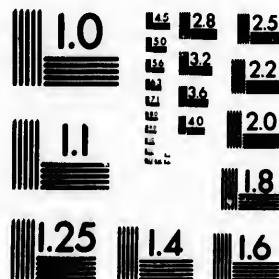
*A branch with a cone of the natural size. Fig. 1, A leaf. Fig. 2, A seed.*

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## GREY PINE.

**PINUS RUPESTRIS.** *P. arbor humilis; foliis bina, rigidis, uncialibus; strobilis cinereis, recurvis, insigniter incurvato-tortis; squamis inermibus, ramulo adpressis.*

*Pinus Banksiana. LINNÆUS.*

THIS species is found farther northward than any other American Pine. In Nova Scotia and the District of Maine, where it is rare, it is called *Scrub Pine*, and in Canada, *Grey Pine*. I cannot impart a juster idea of its nature than by an extract from my father's notes upon Canada: "In the environs of Hudson's Bay and of the Great Mistassin lakes, the trees which compose the forests a few degrees farther south disappear almost entirely, in consequence of the severity of the winter and the sterility of the soil. The face of the country is almost everywhere broken by innumerable lakes, and covered with large rocks piled upon each other and usually overgrown with large black lichens, which deepen the gloomy aspect of these desolate and almost uninhabited regions. Here and there, in the intervals of the rocks, are seen a few individuals of this species of Pine, which fructify and even exhibit the appearances of decrepitude at the height of 3 feet. One hundred and fifty miles farther south its vegetation is more vigorous, but it is still



Grey Pine  
*Pinus rupestris.*

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not more than 8 or 10 feet high, and in Nova Scotia, where it is confined to the summit of the rocks, it rarely exceeds this stature."

The leaves of the Grey Pine are united in pairs in the same sheath, but they are disseminated over the branches instead of being collected at the extremity, and are about an inch long, flat on the interior, and rounded on the exterior face. The cones are commonly in pairs, and are of a grey or ashy colour, which has probably lent its name to the tree; they are about 2 inches long, and have the peculiarity of always pointing in the same direction with the branches: they are, besides, remarkable for naturally assuming an arching shape, which gives them the appearance of small horns. They are extremely hard, and do not open to release the seeds before the second or third year. The Canadians find a speedy cure for obstinate colds in a diet-drink made by boiling these cones in water. If this property, which is said to belong also to the fruit of the Black Spruce, is proved to exist, it forms the only merit of a tree too diminutive to be of any utility; in my opinion Sir A. B. Lambert mistakes, in supposing it capable of furnishing turpentine or tar as an article of commerce.

## PLATE CXXXVI.

*A branch with a cone of the natural size. Fig. 1, A leaf.  
Fig. 2, A seed.*

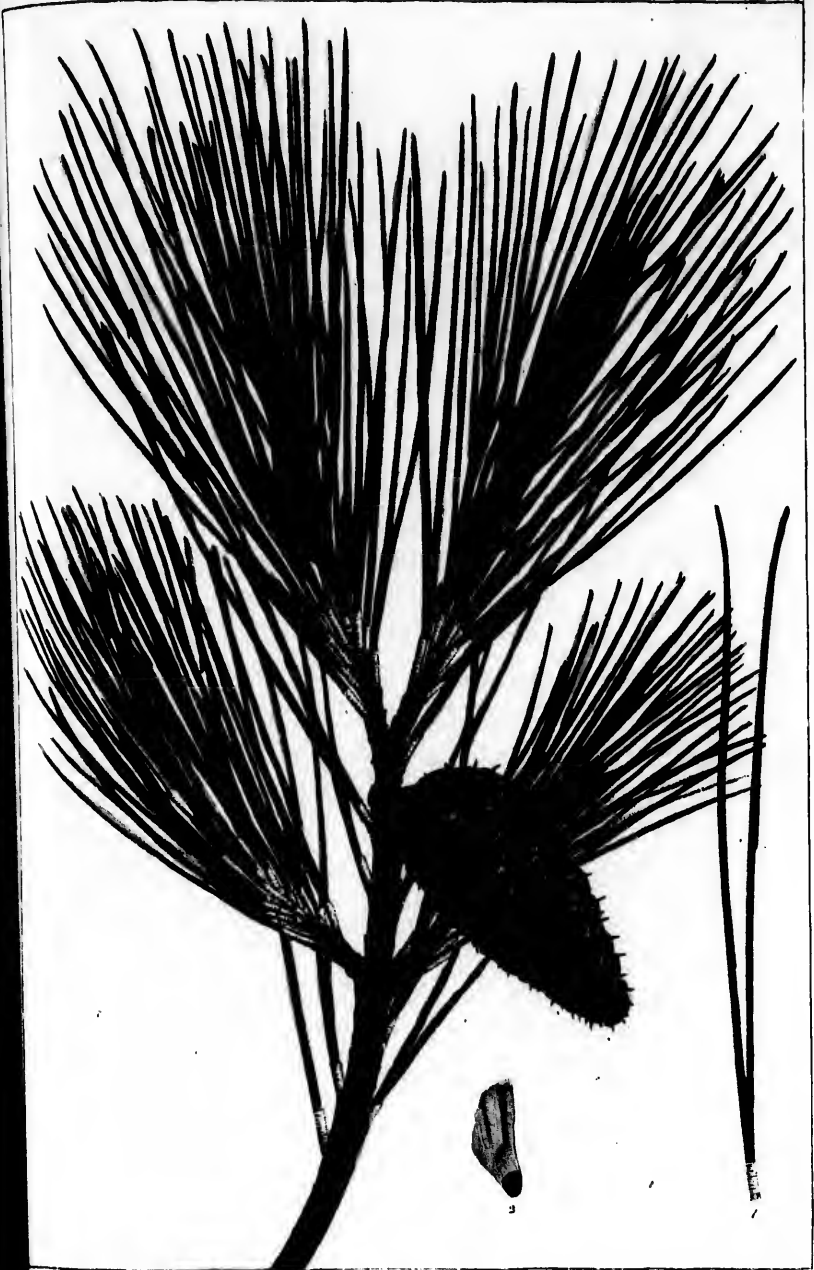
## YELLOW PINE.

**PIRUS MITIS.** *P. arbor maxima; foliis prælongis, tenuoribus, caniculatis; strobilis parvis, conoideo-ovatis; tessularum mucrone minutissimo.*

*Pinus mitis*, MICHX. Flor. Bor. Am.

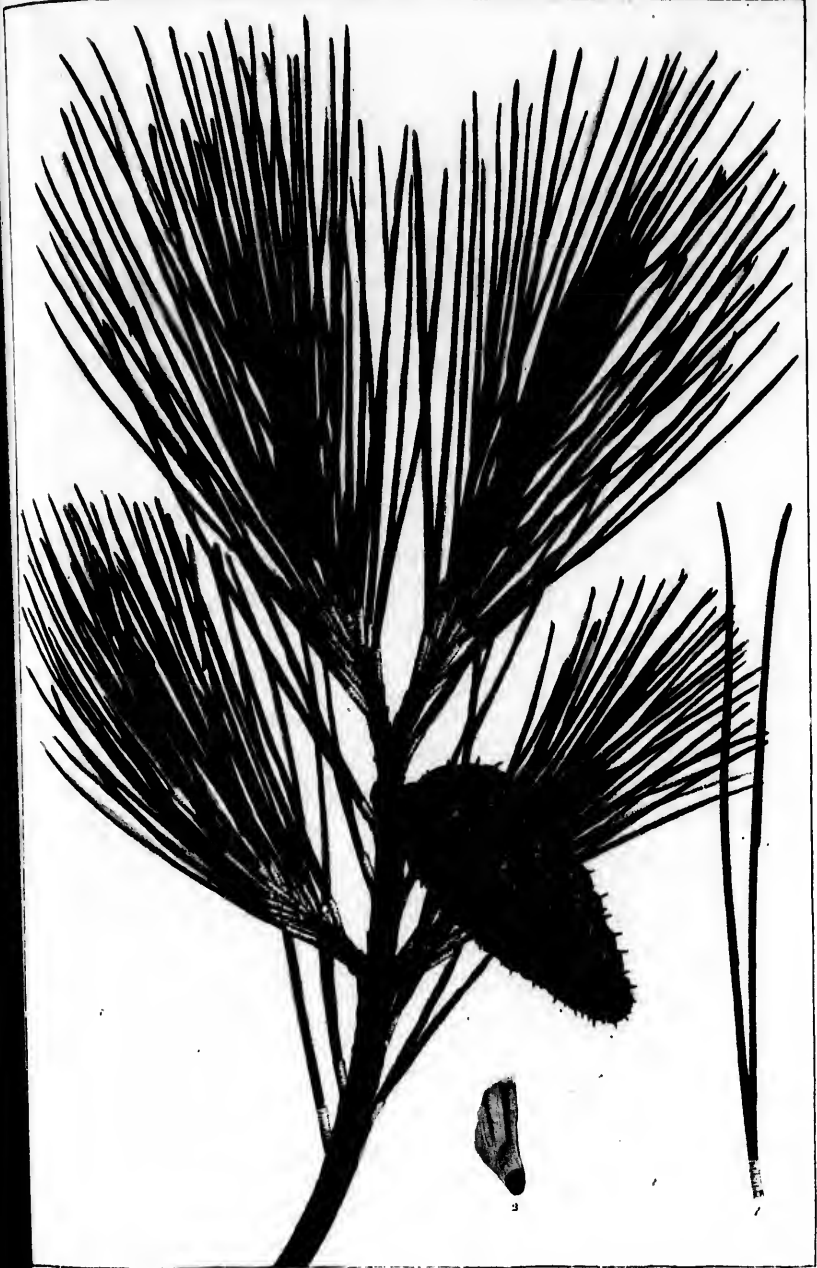
THIS tree is widely diffused in North America, and is known in different places by different names: in the Middle States, where it is abundant and in common use, it is called Yellow Pine, in the Carolinas and Georgia, Spruce Pine, and more frequently Short-leaved Pine.

Towards the North this species is not found beyond certain districts of Connecticut and Massachussets; it is multiplied in the lower part of New Jersey, and still more on the eastern shore of Maryland and in the lower parts of Virginia, where it is seen only upon arid soils: I have, also, met with it on the right bank of the river Hudson at a little distance from Albany, at Chambersburgh in Pennsylvania, near Mudlick in Kentucky, on the Cumberland Mountains and in the vicinity of Knoxville in East Tennessee, at Edgfield Court-house in the upper part of South Carolina, and on the river Oconee in the upper part of Georgia. In all these places it is united with other trees, and enters in a greater or less proportion into the composition of the forests, according to the



Yellow Pine.  
*Pinus mitis.*

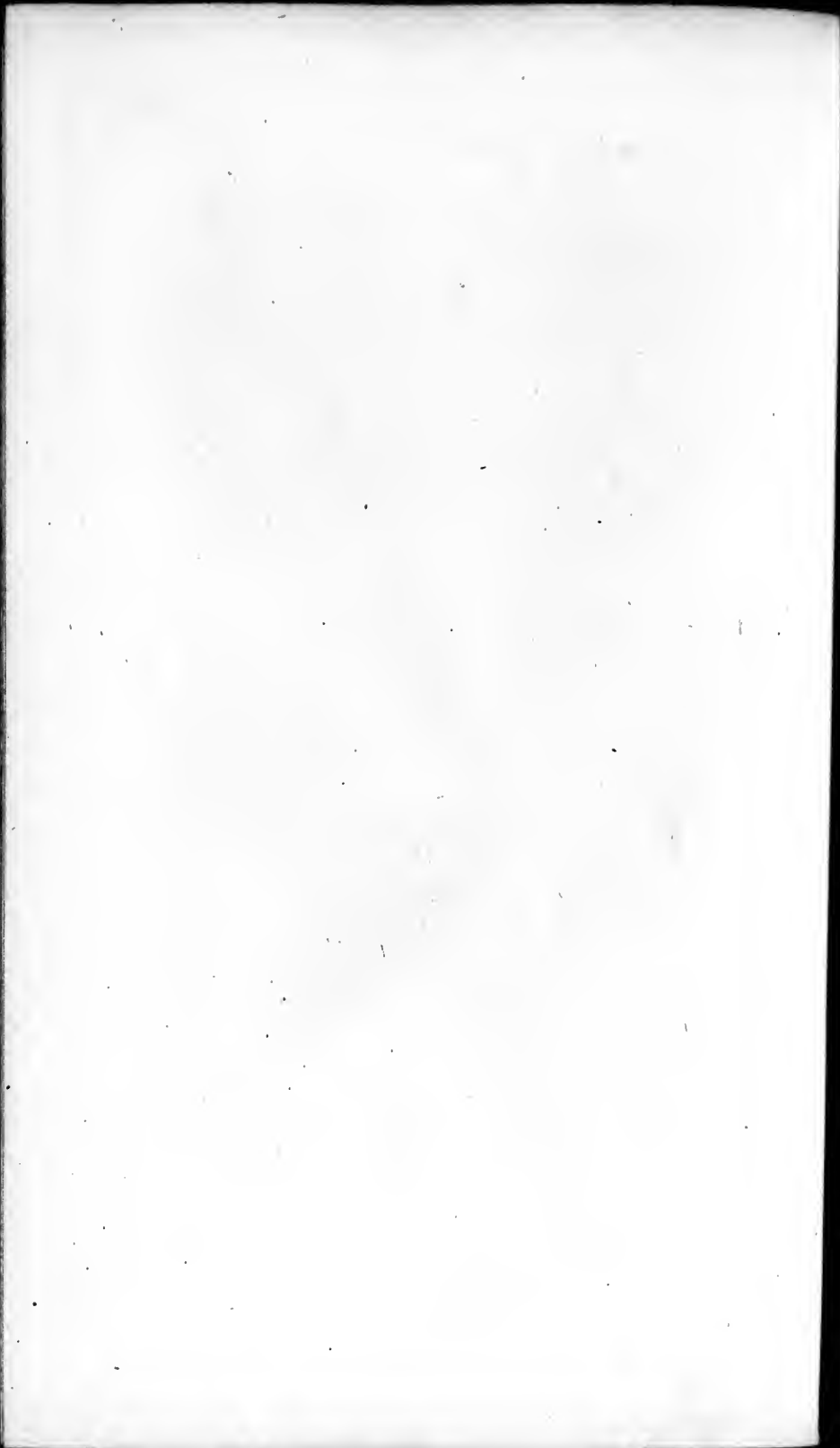
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Yellow Pine.  
*Pinus mitis.*

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nature of the soil. It abounds on the poorest lands; on those of a certain degree of fertility, which is indicated by the flourishing appearance of the Oaks and Walnuts, it is more rare, though it still surpasses the surrounding trees in bulk and elevation. The Yellow Pine is also occasionally seen in the lower part of the Carolinas, in the Floridas, and probably in Louisiana; but in these regions it grows only in spots consisting of beds of red clay mingled with gravel, which here and there pierce the light covering of sand which forms the surface of the country to the distance of 120 miles from the sea.

The Yellow Pine is a beautiful tree, and this advantage it owes to the disposition of its limbs, which are less divergent the higher they are placed upon the stock, and which are bent towards the body so as to form a summit regularly pyramidical, but not spacious in proportion to the dimensions of the trunk. Its regularity has perhaps given rise to the name of *Spruce Pine*.

In New Jersey and in Maryland this tree is 50 or 60 feet high, and is commonly of an uniform diameter of 15 or 18 inches for two thirds of this distance; in Virginia and the upper part of the Carolinas there are stocks of nearly the same height and of twice this diameter; I have measured several that were between 5 or 6 feet in circumference.

The leaves are 4 or 5 inches long, fine, flexible, hol-

lowed on the inner face, of a dark green, and united in pairs; sometimes, from luxuriancy of vegetation, three are found together on the shoots of the season, but never upon the older branches; there is, therefore, an inaccuracy in the description of this species as a Pine with *two or three leaves*, and in the specific epithet *variabilis*.

The cones are oval, armed with fine spines, and smaller than those of any other American Pine, since they scarcely exceed an inch and a half in length upon old trees. The seeds are cast the first year.

The concentric circles of the wood are six times as numerous in a given space as those of the Pitch and Loblolly Pines. In trunks 15 or 18 inches in diameter there are only two inches, or two and a half, of sap, and still less in such as exceed this size. The heart is fine-grained and moderately resinous, which renders it compact without great weight. Long experience has proved its excellence and durability. In the Northern and Middle States, and in Virginia, to the distance of 150 miles from the sea, nine-tenths of the houses are built entirely of wood, and the floors, the casings of the doors and wainscots, the sashes of the windows, etc., are made of this species, as more solid and lasting than any other indigenous wood. In the upper part of the Carolinas, where the Cypress and White Cedar do not grow, the houses are constructed wholly of Yellow Pine, and are even covered with it. But for whatever pur-

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pose it is employed it should be completely freed from the sap, which speedily decays. This precaution is sometimes neglected in order to procure wider boards, especially near the ports, where, from the constant consumption, the tree is becoming rare. Immense quantities are used in the dock-yards of New York, Philadelphia, Baltimore, etc., for the decks, masts, yards, beams and cabins of vessels, and it is considered as next in durability to the Long-leaved Pine. The wood from New Jersey and Maryland is finer-grained, more compact, and stronger than that from the river Delaware, which grows upon richer lands.

The Yellow Pine, in boards from an inch to two inches and a half thick, forms a considerable article of exportation to the West Indies and Great Britain: in the advertisements of Liverpool it is designated by the name of *New York Pine*, and in those of Jamaica by that of *Yellow Pine*; in both places it is sold at a lower price than the Long-leaved Pine of the Southern States, but much higher than the White Pine.

Though this species yields turpentine and tar, their extraction demands too much labour, as it is always mingled in the forests with other trees. The value of its wood alone renders it, for the middle and north of Europe, the most interesting, except the Red Pine, of the American species. Sir A. B. Lambert begins his latin description of it thus: *Arbor mediocris*,

etc., and adds that "it does not exceed 25 or 30 feet in height, is of a spongy consistence, and unfit for building."

PLATE CXXXVII.

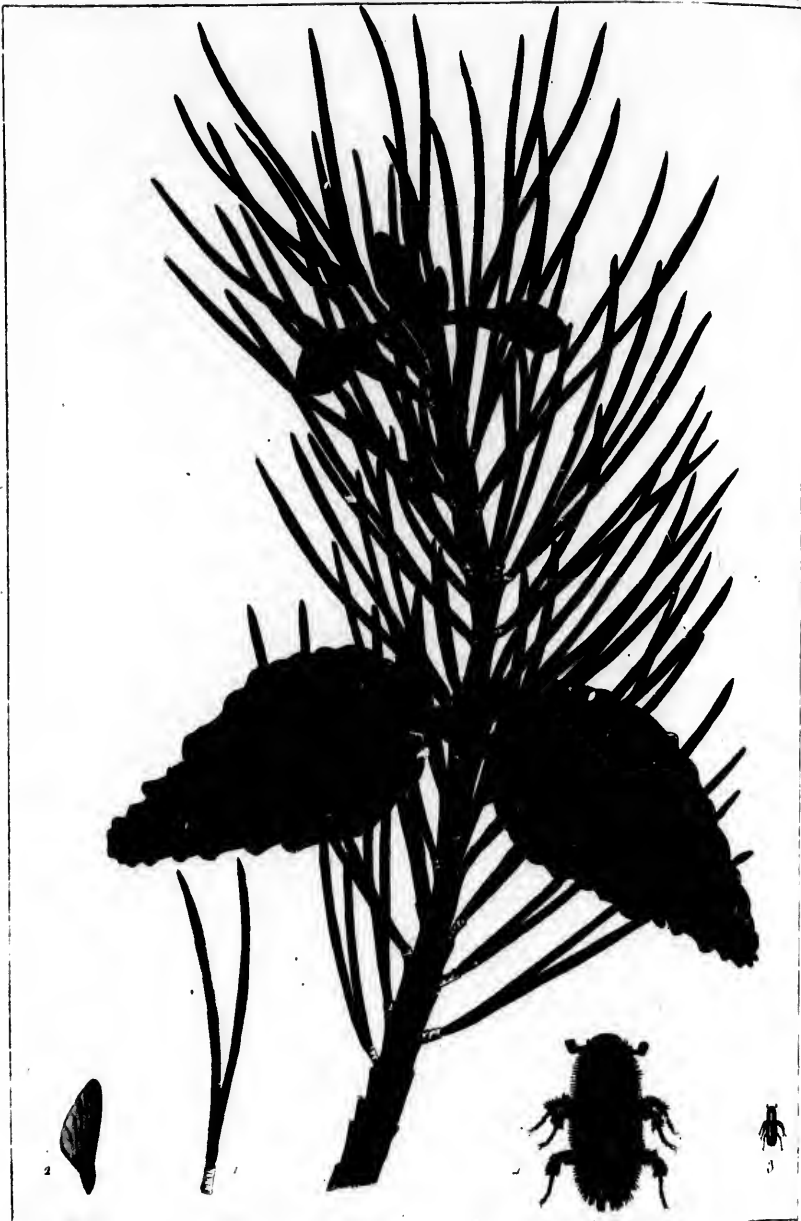
*A branch with a cone of the natural size. Fig. 1, A leaf.  
Fig. 2, A seed.*

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Wild Pine or Scotch Fir.

*Pinus sylvestris.*

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## WILD PINE, OR SCOTCH FIR.

**PINUS SYLVESTRIS.** *P. foliis geminis rigidis, strobilis ovato-conicis, longitudine foliorum; squamis echinatis.*

**THE** Pines of the Old Continent are less numerous than those already observed in North America. Among them the Wild Pine is the most valuable for the properties of its wood; it is, besides, extensively diffused, and grows in the most dissimilar soils.

In that part of Europe which lies above the 55th degree of latitude, are found immense forests of resinous trees, in general composed entirely of this species: below this parallel the leafy trees begin to mingle with them, and soon exclude them from the forests. In the centre of Europe the Wild Pine abounds only in the coldest and most elevated situations, such as the Pyrenees, the Tyrolian, Swiss and Vosgian Mountains. In Scotland it is so common as to leave no doubt of its being indigenous to that kingdom, though some authors believe it to have come originally from the Continent.

This tree arrives at perfection only in the north of Europe, where it is more than 80 feet high and 4 or 5 feet in diameter. The full-grown trunk is covered with a thick and deeply furrowed bark; the leaves are in pairs, of a pale green, stiff, twisted, and about three inches long; the flowers are of a yellowish tint, and the



cones are greyish, of a middling thickness and a little shorter than the leaves. Each scale is surmounted by a retorted spine; the seeds are small, black, and garnished with a reddish wing; they ripen the second year.

The great elevation of the Wild Pine, its uniform diameter, and the excellent quality of its wood, resulting from a just proportion of resinous fluid, render it peculiarly proper for the masts of large ships, and for an infinite variety of secondary uses. A considerable exportation takes place from the north of Europe, especially from Riga, Memel and Dantzick, to the maritime states, particularly to England, where, according to Sir A. B. Lambert, it is known by the name of *red deal*; and in London by that of *yellow deal*. In Poland and Russia the houses in the country are generally constructed of it. This species furnishes four-fifths of the tar consumed in the dock-yards of Europe, which is imported from Archangel, Riga, and other ports of Russia and Norway.

In the north of Europe great ravages are committed in the forests composed of the Wild Pine and Norway Spruce Fir, by several insects of which the most destructive is the *Bostrichus piniperda*. This little animal introduces itself into the cellular integument of the bark, and succeeds in dividing it from the trunk. The separation of the bark prevents the circulation of the sap, and hence results the inevitable death of the tree. It is impossible to oppose an effectual resistance to this winged enemy; but I have been informed by a Polish

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gentleman that its progress is sometimes arrested by felling all the trees, for a space of 50 yards in breadth, between the part of the forest which it already occupies and that which it threatens to assail.

The faculty which I have ascribed to the Wild Pine of growing in climates, soils and exposures extremely different, is of inestimable value, and its cultivation has been successfully attempted on lands abandoned during ages of hopeless sterility. Plantations may be formed from the seed or with young stocks from the nursery: of all the Pines this species bears transplanting with the least injury. It is seen flourishing on sandy wastes exposed to the saline vapours of the sea, and, which is more remarkable, on calcareous lands, a large tract of which in the Department of the Marne, called *la Champagne pouilleuse*, has begun within 40 years to be covered with it, after lying desert from time immemorial. The proprietors who first conceived this fortunate plan have already seen their barren grounds acquire a tenfold value. The oldest plantations yield seeds, which are disseminated by the winds and spring up spontaneously. After the first growth of evergreen trees, the soil becomes capable of sustaining the Birch, the Hornbeam, the Oaks, etc., which in time render it proper for the production of cereal plants. In Belgium large heaths have in this way been transformed into rich arable land.

The culture of the Wild Pine has been found so pro-

fitable that seeds or young plants may every where be obtained at a moderate price. April is the most favourable season for sowing the seeds or removing the young stocks : 6 or 8 pounds of seeds should be scattered upon an acre of ground previously sown with half the usual quantity of oats ; the roller suffices to cover them. The oats preserve a degree of coolness in the soil, and shelter the young Pines from the ardour of the sun ; but great care must be taken not to injure them in the harvest.

The Wild Pine is so different from the White Pine in its foliage, the form of its cones and the quality of its wood, that no comparison can be instituted between them : it is more analogous to the Yellow Pine, to which however it is superior. It might be most profitably cultivated on waste lands in the Northern Section of the United States.

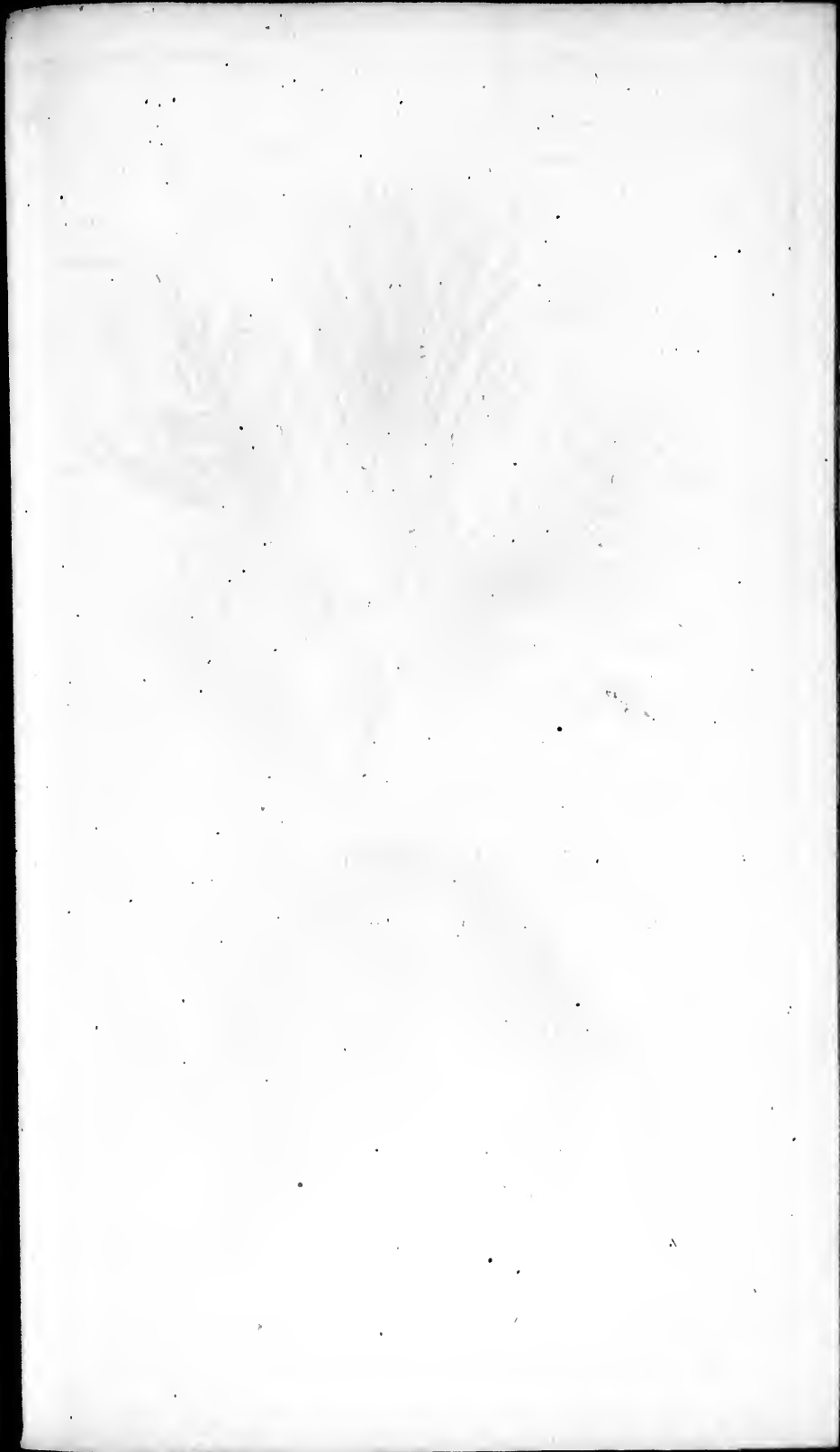
#### PLATE CXXXVIII.

*A branch with a cone of the natural size. Fig. 1, A leaf. Fig. 2, A seed. Fig. 3, Bostrichus piniperda, or Dermestes typographus, of the natural size. Fig. 4, The same insect enlarged.*

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## NEW JERSEY PINE.

**PINUS INOPS.** *P. arbor mediocris, ramosa; foliis binis, brevibus; strobilis ovato-acuminatis, solitariis, fuscis; mucronibus tessularum rigidis; deorsum sub-inclinatis.*

**OBS.** Truncus et ramuli obscure et squalide fusci.

THE Jersey Pine has probably been so named from its abounding in the lower part of New Jersey, where the soil is meager and sandy, and where it is often accompanied by the Yellow Pine. It is not, however, confined to this State, for I have seen it in Maryland, Virginia and Kentucky, in Pennsylvania beyond Chambersburg, near the Juniata, and on the *scrubby ridges* beyond Bedford, at the distance of about 200 miles from Philadelphia. In this part of Pennsylvania it is called *Scrub Pine*, and is seen wherever the soil is composed of argillaceous schistus and is consequently poor. The leanness of the land on which it grows is attested by the decrepid appearance of the Scarlet, Red, Black, White and Rock Chesnut Oaks, with which it is mingled. I have never met with it northward of the river Hudson, nor in the Carolinas and Georgia.

This tree is sometimes 30 or 40 feet high and 12 or 15 inches in diameter, but it rarely attains these dimensions. The trunk, which is clad in a blackish bark, tapers sensibly from the base to the summit, and half its length is occupied by limbs remote from each other. The

leaves are united in pairs and are of a dark green, one or two inches long, flat on the inner face, stiff and scattered over the young branches, which are very flexible and smooth, while those of the other species are scaly. The wood of the annual shoots is observed to be of a violet tint, which is a character peculiar to this species and to the Yellow Pine.

The cones are a little larger than those of the preceding species, or about 2 inches long and an inch in diameter at the base : they are attached by short, thick peduncles, and are armed with long, firm spines, pointed and bent backwards ; they are usually single and directed towards the earth. The seeds are shed the first year of their maturity.

The size of this species of Pine forbids the useful employment of its wood, not to mention the disadvantage under which it labours of containing a large proportion of sap. Near Mudlick in Kentucky a small quantity of tar is obtained from the heart and consumed in the vicinity. I must again dissent from the opinion of Sir A. B. Lambert, who thinks that the flexible branches of the Jersey Pine might serve for hoops : they are too knotty, and would decay in less than six months. Next to the Grey Pine this is the most uninteresting species of the United States.

PLATE CXXXIX.

*A branch with a cone of the natural size. Fig. 1, A leaf.  
Fig. 2, A seed.*

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## TABLE MOUNTAIN PINE.

**PINUS PUNGENS.** *P. arbor 45-50 pedalis; foliis binis, brevibus et crassis; strobilis turbinatis, præmagnis, flavis, squamis echinatis, spinis luteis, durissimis et basi latioribus.*

THE Table Mountain, in North Carolina, one of the highest points of the Alleghanies, at the distance of nearly 300 miles from the sea, has given its name to this species of Pine, which covers it almost exclusively, though it is rare on the neighbouring summits. Nor is it found in any other part of the United States, as my father and myself have become assured by extensive researches. Of all the forest trees of America this species alone is restricted to such narrow limits, and it will probably be among the first to become extinct; as the mountains which produce it are easy of access, are favoured with a salubrious air and a fertile soil, and are rapidly peopling; besides which, their forests are frequently ravaged by fire.

The Table Mountain Pine is 40 or 50 feet in height with a proportional diameter. The buds are resinous, and the leaves, which grow in pairs, are thick, stiff, and about 2 inches and a half in length. The cones are about 3 inches long and 2 inches in diameter at the base, of a regular form and a light yellow colour: they are sessile,

and often united to the number of four. Each scale is armed with a strong, ligneous spine, 2 lines in length, widened at the base, and bent towards the summit of the cone.

This tree divides itself in numerous ramifications. It is appropriated to no particular use, but in the mountains of North Carolina its turpentine is preferred to every other as a dressing for wounds. I cannot discover the slightest difference between this resin and that of the Pitch Pine, and it is a remarkable fact that all the Pines, though differing widely from each other, yield a resin so analogous as often to be undistinguishable by the taste and smell.

The Table Mountain Pine has no valuable properties to recommend it to notice in Europe; it will serve only to complete botanical collections and to diversify pleasure grounds.

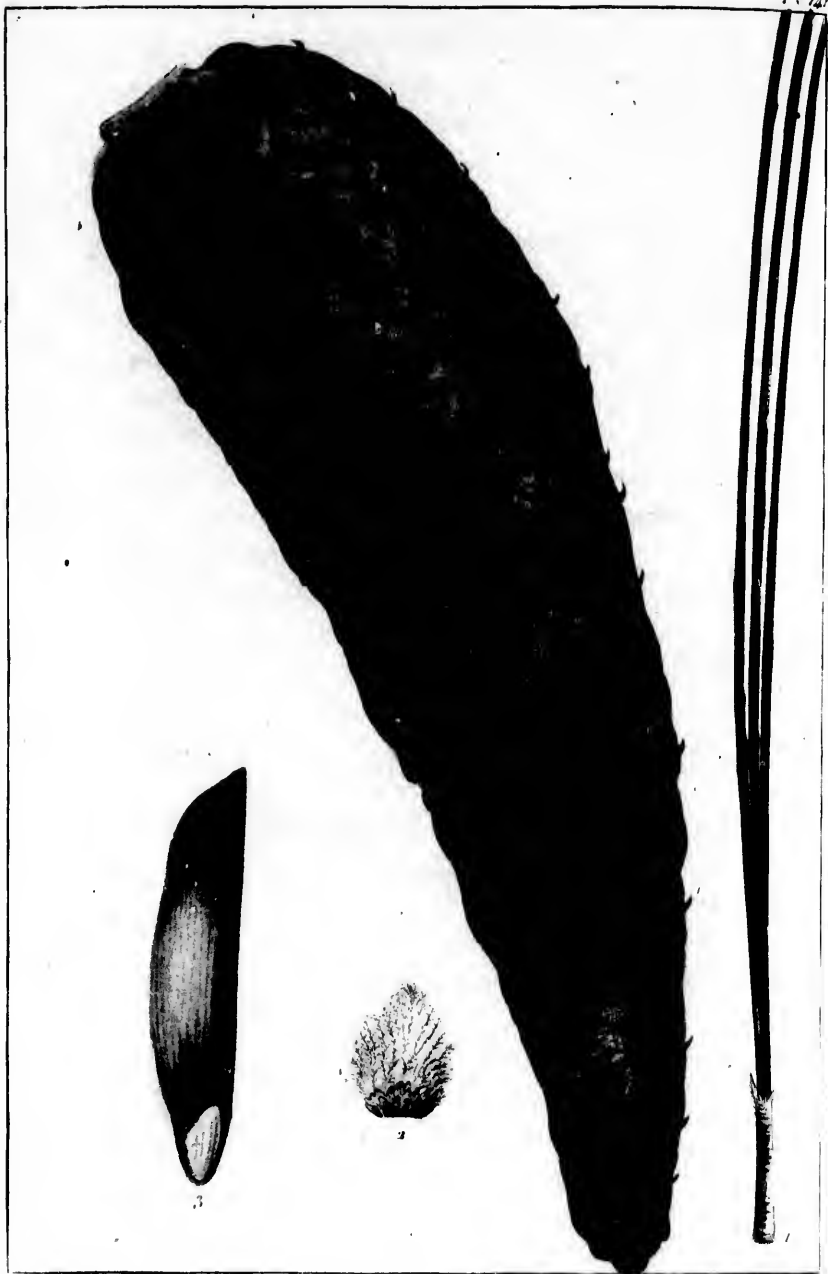
#### PLATE CXL

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## LONG-LEAVED PINE.

**PINUS AUSTRALIS.** *P. arbor maxima; foliis ternis longissimis; amentis masculis longo-cylindraceis, fusco-glaucis, divergentibus; strobilis longissime conoideis, tessularum tuberculo tumido, mucrone minutissimo terminato.*

*Pinus palustris.* LINN.

THIS invaluable tree is known both in the countries which produce it, and in those to which it is exported, by different names: in the first it is called Long-leaved Pine, Yellow Pine, Pitch Pine and Broom Pine; in the Northern States, Southern Pine and Red Pine; and in England and the West Indies, Georgia Pitch Pine. I have preferred the first denomination, because this species has longer leaves than any other eastward of the Mississippi, and because the names of Yellow Pine and Pitch Pine, which are more commonly employed, serve in the Middle States to designate two species entirely distinct and extensively diffused. The specific epithet *australis* is more appropriate than that of *palustris*, which has hitherto been applied to it by botanists, but which suggests an erroneous idea of the situations in which it grows.

Towards the north the Long-leaved Pine first makes its appearance near Norfolk in Virginia, where the *pine-barrens* begin. It seems to be especially assigned to dry,

sandy soils, and it is found almost without interruption in the lower part of the Carolinas, Georgia and the Floridas, over a tract more than 600 miles long from north-east to south-west, and more than 100 miles broad from the sea towards the mountains of the Carolinas and Georgia. I have ascertained three points, about 100 miles apart, where it does not grow: the first, 8 miles from the river Nuse in North Carolina, on the road from Louisburgh to Raleigh; the second, between Chester and Winesborough in South Carolina; the third, 12 miles north of Augusta in Georgia. Where it begins to show itself towards the river Nuse, it is united with the Loblolly Pine, the Yellow Pine, the Pond Pine, the Black Jack Oak and the Scrub Oak; but immediately beyond Raleigh it holds almost exclusive possession of the soil, and is seen in company with the Pines just mentioned only on the edges of the swamps enclosed in the *barrens*: even there not more than one stock in a hundred is of another species. With this exception the Long-leaved Pine forms the unbroken mass of woods which covers this extensive country. But between Fayetteville and Wilmington, in North Carolina, the Scrub Oak is found in some districts disseminated in the *barrens*, and, except this species of Pine, it is the only tree capable of subsisting in so dry and sterile a soil.

The mean stature of the Long-leaved Pine is 60 or 70 feet, with an uniform diameter of 15 or 18 inches for two-thirds of this height. Some stocks, favoured by

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local circumstances, attain much larger dimensions, particularly in East Florida. The bark is somewhat furrowed, and the epidermis detaches itself in thin transparent sheets. The leaves are about a foot long, of a beautiful brilliant green, united to the number of three in the same sheath, and collected in bunches at the extremity of the branches: they are longer and more numerous on the young stocks, which are sometimes cut by the negroes for brooms. The buds are very large, white, fringed, and not resinous.

The bloom takes place in April; the male flowers form masses of divergent violet-coloured aments about 2 inches long; in drying they shed great quantities of yellowish pollen, which is diffused by the wind and forms a momentary covering on the surface of the land and water. The cones are very large, being 7 or 8 inches long, and 4 inches thick when open, and are armed with small retorted spines. In the fruitful year they are ripe about the 15th of October, and shed their seeds the same month. The kernel is of an agreeable taste, and is contained in a thin white shell, surmounted by a membrane; in every other species of American Pine the shell is black. Sometimes the seeds are very abundant, and are voraciously eaten by wild turkies, squirrels, and the swine that live almost wholly in the woods. But in the unfruitful year, a forest of a hundred miles in extent may be ransacked without finding a single cone: this probably occasioned the mistake of the French

who in 1567 attempted a settlement in Florida, that "the woods were filled with superb Pines that never yielded seed."

The Long-leaved Pine contains but little sap ; several trunks 15 inches in diameter at the height of 3 feet , which I have myself measured , had 10 inches of perfect wood. Many stocks of this size are felled for commerce , and none are received for exportation of which the heart is not 10 inches in diameter when squared. The concentrical circles in a trunk fully developed are close and at equal distances , and the resinous matter , which is abundant , is more uniformly distributed than in the other species ; hence the wood is stronger , more compact and more durable : it is , besides , fine-grained , and susceptible of a bright polish. These advantages give it a preference over every other Pine : but its quality is modified by the nature of the soil in which it grows ; in the neighbourhood of the sea , where only a thin layer of mould reposes on the sand , it is more resinous than where the mould is 5 or 6 inches thick ; the stocks that grow upon the first mentioned soil are called Pitch Pine , and the others Yellow Pine , as if they were distinct species.

This wood subserves a great variety of uses in the Carolinas , Georgia and the Floridas : four-fifths of the houses are built of it , except the roof , which is covered with shingles of Cypress ; but in the country the roof is also of Pine , and is renewed after 15 or 18 years , a

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considerable interval in a climate so warm and humid. A vast consumption takes place for the enclosure of cultivated fields. In naval architecture this is the most esteemed of the Pines : in the Southern States , the keel , the beams , the side-planks , and the pins by which they are attached to the ribs , are of this tree. For the deck it is preferred to the true Yellow Pine , and is exported for that purpose to Philadelphia , New York , etc. , where it is in request also for the flooring of houses.

In certain soils its wood contracts a reddish hue , and it is for that reason known in the dock-yards of the Northern States by the name of Red Pine. Wood of this tint is considered the best , and in the opinion of some ship-wrights it is more durable on the sides of vessels , and less liable to injury from worms , than the Oak.

The Long-leaved Pine is the only species exported from the Southern States to the West Indies. A numerous fleet of small vessels is employed in this traffic , particularly from Wilmington in North Carolina , and Savannah in Georgia. The stuff destined for the Colonial market is cut into every form required in the construction of houses and of vessels ; what is sent to England is in planks from 15 to 30 feet long and 10 or 12 inches broad ; they are called *ranging timbers* , and are sold at 8 or 10 dollars a hundred cubic feet. The vessels freighted with this timber repair chiefly to Liverpool , where it is said to be employed in the building of ships and of wet-

docks : it is called Georgia Pitch Pine , and is sold 25 or 30 per cent higher than any other Pine imported from the United States.

From the diversified uses of this wood an idea may be formed of the consumption ; to which must be added a waste of a more disastrous kind , which it seems impossible to arrest. Since the year 1804 , extensive tracts of the finest Pines are seen covered only with dead trees. In 1802 , I remarked a similar phenomenon among the Yellow Pines , in East Tennessee. This catastrophe is felt among the Scotch Firs which people the forests of the north of Europe , and is wrought by swarms of small insects , which lodge themselves in different parts of the stock , insinuate themselves under the bark , penetrate into the body of the tree , and cause it to perish in the course of the year.

The value of the Long-leaved Pine does not reside exclusively in its wood : it supplies nearly all the resinous matter used in the United States in ship-building , and a large residue for exportation to the West Indies and Great Britain. In this view its place can be supplied by no other species : those which afford the same product being dispersed through the woods or collected in inaccessible places. In the Northern States , the lands which , at the commencement of their settlement , were covered with the Pitch Pine , were exhausted in 25 or 30 years , and for more than half a century have ceased to furnish tar.

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The *pine-barrens* are of vast extent, and are covered with trees of the finest growth; but they cannot all be rendered profitable from the difficulty of communication with the sea. Formerly tar was made in all the lower parts of the Carolinas and Georgia, and throughout the Floridas vestiges are every where seen of kilns that have served in the combustion of resinous wood. At present, this branch of industry is confined to the lower districts of North Carolina, which furnish almost all the tar and turpentine exported from Wilmington and other ports.

The resinous product of the Pine is of six sorts, viz: turpentine, *scrapings*, spirit of turpentine, rosin, tar and pitch. The two last are delivered in their natural state; the others are modified by the agency of fire in certain modes of preparation. More particularly: turpentine is the sap of the tree obtained by making incisions in its trunk. It begins to distil about the middle of March, when the circulation commences, and flows with increasing abundance as the weather becomes warmer, so that July and August are the most productive months. When the circulation is slackened by the chills of autumn, the operation is discontinued, and the remainder of the year is occupied in preparatory labours for the following season, which consist—first, in making the *boxes*. This is done in January and February: in the base of each tree, about 3 or 4 inches from the ground, and of preference on the south side,

a cavity is formed, commonly of the capacity of three pints, but proportioned to the size of the trunk, of which it should occupy a quarter of the diameter; on stocks more than 6 feet in circumference, two, and sometimes four, *boxes* are made on opposite sides. Next comes the *raking*, or the clearing the ground at the foot of the trees from leaves and herbage, by which means they are secured against the fires that are often kindled in the woods by the carelessness of travellers and wagners. If the flames gain the *boxes* already impregnated with turpentine, they are rendered useless, and others must be made. *Notching* is merely making at the sides of the box two oblique gutters, about 3 inches long, to conduct into it the sap that exudes from the edges of the wound. In the interval of a fortnight, which is employed in this operation, the first boxes become filled with sap. A wooden shovel is used to transfer it to pails, which in turn are emptied into casks placed at convenient distances. To increase the product, the upper edge of the box is *chipped* once a week, the bark and a portion of the alburnum being removed to the depth of four concentric circles. The boxes fill every three weeks. The turpentine thus procured is the best, and is called *pure dipping*.

The *chippings* extend the first year a foot above the box, and as the distance increases, the operation is more frequently repeated, to remove the sap coagulated on the surface of the wound. The closing of the

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pores, occasioned by continued rains, exacts the same remedy; and it is remarked that the produce is less abundant in moist and cool seasons. After 5 or 6 years the tree is abandoned; the upper edge of the wound becomes cicatrized, but the bark is never restored sufficiently for the renewal of the process.

It is reckoned that 250 boxes yield a barrel containing 320 lb. Some persons charge a single negro with the care of 4,000 or 4,5000 trees of one box; others, of only 3,000, which is an easy task. In general, 3,000 trees yield, in ordinary years, 75 barrels of turpentine and 25 of *scraping*, which supposes the boxes to be emptied five or six times in the season. The *scraping* is a coating of sap which becomes solid before it reaches the boxes, and which is taken off in the fall and added to the last runnings. In November, 1807, the *pure dipping* was sold at Wilmington at 3 dollars a barrel, and the *scraping* a quarter less.

In 1804, the exportation to the Northern States and to the English possessions amounted to 77,827 barrels. During peace it comes even to Paris, where it is called Boston Turpentine. Throughout the United States it is used to make yellow soap of a good quality. The consumption in England is great, and, in the official statements, the value imported in 1807 is 465,828 dollars; in 1805, Liverpool alone received 40,294 barrels, and in 1807, 18,924 barrels. It was sold there in August 1807, at 3 dollars a hundred pounds, and after the

American embargo, in 1808, at 8 or 9 dollars. Oddy omits, in his list of articles exported from Archangel and Stockholm to Great Britain, the resinous product of the Pine, which has amounted to 100,000 barrels of tar in a year.

A great deal of spirits of turpentine is made in North Carolina : it is obtained by distilling the turpentine in large copper retorts, which are of an imperfect shape, being so narrow at the mouth as to retard the operation. Six barrels of turpentine are said to afford one cask or 122 quarts of the spirit. It is sent to all parts of the United States, even to the Western Country by the way of Philadelphia, to England, and to France, where it is preferred, as less odorous, to that made near Bordeaux. In 1804, 19,526 gallons were exported from North Carolina. The residuum of the distillation is *rosin*, which is sold at one third of the price of turpentine. The exportation of this substance, in 1804, was 4,675 barrels.

All the tar of the Southern States is made from dead wood of the Long-leaved Pine, consisting of trees prostrated by time or by the fire kindled annually in the forests, of the summits of those that are felled for timber, and of limbs broken off by the ice which sometimes overloads the leaves. <sup>1</sup>

It is worthy of remark that the branches of resinous trees consist almost wholly of *wood*, of which the or-

<sup>1</sup> See Travels West of the Alleghanies, by F. A. Michaux. Paris. 1803.

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ganization is even more perfect than in the body of the tree; the reverse is observed in trees with deciduous leaves: the explanation of the phenomenon I leave to persons skilled in vegetable physiology. As soon as vegetation ceases in any part of the tree, its consistence speedily changes; the sap decays, and the heart, already impregnated with resinous juice, becomes surcharged to such a degree as to double its weight in a year: the accumulation is said to be much greater after 4 or 5 years: the general fact may be proved by comparing the wood of trees recently felled, and of others long since dead.

To procure the tar, a *kiln* is formed in a part of the forest abounding in dead wood: this is first collected, stript of the sap, and cut into billets two or three feet long and about three inches thick; a task which is rendered long and difficult by the knots. The next step is to prepare a place for piling it: for this purpose, a circular mound is raised, slightly declining from the circumference to the centre, and surrounded with a shallow ditch. The diameter of the pile is proportioned to the quantity of wood which it is to receive: to obtain 100 barrels of tar, it should be 18 or 20 feet wide. In the middle is a hole with a conduit leading to the ditch, in which is formed a receptacle for the resin as it flows out. Upon the surface of the mound, beaten hard and coated with clay, the wood is laid round in a circle like rays.

The pile, when finished, may be compared to a cone truncated at two-thirds of its height and reversed, being 20 feet in diameter below, 25 or 30 feet above, and 10 or 12 feet high. It is then strewed with pine-leaves, covered with earth, and contained at the sides with a slight cincture of wood. This covering is necessary in order that the fire kindled at the top may penetrate to the bottom with a slow and gradual combustion : if the whole mass was rapidly inflamed, the operation would fail and the labour in part be lost : in fine, nearly the same precautions are exacted in this process as are observed in Europe in making charcoal. A kiln which is to afford 100 or 130 barrels of tar, is 8 or 9 days in burning.

As the tar flows off into the ditch, it is emptied into casks of 30 gallons, which are made of the same species of wood.

*Pitch* is tar reduced by evaporation : it should not be diminished beyond half its bulk to be of a good quality.

In 1807, tar and pitch were exported to England from the United States to the amount of 265,000 dollars ; the tar was sold at Liverpool, in August of the same year, at 4 dol. 67 c. a barrel, and when the embargo became known, at 5 dol. 56 c. ; from which inferences may be drawn to the advantage of the United States. At Wilmington, the ordinary price is from 1 dol. 75 c. to 2 dol. 20 c. a barrel.

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between 1786 and 1799, came in equal proportions from Russia, Sweden and the United States; only a very small quantity was drawn from Denmark. The Swedish tar is the most highly esteemed in commerce, and next, that of Archangel; that of the United States is considered inferior to both, which is owing to its being made from dead wood, while that of Europe is extracted from trees recently felled: I shall speak more particularly of the difference arising from this cause in the description of the Pitch Pine. The tar of Carolina is said also to contain earth; this can be attributable only to the want of care in preparing the receptacles; if the same pains were taken in the fabrication, it would probably equal that of Europe, though it must be considered that the tar of Russia and Sweden is produced by a different tree, a native of the north of Europe. It has already been remarked that in the United States this manufacture is confined to the maritime part of North Carolina, and to a small tract of Virginia; but, according to the rate of consumption in America and Great Britain, the product would not long suffice if all the extensive regions covered with the Long-leaved Pine were made to contribute to this object; for the dead wood is said not to be renewed upon a tract that has been cleared, in less than ten or twelve years. It might be advantageous to make use of green wood, or purposely to strip the trees of their bark; and perhaps in this way supplies might be obtained equivalent to the demands of commerce.

Great benefit would result from stripping the Pines of a certain diameter of their bark; they would pass completely into the resinous state in fifteen months, and would be proper for posts and many other uses which require strong and lasting wood. This experiment, which I should have tried when I was last in South Carolina if the season had not been too far advanced, should be made in April or the beginning of May, while the sap is in active circulation, and the *liber* or inner bark should be exactly removed.

I cannot conclude this protracted article without expressing a wish that the Long-leaved Pine should be introduced upon the wastes near Bordeaux: the soil and climate are perfectly congenial to it, and it would succeed better than in the more northern departments. It would be a valuable addition to our domestic resources, for its wood is superior to that of any Pine of North America, and, as I have proved by comparison, to that of the Bordeaux and Riga Pines. The Red and Yellow Pines, also, are shown to be superior to these European species, by samples which I brought from America.

The figure of the Long-leaved Pine, in Sir A. B. Lambert's work, is correct in the leaves and fruit, but defective in the male flowers. His description is wholly inconsistent with my own observations. The latin phrase begins thus: "*Pinus palustris, arbor mediocris, in paludosis*, etc. The wood is of a reddish white colour, soft,

light, and  
decays, but  
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Fig. 1,

light, and very sparingly impregnated with resin. It soon decays, burns badly, and is so little esteemed that it is not used while any other species of wood can be procured."

## PLATE CXLI.

*Fig. 1, A leaf. Fig. 2, A bud. Fig. 3, A seed.*

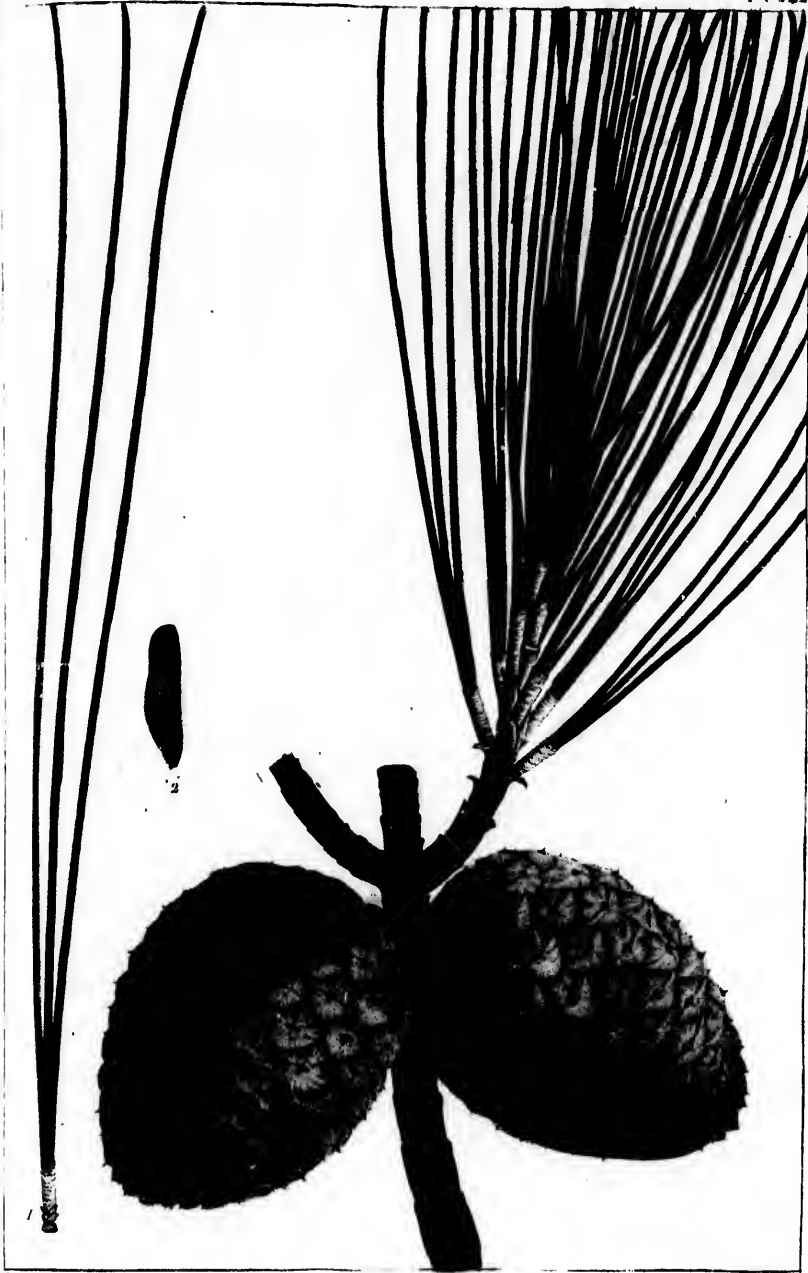
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## POND PINE.

**PINUS SEROTINA.** *P. arbor* 40-45 pedalis; foliis ternis prelongis; amentis masculis erecto incumbentibus; strobilis ovatis, tessularum mucrone minutissimo.

THE Pond Pine frequently recurs in the maritime parts of the Southern States, but is lost as it were among the Long-leaved Pines which cover these regions, and as it is appropriated to no use, and bears a strong family likeness to the rest of the genus, it has received no popular specific name: that which I have given it seems sufficiently appropriate, since it grows principally on the borders of ponds covered with the Pond Bush, *Laurus æstivalis*, and in the small swamps, whose black and miry soil is shaded by the Loblolly Bay, Red Bay, Tupelo, and Small Magnolia or White Bay.

The leaves, united to the number of 3, are 5 or 6 inches in length, and a little more upon young stocks. The aments are straight, and 6 or 8 lines long; the cones are commonly opposite and in pairs, 2 inches and a half in length, 5 inches and a half in circumference, and in form like an egg; their scales are rounded at the extremity, and armed with fine short spines which are easily broken off, so that in some instances no vestige is left of their existence. The cones arrive at maturity the



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*Fig. 2*

second year, but do not release their seeds before the third or fourth.

The ordinary size of the tree, which it rarely exceeds, is 35 or 40 feet in height and 15 or 18 inches in diameter. It is remarkable for the remoteness of its branches, which begin to spring upon the lower half of the stock; and more than half of the largest trunks consists of sap; for these reasons the species is useless at home and deservedly neglected abroad.

*Observation.* The Pond Pine sometimes grows with the Long-leaved Pine in abandoned fields near the swamps. The dryness of the soil occasions no difference in its form. This observation is important, as the species under consideration is frequently confounded with the Pitch Pine, which it strikingly resembles.

#### PLATE CXLII.

*A branch with a cone of the natural size. Fig. 1, A leaf.  
Fig. 2, A seed.*

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## PITCH PINE.

**PINUS RIGIDA.** *P. arbor ramosa; cortice scabro-rimosa; gemmis resinosis; foliis ternis; amentis masculis erecto-incumbentibus; strobilis sparsis vel aggregatis; squamis echinatis; spinis rigidis.*

THIS species is known in all the United States by the name of *Pitch Pine*, and sometimes in Virginia by that of *Black Pine*, but no where by that of *Three-leaved Virginian Pine* which is used by Sir A. B. Lambert.

Except the maritime part of the Atlantic States, and the fertile regions west of the Alleghany Mountains, it is found throughout the United States, but most abundantly upon the Atlantic coast, where the soil is diversified but generally meager. The vicinity of Brunswick in the District of Maine, and of Burlington on Lake Champlain in the State of Vermont, are the most northern points at which I have observed it; in these places it commonly grows in light, even, friable, sandy soils, which it occupies almost exclusively. It does not exceed 12 or 15 feet in height, and its slender branches, laden with puny cones, evince the feebleness of its vegetation.

In Pennsylvania and Virginia the ridges of the Alleghanies are sometimes covered with it, as I have remarked in travelling from Philadelphia to Pittsburgh, and particularly in traversing the *South Mountains*, on



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the ridge called *Saddle Hill*, 30 miles from Bedford. Here the soil is a little more generous, consisting of clay thickly sown with stones, and the Pitch Pine is 35 or 40 feet high, and 12 or 15 inches in diameter.

In the lower part of New Jersey, Pennsylvania and Maryland, it is frequently seen in the large swamps filled with the Red Cedar, which are constantly miry or covered with water; in such situations it is 70 or 80 feet high and from 20 to 28 inches in diameter, and exceeds the surrounding trees both in bulk and elevation. It supports a long time the presence of sea-water, which in spring-tides overflows the salt-meadows, where it is sometimes found alone of its genus.

The buds of the Pitch Pine are always resinous, and its triple leaves vary in length from an inch and a half to 7 inches, according to the degree of moisture in the soil. The aments are an inch long, straight and winged like those of the Pond Pine. The size of the cones depends upon the nature of the soil, and varies from less than an inch to more than three inches in length; they are of a pyramidal shape, and each scale is pointed with an acute spine about two lines long. Wherever these trees grow in masses the cones are dispersed singly over the branches, and, as I have learned by constant observation, they release the seeds the first autumn after their maturity; but on solitary stocks, exposed to the buffeting of the winds, the cones are collected in groups of four, five, or even a larger number, and remain

closed for several years. This clustering of the cones serves, also, to distinguish the Jersey and Table Mountain Pines.

The Pitch Pine has a thick, blackish, deeply furrowed bark. It is remarkable for the number of its branches, which occupy two thirds of its trunk and render the wood extremely knotty. The concentric circles are widely distant, and three fourths of the larger stocks consist of sap. On mountains and gravelly lands the wood is compact, heavy, and surcharged with resin, whence is derived the name of *Pitch Pine*: in swamps, on the contrary, it is light, soft, and composed almost wholly of sap; it is then called *Sap Pine*. These essential defects place it below the Yellow Pine, but as that species is daily dwindling by the vast consumption in civil and naval architecture, it is partially replaced by the Pitch Pine, the poorer variety of which is used for the boxes employed in packing certain sorts of merchandize, such as soap, candles, etc.

On some parts of the Alleghanies, where this tree abounds, houses are built of it, and the wood, if it is not covered with paint, is recognized by its numerous knots. It is thought better than the Yellow Pine for floors that are frequently washed, as the resin with which it is impregnated renders it firmer and more durable. It serves perfectly well for ship-pumps, for which purpose trees with very little heart are preferred. The bakers of New York, Philadelphia and Baltimore, and

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the brick-makers in the vicinity of these cities, consume it in prodigious quantities; it is sold at Philadelphia at 6 dollars a cord. From the most resinous stocks is procured the lamp-black of commerce.

The Pitch Pine seems to have formerly abounded in Connecticut, Massachusetts and New Hampshire; for, since the beginning of the seventeenth century till 1776, they have furnished a certain quantity of tar. About the year 1705, upon a misunderstanding with Sweden, whence she had drawn her supplies, Great Britain encouraged this branch of industry in the northern part of America by a premium of one pound sterling for eight barrels of tar made from dead wood, and of two pounds for the same quantity extracted from green trees. The method of depriving the trees of their bark and felling them the following year, whose excellence has since been proved by Buffon's experiments on the conversion of alburnum into perfect wood, and which might be profitably applied in the United States, was published and disseminated. In consequence of this encouragement, or from other causes, the destruction has been so rapid that the Northern States no longer furnish turpentine or tar for their own consumption. The little tar that is made on the shores of Lake Champlain is used on the small vessels that ply upon its surface, or is sent to Quebec. A few of the poorer inhabitants in the maritime part of New Jersey live by this resource, and the product of their industry is sent

to Philadelphia, where it is less esteemed than the tar of the Southern States. What is required for the few vessels that are annually launched on the Ohio, is obtained at an exorbitant price from the Alleghany Mountains, and from the borders of Tar Creek, which empties into the Ohio 20 miles below Pittsburgh. The essence of turpentine used in the western country in painting is drawn from Philadelphia and Baltimore.

Such is the sum of my information concerning the Pitch Pine ; I have already remarked that on dry gravelly soils its wood is knotty, and on humid lands, of so poor a quality as to be unfit for works that require strength and durability. Several other species are preferable to this, such as the Yellow and Red Pines, which grow in the same soils, and are sometimes associated with it in the forests.

PLATE CXLIII.

*A branch with a cone of the natural size. Fig. 1, A leaf.  
Fig. 2, A seed.*

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## LOBLOLLY PINE.

**PINUS TÆDA.** *P. arbor maxima, supernè patula; foliis ternis, prælongis; amentis masculis divergentibus; strobilis 4 uncialibus; tessulis mucrone sursum rigide uncinato; fructiferis sub-rhomboideis.*

THROUGHOUT the lower part of the Southern States this species is called *Loblolly Pine*, and sometimes *White Pine* about Petersburg and Richmond in Virginia. I observed it for the first time near Fredericksburgh, 250 miles south of Philadelphia, and I believe it does not exist much farther north; it certainly is not found in Pennsylvania, as Sir A. B. Lambert mistakingly asserts after Vanghenheim.

In the lower part of Virginia, and in the districts of North Carolina situated north-east of the river Cape Fear, over an extent of nearly 200 miles, it grows wherever the soil is dry and sandy; on spots consisting of red clay mingled with gravel it is supplanted by the Yellow Pine and by different species of Oak: the two Pines are regularly alternated according to the variations in the soil, and frequently vanish and reappear at intervals of 4 or 5 miles.

In the same parts of Virginia this species exclusively occupies lands that have been exhausted by cultivation, and amid forests of Oak tracts of 100 or 200 acres are not unfrequently seen covered with thriving young

**Pines.** In the more Southern States it is the most common species after the Long-leaved Pine, but it grows only in the *branch-swamps*, or long narrow marshes that intersect the *pine-barrens*, and near the creeks and rivers, where the soil is of middling fertility and susceptible of improvement: such is the vicinity of Charleston, S. C., which is covered to the distance of 5 or 6 miles with Loblolly Pines.

The leaves are fine, of a light green, 6 inches long, and united to the number of three, and sometimes of four on young and vigorous stocks. The bloom takes place in the beginning of April; the aments are nearly an inch long, and are bent and intermingled like those of the Long-leaved Pine. The cones are about 4 inches in length, and armed with strong spines; when closed they have the form of an elongated pyramid, and when open, of a rhombus more or less perfect: the seeds are cast the first year.

The tree exceeds 80 feet in height, with a diameter of 2 or 3 feet and a wide-spreading summit. The tallest stocks in proportion to their diameter I observed near Richmond, on a light, arid soil; from several of them cylinders might have been formed, 12 or 15 inches in diameter and 50 feet in length, perfectly regular and free from knots.

This wood has a still greater proportion of sap than that of the Pond and Pitch Pines: in trunks 3 feet in diameter I have constantly found 30 inches of alburnum,

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and in those of a foot in diameter and 30 or 35 feet in height, not more than an inch of heart. The concentric circles are widely distant, as might be supposed from the rapidity of its growth in the more Southern States; in Virginia, where it vegetates more slowly, its texture is closer and the proportion of sap less considerable, as I have particularly observed at the saw-mills of Petersburg.

Three fourths of the houses in this part of Virginia are built of the Loblolly Pine, which is even used in the absence of the Yellow Pine for the ground-floors; but the boards, though only 4 inches wide and strongly nailed, shrink and become uneven. This inconvenience is attributable to its spongy consistence, and is not experienced in the Long-leaved Pine, whose concentric circles are twelve times as numerous in the same space.

In the ports of the Southern States this species is used, like the Pitch Pine in those of the North, for the pumps of ships; at Charleston the wharfs are built with logs of the Loblolly Pine, consolidated with earth; bakers consume it in their ovens, and it is sold a third cheaper than the more resinous wood of the Long-leaved Pine.

This species is applied only to secondary uses; it decays rapidly when exposed to the air, and is regarded as one of the least valuable of the Pines. It speedily possesses itself of deserted lands, and renders a long labour necessary to clear them anew for cultivation. Though little esteemed in America, it would be an im-

portant acquisition to the South of Europe, where a tree of fine appearance and rapid vegetation is an invaluable treasure. It might be employed in joinery for objects concealed from sight, for packing-cases, etc. It remains to be proved whether it would not grow more rapidly than the Maritime Pine on the plains of Bordeaux. It supports a more northern climate, and even fructifies at Paris, but probably does not attain its perfect development.

It affords turpentine in abundance, but in a less fluid state than that of the Long-leaved Pine: as it contains more alburnum, from which the turpentine distils, perhaps by making deeper incisions it would yield a greater product.

The figure of this species in Sir A. B. Lambert's work is correct; but he mistakes in describing it as of little stature: *arbor humilis*, etc.; it is, on the contrary, next to the White Pine, the tallest tree of its genus in the United States.

#### PLATE CXLIV.

*A branch with a cone of the natural size. Fig. 1, A leaf.  
Fig. 2, A seed.*

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# WHITE PINE.

**PINUS STROBUS.** *P. arbor excelsa cortice lævi, cinereo ætate; foliis quinis, gracilibus, vaginis nullis; amentis masculis parvis, rufis; strobilis lævigatis pendulis longo-cylindræcis.*

This species, one of the most interesting of the American Pines, is known in Canada and the United States by the name of *White Pine*, from the perfect whiteness of its wood when freshly exposed, and in New Hampshire and Maine, by the secondary denominations of *Pumpkin Pine*, *Apple Pine* and *Sapling Pine*, which are derived from certain accidental peculiarities.

The leaves of the White Pine are five-fold, 4 inches long, numerous, slender, and of a bluish green: to the lightness and delicacy of the foliage is owing the elegant appearance of the young trees. The male aments are 4 or 5 lines long, united to the number of 5 or 6, and arranged like those of the Loblolly and Long-leaved Pines; they turn reddish before they are cast. The cones are 4 or 5 inches long, 10 lines in diameter in the middle, pedunculated, pendulous, somewhat arched, and composed of thin, smooth scales, rounded at the base. They open about the first of October to release the seeds, of which a part are left adhering to the turpentine that exudes from the scales.

This tree is diffused, though not uniformly, over a vast extent of country; it is incapable of supporting

\*? See Enderbury's *Bot. of p. 110*



intense cold, and still less extreme heat. My father, in returning from Hudson's Bay, after traversing 300 miles without perceiving a vestige of it, first observed it about 40 leagues from the mouth of the Mistassin, which discharges itself into Lake St. John in Canada, in the latitude of  $48^{\circ} 50'$ . Two degrees farther south he found it common, which was doubtless owing rather to a difference of soil than of climate. From his observations and my own it appears to be most abundant between the 43d and 47th degrees of latitude; farther south it is found in the vallies and on the declivities of the Alleghanies to their termination, but at a distance from the mountains on either side its growth is forbidden by the warmth of the climate. It is said with great probability to be multiplied near the source of the Mississippi, which is in the same latitude with the District of Maine, the upper part of New Hampshire, the State of Vermont and the commencement of the St. Lawrence, where it attains its greatest dimensions. In these countries I have seen it in very different situations, and it seems to accommodate itself to all varieties of soil except such as consist wholly of sand and such as are almost constantly submerged. But I have seen the largest stocks in the bottom of soft, friable and fertile vallies, on the banks of rivers composed of deep, cool, black sand, and in swamps filled with the White Cedar and covered with a thick and constantly humid carpet of *sphagnum*. Near Norridgewock on the river Kennebeck,

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in one of these swamps, which is accessible only in midsummer, I measured two trunks felled for canoes, of which one was 154 feet long and 54 inches in diameter, and the other, 142 feet long and 44 inches in diameter, at three feet from the ground. Mention is made in Belknap's History of New Hampshire of a White Pine felled near the river Merrimack, 7 feet 8 inches in diameter, and near Hollowell I saw a stump exceeding 6 feet: these enormous stocks had probably reached the greatest height attained by the species, which is about 180 feet: I have been assured by persons worthy of belief that in a few instances they had felled individual trees of nearly this stature. Hence we must conclude that the authors who have stated its height at 260 feet have been misled by incorrect reports.

But this ancient and majestic inhabitant of the North American forests is still the loftiest and most valuable of their productions, and its summit is seen at an immense distance aspiring towards heaven, far above the heads of the surrounding trees. The trunk is simple for two thirds or three fourths of its height, and the limbs are short and verticillate, or disposed in stages one above another to the top of the tree, which is formed by three or four upright branches seemingly detached and unsupported. In forests composed of the Sugar Maple, the Beeches or the Oaks, where the soil is strong and proper for the culture of corn, as for example on the shores of Lake Champlain, it is arrested at a lower height and

diffused into a spacious summit; but it is still taller and more vigorous than the neighbouring trees.

In the District of Maine and the Province of Nova Scotia I have constantly remarked that the White Pine is the foremost tree in taking possession of barren deserted lands, and the most hardy in resisting the impetuous gales from the ocean.

On young stocks not exceeding 40 feet in height the bark of the trunk and branches is smooth and even polished; as the tree advances in age it splits and becomes rugged and grey, but does not fall off in scales like that of the other Pines. The White Pine is, also, distinguished by the sensible diminution of its trunk from the base to the summit, in consequence of which it is more difficult to procure sticks of great length and uniform diameter: this disadvantage, however, is compensated by its bulk and by the small proportion of its alburnum; a trunk of one foot in diameter contains 11 inches of perfect wood.

The wood of this species is employed in greater quantities and far more diversified uses than that of any other American Pine; yet it is not without essential defects; it has little strength, gives a feeble hold to nails, and sometimes swells by the humidity of the atmosphere. These properties are compensated however by others which give it a decided superiority; it is soft, light, free from knots and easily wrought, is more durable, and less liable to split when exposed to the sun, furnishes

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boards of a great width, and timber of large dimensions, in fine, it is still abundant and cheap.

I have constantly observed the influence of soil to be greater upon resinous than upon leafy trees. The qualities of the White Pine, in particular, are strikingly affected by it. In loose, deep, humid soils, it unites in the highest degree all the valuable properties by which it is characterized, especially lightness and fineness of texture, so that it may be smoothly cut in every direction; and hence, perhaps, is derived the name of *Pumpkin Pine*. On dry, elevated lands, its wood is firmer and more resinous, with a coarser grain and more distant concentrical circles, and it is then called *Sapling Pine*.

Throughout the Northern States, except in the larger capitals, seven-tenths of the houses are of wood, of which three quarters, estimated at about 500,000, are almost wholly of White Pine: even the suburbs of the cities are built of wood. The principal beams of churches and other large edifices are of White Pine.

The ornamental work of outer doors, the cornices and frizes of apartments, and the mouldings of fire-places, which in America are elegantly wrought, are of this wood. It receives gilding well, and is therefore selected for looking-glass and picture frames. Sculptors employ it exclusively for the images that adorn the bows of vessels, for which they prefer the variety called *Pumpkin Pine*.

At Boston, and in other towns of the Northern

States, the inside of mahogany furniture and of trunks, the bottom of windsor chairs of an inferior quality, water-pails, a great part of the boxes used for packing goods, the shelves of shops, and an endless variety of other objects, are made of White Pine.

In the District of Maine it is employed for barrels to contain salted fish, especially the variety called *Sapling Pine*, which is of a stronger consistence. For the magnificent wooden bridges over the Schuylkill at Philadelphia and the Delaware at Trenton; and for those which unite Cambridge and Charleston with Boston of which the first is 1,500 and the second 3,000 feet in length, the White Pine has been chosen for its durability. It serves exclusively for the masts of the numerous vessels constructed in the Northern and Middle States, and for this purpose it would be difficult to replace it in North America. Before the war of Independence, England is said to have furnished herself with masts from the United States, and she still completes from America the demand which cannot be fully supplied from the north of Europe: the finest timber of this species is brought from Maine, and particularly from the river Kennebeck.

Soon after the establishment of the Colonies, England became sensible of the value of this resource, and solicitous for its preservation. In 1711 and 1721, severe ordinances were enacted, prohibiting the cutting of any trees proper for masts on the possessions of the

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crown. The order comprised the vast countries bounded on the south by New Jersey and on the north by the upper limit of Nova Scotia : I am unable to say with what degree of rigour it was enforced before the American revolution , but for a space of 600 miles, from Philadelphia to a distance beyond Boston, I did not observe a single stock of the White Pine large enough for the mast of a vessel of 600 tons.

The principal superiority of the White Pine masts over those brought from Riga is their lightness ; but they have less strength, and are said to decay more rapidly between decks and at the point of intersection of the yards : this renders the Long-leaved Pine superior to the White Pine in the opinion of the greater part of American ship-builders. But some of them are of opinion that the White Pine would be equally durable if the end was carefully protected from the weather. With this view an experiment has been imagined of a hole several feet deep made in the top of the mast, filled with oil, and hermetically sealed ; the oil is said to be absorbed in a few months. The bowsprits and yards of ships of war are of this species.

The wood is not resinous enough to furnish turpentine for commerce, nor would the labour of extracting it be easy, since the White Pine occupies exclusively tracts of only a few hundred acres, and is usually mingled in different proportions with the leafy trees.

The vast consumption of this tree for domestic use,

and for exportation to the West Indies and to Europe; renders it necessary every year to penetrate farther into the country, and inroads are already made, in quest of this species only, upon forests which probably will not be cleared for cultivation in 25 or 30 years.

The persons engaged in this branch of industry are in general emigrants from New Hampshire, lead by inconstancy of character or by the desire of amassing rapidly the means of purchasing a hundred acres of land<sup>1</sup> for the establishment of their families. In the summer they unite in small companies, and traverse these vast solitudes in every direction to ascertain the places in which the Pines abound. After cutting the grass and converting it into hay for the nourishment of the cattle to be employed in their labour, they return home. In the beginning of winter they enter the forests again, establish themselves in huts covered with the bark of the Canoe Birch or the Arbor Vitæ, and though the cold is so intense that the mercury sometimes remains for several weeks from 40 to 45 degrees<sup>2</sup> below the point of congelation, they persevere with unabated courage in their work. When the trees are felled they cut them into logs from 14 to 18 feet long, and by means of their cattle, which they employ with great dexterity, drag them to the river, and, after stamping on them a mark of pro-

<sup>1</sup> The price of land in the County of Kennebeck, in 1807, was 5 or 6 dollars an acre.

<sup>2</sup> Of Farenheit's scale.

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perty, roll them upon its frozen bosom. At the breaking up of the ice in the spring they float down with the current. All the logs that come down the Kennebeck are stopped at Winslow, about 120 miles from the sea, where each person selects his own and forms them into rafts with the intention of selling them to the proprietors of the numerous saw-mills between that place and the sea, or of having them sawn for his own benefit at the price of a half or even of three quarters of the product in abundant years.

When I was at Winslow in August 1806, the river was still covered with thousands of logs, of which the diameter of the greater part was 15 or 16 inches, and that of the remainder (perhaps one fiftieth of the whole) 20 inches. The Blue Ash and the Red Pine were the only species mingled with them, and these not in the proportion of one to a hundred. The logs which are not sawn the first year are attacked by large worms, which form in every direction holes about two lines in diameter; but if stript of the bark they remain uninjured for thirty years: the same remark is applicable to the stumps, which resist the influences of heat and moisture during a great length of time, and it has passed into proverb that the man who cuts down a Pine never lives to see it decay. In Hollowell, near the Kennebeck, I saw several stumps unchanged after an exposure of forty years. Next to the District of Maine, which furnishes three quarters of the White Pine exported from the

United States, including what comes from New Hampshire by the Merimack and is brought to Boston, the shores of Lake Champlain appeared to be the most abundantly peopled with this species, and to be not unfavourably situated for its transportation. All that is cut beyond Ticonderaga, comprising about three-fourths of the length of the lake, which is 150 miles from north to south, is carried to Quebec, 270 miles distant, by the Sorel and the St. Lawrence. What is furnished by the southern part of the lake is sawn at Skeensborough, transported 70 miles in the winter on sledges to Albany, and, with all the lumber of the North river, brought down in the spring to New York in sloops of 80 or 100 tons, to be afterwards exported in great part to Europe, the West Indies, and the Southern States.

By an extract from the custom-house register of Fort St. John, the quantity of this wood that passed down the Sorel for Quebec, between the first of May 1807 and the 30th of July following, was 132,720 cubic feet of square timber, 160,000 feet of common boards, 67,000 feet of planks two inches thick, 20 masts, and 4,545 logs of the same dimensions as are brought from the District of Maine.

The upper part of Pennsylvania, near the source of the Delaware and Susquehannah, which is mountainous and cold, possesses large forests of this Pine, and in the spring the timber floats down these streams for the internal consumption of the State. It enters into the

construction of towns, and Philadelphia built at Philadelphia.

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Boston in the North in the following 25 feet long or square part of from into merchant boards. The an inch thick 15 feet long New York at the same thousand



construction of houses both in the country and in the towns, and is sawn into planks for exportation from Philadelphia to the West Indies. The masts of vessels built at Philadelphia are also obtained from the Delaware.

Beyond the mountains, near the springs of the river Alleghany, from 150 to 180 miles from its junction with the Ohio, is cut all the White Pine destined for the market of New Orleans, which is 2,900 miles distant. In the spring, immense quantities descend the river for the consumption of the country. Three quarters of the houses of Wheeling, Marietta and Pittsburgh, and of Washington in Kentucky, are built with White Pine boards, which are sold at Pittsburgh at 6 or 7 dollars a thousand feet.

Boston is the principal emporium of this commerce in the Northern States. The White Pine is found there in the following forms :— In square pieces from 12 to 25 feet long, and of different diameters ; in *scantling*, or square pieces 6 inches in diameter, for the lighter part of frames ; and in boards, which are divided into *merchantable* or *common*, and into *clear* or *picked* boards. The merchantable boards are three fourths of an inch thick, from 10 to 15 inches wide, from 10 to 15 feet long, and frequently deformed with knots : at New York they are called Albany boards, and are sold at the same price as at Boston, or from 8 to 10 dollars a thousand feet. The clear boards, formed from the largest

stocks of the Pumpkin Pine, are of the same length and thickness as the first, and 20, 24 and 30 inches wide. They should be perfectly *clear*, but they are admitted if they have only two knots small enough to be covered with the thumb : they are sold at 20 to 26 dollars a thousand feet, and are employed for all light and delicate works of joinery, particularly for the panels of doors and the mouldings of apartments : at Philadelphia they are called *White Pine panels*.

This wood is also formed into *clap-boards* and *shingles*. The clap-boards are of an indeterminate length, 6 inches wide, 3 lines thick at one edge, and thinner at the other : they form the exterior covering of houses, and are placed horizontally lapping one upon another, so that the thinner edge is covered. The shingles are commonly 18 inches long, from 3 to 6 inches wide, 3 lines thick at one end, and one line at the other : they should be free from knots, and made only of the perfect wood. They are packed in square bundles, and sustained by two cross pieces of wood confined by withes. The bundles sometimes consist of 500, but oftener of 250 shingles : the price at Hollowell, in 1807, was 3 dollars a thousand : two men can make 16 or 18 hundred in a day.

East of the river Hudson the houses are almost invariably covered with these shingles, which last only 12 or 15 years. They are exported in great quantities to the West Indies, and in the French islands they are called *essentes blanches*.

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From these details an estimate may be formed of the consumption of the White Pine in the United States : that of Europe and the West Indies is also considerable. In a table of importation from the United States presented to the Parliament of Great Britain, the timber introduced in 1807 is reckoned at 1,302,980 dollars, of which I suppose the White Pine to have formed a fifth. In 1808 it was sold at Liverpool at about 60 cents the cubic foot. Planks 2 inches thick and 12 wide were worth 4 cents a foot, and common planks 6 cents.

In this statement the wood imported from New Brunswick is not included, nor the vast quantities sent from the United States to the West India Islands not dependent upon Great Britain.

The precious qualities and varied uses of this tree are sufficient motives for propagating it in Europe. It flourishes in the centre of France, but it would succeed better on the borders of the Rhine, in the vallies of the Alps and Pyrenees, and in the cold and humid climates of Germany, Poland and Russia : its vegetation appeared to me more vigorous in Belgium than in the neighbourhood of Paris. When the forests of Wild Pine and of Norway Spruce Fir are renewed in those countries, the White Pine should be introduced ; it will be easy to decide whether it can be successfully naturalized.

PLATE CXLV.

*A branch with a cone of the natural size. Fig. 1. A leaf.  
Fig. 2, A seed.*

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## NORWAY SPRUCE FIR.

**ABIES PICEA.** *A. arbor excelsa; foliis solitariis, subtetragonis, subulatis; strobilis cylindraceutis, pendulis; squamis rhombeis, planis; margine repandis, cerosis.*

**THE** Norway Spruce Fir, like the Wild Pine, is indigenous to the northern climates of Europe and Asia, and becomes rare in descending towards the South. In France, Italy and Spain, it abounds only among the mountains, in deep vallies, and on declivities exposed to the north.

This is one of the tallest trees of the Old Continent: it is straight-bodied, from 120 to 150 feet in height, and from 3 to 5 feet in diameter, and is a hundred years in acquiring its growth. Its dark foliage gives it a funereal aspect, which is rendered more gloomy by the declining of its branches towards the earth. The limbs, as in the American Spruces, are verticillate, and spring from a common centre. The leaves are longer, but less numerous, than those of the American species, and are slightly arched, firm and acute. The flowers form red aments at the extremity of the upper branches, and are succeeded by reddish, cylindrical cones, 5 or 6 inches long and 15 or 18 lines in diameter, containing small winged seeds, which are ripe towards the end of November.





Norway Spruce Fir.

*Abies picea.*

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The wood is essentially different from that of the Wild Pine, being whiter, far less impregnated with resin, and consequently lighter, to which is added greater elasticity. The union of these qualities renders it peculiarly proper for the yards of large ships. Besides this important use, it is much employed in England in joinery, and is called among workmen *white deal*. It is brought principally from Norway, and forms a large proportion of the commerce of that country in wood, which exceeds a million and a half of dollars annually. In the north of Europe its bark is frequently substituted for that of the Oak in tanning. A resinous substance, less fluid than that of the Pines, distils between the bark and the trunk, which is mixed with lamp-black and used by shoe-makers.

The Norway Spruce Fir is attacked, like the Wild Pine, by the insect *Bostrichus piniperda*, which makes such havock of the resinous trees.

The extensive use of this wood in Germany has caused great attention to be paid to the forming and preserving of forests. The plantation is begun by thoroughly loosening the ground in the month of March, and the seed is mixed, in the proportion of one sixth, with oats.

The wood of the Norway Spruce is not superior to that of the Black Spruce, but in my opinion the European species would be preferable for the northern parts of America.

*Observation.* A variety of this species is said to exist, called *Long Cornish Fir*, of which the cones are much larger.

## PLATE CXLVI.

*A branch with a cone of the natural size. Fig. 1, A seed.*





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Black (double) Spruce.  
*Abies nigra.*

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**BLACK OR DOUBLE SPRUCE.**

**ABIES NIGRA.** *A. arbor maxima; foliis solitariis undique circa ramos erectis, brevioribus, subtetragonis; strobilis ovatis, pendulis; squamis subundulatis, apice crenulatis aut divisis.*

THIS tree, which appertains to the coldest regions of North America, is called *Epinette noire* and *Epinette à la bière* in Canada, *Double Spruce* in the District of Maine, and *Black Spruce* in Nova Scotia, though the two last denominations are known throughout all these countries. I have preferred that of *Black Spruce*, which expresses a striking character of the tree, and is contrasted with that of the following species, the *White Spruce*. From the influence of the soil upon the wood it is sometimes called *Red Spruce*, and this variety has been considered, mistakenly as I shall prove in the sequel, as a distinct species.

The *Black Spruce* is most abundant in the countries lying between the 44th and 53d degrees of latitude, and between the 55th and 75th degrees of longitude, viz: Lower Canada, Newfoundland, New Brunswick, Nova Scotia, the District of Maine, Vermont and the upper part of New Hampshire; and it is so multiplied as often to constitute a third part of the forests by which they are uninterruptedly covered. Farther south it is rarely



seen except in cold and humid situations on the top of the Alleghanies. It is particularly remarked in a large swamp not far from Wilksberry in Pennsylvania, and on the Black Mountain in South Carolina, which is one of the loftiest summits of the Southern States, and is probably thus named from the melancholy aspect occasioned by the dusky foliage of this tree. It is sometimes met with also in the White Cedar swamps near Philadelphia and New York; but in these places, which are always miry and sometimes submerged, its vegetation is feeble. The leaves are of a dark, gloomy green, about 4 lines long, firm, numerous, and attached singly over the surface of the branches. The flowers appear at the extremity of the highest twigs, and are succeeded by small, reddish, oval cones, pointing towards the earth, and varying in length from 8 lines to 2 inches. They are composed of thin scales, slightly notched at the base, and sometimes split for half their length on the most vigorous trees, on which the cones are also the largest: they are not ripe till the end of autumn, when they open for the escape of the seeds, which are small, light, and surmounted by a wing, by means of which they are wafted abroad by the wind.

The regions in which the Black Spruce is the most abundant are often diversified with hills, and the finest forests are found in vallies where the soil is black, humid, deep, and covered with a thick bed of moss: though crowded so-as to leave an interval of only three,

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four or five feet, these stocks attain their fullest development, which is 70 or 80 feet in height and from 15 to 20 inches in diameter. The summit is a regular pyramid, and has a beautiful appearance on insulated trees. This agreeable form is owing to the spreading of the branches in a horizontal instead of a declining direction, like those of the true Norway Pine, which is a more gloomy tree.

The trunk, unlike that of the Pines, is smooth, and is remarkable for its perpendicular ascension and for its regular diminution from the base to the summit, which is terminated by an annual shoot 12 or 15 inches long. It is found in the same countries on the declivities of mountains, where the soil is stony, dry, and covered only with a thin bed of moss; but as this soil is less favourable, its growth is less luxuriant and its stature less commanding. The same observation is applicable to other tracts designated by the name of *poor black lands*, which are meager spots covered with the Black Spruce. In these situations it has shorter, thicker leaves of a still darker colour, with cones only half as large, but similar in form and ripe at the same period.

I shall frequently have occasion to observe that the inhabitants of the country, and mechanics who work in wood, take notice only of certain striking appearances in forest trees, such as the quality of the wood, its colour and that of the bark; and that, from ignorance of botanical characters, they give different names to

the same tree, according to certain variations in these respects arising from local circumstances. To this cause must be attributed the popular distinction of Black and Red Spruce. Sir A. B. Lambert, misled by the remarkable size of the cones of the last variety which have been sent to England, and by incorrect information, determined, with some hesitation, to describe and figure it under the name of *Abies rubra*: he represents it as inferior in every respect to the Black Spruce, though, according to my own observations in the country where it grows, it unites in the highest degree all the good qualities which characterize the species. Samples of the heart would probably have confirmed his opinion that they are distinct species; for that of the Black Spruce is white, and that of the other variety reddish. But I repeat that this difference in the wood of trees of the same species is produced only by the influence of soil.

The distinguishing properties of the Black Spruce are strength, lightness and elasticity. Josselyn, in his *History of New England*, published in London in 1672, informs us that it was considered at that period as furnishing the best yards and topmasts in the world. Besides possessing these qualities, as we have already observed, in a higher degree, the Red Spruce is superior in size to the other variety, which grows in a poorer soil, and is less supple and more liable to be crooked.

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In the dock-yards of the United States the spars are usually of Black Spruce from the District of Maine, and for the same purpose it is exported in great quantities from Maine, New Brunswick and Nova Scotia to the West Indies and to Liverpool.

Oddy says that in England it is preferred to the Norway Pine, *Abies picea*, but that it does not afford pieces of sufficient dimensions for the yards of men of war, which are made of the Norway Pine or of the White Pine.

The *knees* of vessels are frequently of Black Spruce in the District of Maine, and sometimes at Boston, where the Oak is becoming rare. When these pieces are of Oak, they are formed of two limbs united at the base; but when of Spruce, they are made from the base of the trunk and one of the principal roots. From its strength and durability this species is the most proper substitute for the Oak and the Larch which is also rare in the northern parts of the United States. In Maine and at Boston it is often employed for the rafters of houses, and is more esteemed than the Hemlock Spruce, which was formerly preferred. Some persons select it for floors; it is tougher than the White Pine, but more liable to crack.

In all these regions, and particularly in Maine and New Brunswick, the Black Spruce is sawn into boards of considerable width, which are sold a fourth cheaper than those of White Pine. They are exported to the

West Indies and to England, and I have been informed that a large part of them are consumed at Manchester and Birmingham in packing goods. The supply I doubt not will long be abundant, for the species is a hundred times more multiplied than the White Pine. In Nova Scotia the Red Spruce, which is straight-grained and more easily wrought, is employed for barrels to contain salted fish. This species is not resinous enough to afford turpentine as an article of commerce. The wood is filled with air, and snaps in burning like Chesnut.

With the young branches, especially those of the Black Spruce, is made the salutary drink known by the name of *spruce beer*, which in long voyages is found an efficacious preventive of the scurvy. The twigs are boiled in water, a certain quantity of melasses or maple sugar is added, and the mixture is left to ferment. The essence of spruce is obtained by evaporating, to the consistence of an extract, water in which the summits of the young branches have been boiled. As I have never seen the operation performed, I cannot describe its details; but I have often witnessed the process of making the beer in the country about Halifax and in Maine, and can affirm with confidence that it is not, as Sir A. B. Lambert asserts, the White Spruce which is used for this purpose.

If the wood of this species has in fact been proved in England to be superior to that of the Norway Pine, it would be useful to propagate it on the Old Continent;

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but in my opinion it would flourish only in the coldest and most humid countries of the north of Europe, and on some parts of the Alps, the Pyrenees, and the Highlands of Scotland.

## PLATE CXLVII.

*A branch with a cone of the natural size. Fig. 1, A leaf.  
Fig. 2, A seed.*

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## WHITE OR SINGLE SPRUCE.

**ABIES ALBA.** *A. arbor* 45-50 pedalis; foliis subglaucis undique circa ramos erectis, tetragonis; strobilis oblongo-cylindraccis, pendulis, laxis; squamis margine integerrimis.

THIS species is indigenous to the same countries as the preceding. In Canada it is called *Epinette blanche*, in Nova Scotia *White Spruce*, and in New Brunswick and the District of Maine *Single Spruce*. As the two last denominations are generally known, I have adopted that which appeared to me the best.

The **White Spruce** commences a few degrees farther south than the species just described. In my father's notes it is first mentioned near lake St. John, between the 48th and 49th degrees of latitude. In the District of Maine, at least in the parts which I have visited, it is much less common than the **Black Spruce**, and the comparison is easily made, as they are readily distinguished, especially young and insulated stocks. Though the leaves of both encompass the branches, they are marked by several characteristic differences: those of the **White Spruce** are less numerous, longer, more pointed, at a more open angle with the branches, and of a pale, bluish green; whence is derived the specific name of *alba*. The cones are also peculiar, being of a lengthened oval form, about 2 inches in one direction, and 6 or 8 lines





White (Single) Spruce.  
*Abies alba*

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in the other : the dimensions vary according to the vigour of the tree, but the form is unchangeable. The scales are loose and thin, with entire edges, unlike those of the Black Spruce. The seeds, also, are rather smaller, and are ripe a month earlier.

This species grows in nearly the same situations as the preceding, but it has a more tapering trunk, and is inferior in stature, rarely exceeding 50 feet in height and 12 or 16 inches in diameter at three feet from the ground. Its summit, like that of the Black Spruce, is a regular pyramid, but less branching and tufted. The bark is lighter-coloured, and the difference is more striking upon the young shoots.

The wood is employed for the same uses as the other; it is, however, inferior in quality, and snaps more frequently in burning. The fibres of the roots, macerated in water, are very flexible and tough; being deprived in the operation of their pellicle, they are used in Canada to stitch together the canoes of Birch bark, the seams of which are afterwards smeared with a resin, improperly called *gum*, that distils from the tree.

Sir A. B. Lambert asserts that the bark is employed in tanning; this may possibly be true in Lower Canada and Newfoundland, which I have not visited, but it is never done in Maine, New Brunswick and Nova Scotia. The branches are not used for beer, because the leaves when bruised diffuse an unpleasant odour, which they are said to communicate to the liquid.

This species is much more common in France than the Black Spruce. It is an elegant tree while young, and as it forms an agreeable contrast with the darker foliage of the other Spruces, it is esteemed a valuable ornament for parks and gardens.

Nurserymen in France and Germany distinguish two varieties, the White or Silver Spruce and the Blue Spruce.

PLATE CXLVIII.

*A branch with a cone of the natural size. Fig. 1, A leaf.  
Fig. 2, A seed.*

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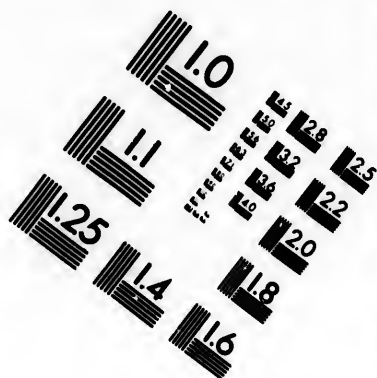
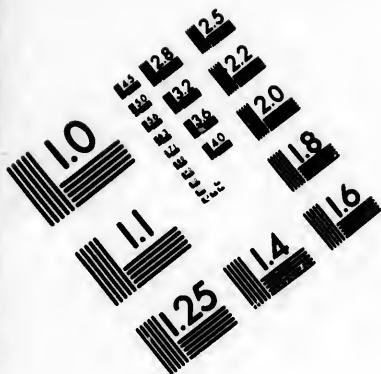
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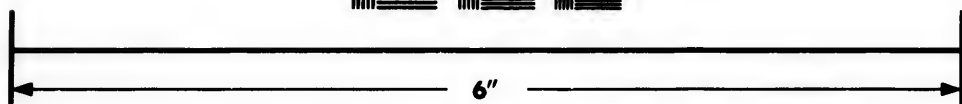
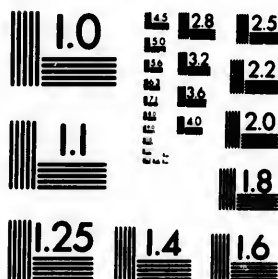
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Wm. B. Wood del.

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Hemlock Spruce.  
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## HEMLOCK SPRUCE.

**ABIES CANADENSIS.** *A. arbor maxima; ramis gracilibus; ramulis novellis villosissimis; foliis solitariis, planis, subdistichis; strobilis terminalibus, minimis, ovatis, despicentibus.*

THE Hemlock Spruce is known only by this name throughout the United States, and by that of *Pérusse* among the French inhabitants of Canada. It is natural to the coldest regions of the New World, and begins to appear about Hudson's Bay, in latitude 51°; near lake St. John and in the neighbourhood of Quebec it fills the forests, and in Nova Scotia, New Brunswick, the District of Maine, the State of Vermont and the upper part of New Hampshire, where I have observed it, it forms three quarters of the evergreen woods, of which the remainder consists of the Black Spruce. Farther south it is less common, and in the Middle and Southern States is seen only on the Alleghanies; even there it is often confined to the sides of torrents and to the most humid and gloomy exposures.

In the country east and north of Massachusetts, which, without embracing Canada, is more than 750 miles long and about 250 miles broad, the resinous trees are constantly found at the foot of the hills, and constitute nearly half of the unbroken forests which cover these



regions. Hence we may conceive how extensively this species is multiplied.

Moist grounds appear not to be in general the most favourable to its growth; when mingled with the Black Spruce it predominates less as the soil is more humid; and I have often seen large stocks among the Beeches and Sugar Maples on soils proper for corn.

The Hemlock Spruce is always larger and taller than the Black Spruce; it attains the height of 70 or 80 feet, with a circumference from 6 to 9 feet, and uniform for two thirds of its length. But if the number and distance of the concentrical circles afford a certain criterion of the longevity of trees and the rapidity of their vegetation, it must be nearly two centuries in acquiring such dimensions.

The leaves are 6 or 8 lines long, flat, numerous, irregularly disposed in two ranks, and downy at their unfolding. The cones are a little longer than the leaves, oval, pendulous, and situated at the extremity of the branches. In a favourable soil this tree has an elegant appearance while less than 30 feet high, owing to the symmetrical arrangement of its branches and to its tufted foliage, and at this age it is employed in landscape gardening. When arrived at its full growth, the large limbs are usually broken off 4 or 5 feet from the trunk, and the dried extremities are seen staring out through the little twigs which spring around them. In this mutilated state, by which it is easily recognized, it has a dis-

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agreeable aspect, and presents, while in full vigour, an image of decrepitude. This accident, which is attributed to the snow lodging upon the close, horizontal, tufted branches, never happens to the young trees, whose fibres are more flexible. The woods are also filled with dead stocks, but I am unable to say whether their destruction is occasioned by an insect which attaches itself of preference to the Pines, or to some other cause. The dead moss-grown trees, which stand mouldering for twenty or thirty years, deform the forests of this part of the United States, and give them a gloomy and desolate appearance.

The Hemlock Spruce is distinguished by the peculiarity of sometimes ceasing to grow at the height of 24 or 30 inches. In this state it has a pyramidal shape, and its compact, tufted branches adhere to the ground. It might be employed to form hedges and to decorate gardens in place of the Yew, to which it is preferable for the superior rapidity of its growth and the sprightlier tint of its foliage, while it suffers the pruning-hook with equal security: this remark I made while observing the Spruces upon an open, dry, stony spot between Portland and York.

Unhappily the properties of its wood are such as to give this species only a secondary importance, notwithstanding its abundant diffusion: it is the least valuable in this respect of all the large resinous trees of North America. But the regret which we should experience to

see it occupying so extensively the place of more useful species, is forbidden by a property of its bark inestimable to the country where it grows, that of being applicable in tanning.

It is esteemed an excellence in wood to split in a straight line, which it does when the fibre is vertical: that of the Hemlock Spruce is so oblique that it makes the circuit of stocks 15 or 20 inches in diameter ascending 5 or 6 feet. Besides this defect, which is essential and which renders it unfit for rural fence, the old trees frequently have the concentric circles separated at intervals, or, in the language of the country, are *shaky*, which greatly impairs their strength. This effect is produced by the winds, which have a powerful hold upon a large, compact summit, exposed above the heads of the surrounding trees. It is found to decay rapidly when open to the atmosphere, and is therefore improper for the external covering of houses, which is another important defect in a country where nearly all the houses are of wood. But as the White Pine becomes rarer this species is substituted for it as extensively as possible: it is firmer, though coarser grained, affords a tighter hold to nails, and offers more resistance to the impression of other bodies; for this reason it is employed in the District of Maine, in the form of two-inch planks, for threshing floors. But the most common use, in which great quantities of it are consumed in the Northern States, is for the first sheath-

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ing of wooden houses, which are afterwards covered with *clap-boards* of White Pine. For economy the interior frame is sometimes made of Hemlock Spruce, and it is found, when guarded from humidity, to be as durable as any other species. It is always chosen for the lathes of the interior walls, and is exported in this form to England. In the District of Maine it is usually taken for the posts of rural fence, which last about 15 years, and are preferable to those of Grey and Red Oak. It contains little resin, and I have found the trunk but slightly coated with turpentine where large pieces of bark had been removed long before.

I have already observed that this bark is a substitute for that of the Oaks in the preparation of leather. It is taken from the tree in the month of June, and half the epidermis is shaved off with a plane before it is thrown into the mill. From the District of Maine it is exported to Boston, Providence, etc., and is almost exclusively employed in the *tan-yards*. It is brought to New York from the upper parts of the Hudson, and is sometimes carried to Baltimore. Its deep red colour is imparted to the leather, and I have been informed by tanners that it is inferior to Oak bark, but that the two species united are better than either of them alone. Hemlock Spruce bark was once exported to England, but the commerce has ceased with the demand. The Indians are said to use it in dying their light baskets made of Red Maple.



This species yields seed in many gardens of France, England and Germany; but in France its vegetation is not luxuriant, because it is usually planted in situations too open and dry. It offers no inducement to propagate it in Europe:

The figure in Sir A. B. Lambert's work is correct, but he repeatedly errs in the brief description annexed, and takes no notice of the peculiar property of the bark.

PLATE CXLIX.

*A branch with cones of the natural size. Fig. 1, A seed.*

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*Abies balsamifera.*

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## AMERICAN SILVER FIR.

**ABIES BALSAMIFERA.** *A. arbor 40-45 pedalis; foliis solitariis, subtus argenteis, apice emarginatis integrisve, subrecurvo-patentissimis; strobilis cylindraceutis, violaceis, sursum spectantibus.*

THE coldest regions of North America are the native country of this species of Spruce. In the United States, Canada and Nova Scotia, it is called *Silver Fir*, *Fir Balsam*, and *Balsam of Gilead*.

From the observations of Messrs. Titus Smith, estimable botanists who have explored Nova Scotia and with whom I became acquainted at Halifax, by those of my father who visited Canada, and by my own, the Silver Fir appears not to constitute masses of woods, but to be disseminated, in greater or less abundance, among the Hemlock and Black Spruces. Farther south it is found only on the summit of the Alleghanies, and particularly on the loftiest mountains of North Carolina. Its height rarely exceeds 40 feet, with a diameter of 12 or 15 inches. This statement is confirmed by the persons whom I have just cited; and Vanghenheim, who never travelled in these countries, and after him Sir. A. B. Lambert, mistakenly assert that it is a tree of elevated stature. The body tapers from a foot in diameter at the surface of the ground to 7 or 8 inches at the height of

6 feet. When standing alone and developing itself naturally, its branches, which are numerous and thickly garnished with leaves, diminish in length in proportion to their height, and form a pyramid of perfect regularity: The leaves are 6 or 8 lines long, and are inserted singly on the sides and on the top of the branches; they are narrow, rigid and flat, of a bright green above and a silvery white beneath; whence probably is derived the name of the tree.

The cones are nearly cylindrical, 4 or 5 inches long; an inch in diameter, and always directed upwards; this last characteristic, which belongs also to the Silver Fir of Europe, distinguishes these species from the *Epicias*, whose cones are turned towards the earth.

The wood of the Silver Fir is light and slightly resinous, and the heart is yellowish. In Maine, where it chiefly abounds, it is not employed on account of its deficiency of size or of strength. I was informed by Messrs. Smith, that in Nova Scotia it sometimes serves for the staves of casks used in packing fish; but for this purpose the White Pine and Yellow Spruce are commonly preferred.

The resin of the Pines is extracted by means of incisions in the body of the tree, at which it exudes from the pores of the bark and from the sap-vessels of the alburnum: in the American and European Silver Firs this substance is naturally deposited in vesicles on the trunk and limbs, and is collected by bursting these tu-

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mours and receiving their contents in a bottle : only a few bottles are annually obtained in Canada, the District of Maine and the adjacent countries. It is sold in England and the United States under the name of *balm of Gilead*, though every body knows that the true balm of Gilead is produced by the *Amyris gileadensis*, a very different vegetable and a native of Asia : perhaps the name has been borrowed in consequence of some resemblance between the substances in taste and smell. The fresh turpentine is a greenish transparent fluid of an acrid penetrating taste ; given inconsiderately it produces heat in the bladder, and applied to wounds it causes inflammation and acute pains. It has been highly celebrated in England, and is recommended in certain stages of the pulmonary consumption ; in these cases it is preferred to the resin of the European Silver Fir, which is collected in a similar manner in Switzerland and in some parts of Germany.

This tree has been long cultivated in Europe, but it must be reserved for the embellishment of pleasure grounds, where its regular form and agreeable foliage give it a distinguished place among evergreen trees.

The Silver Fir of Europe is so analogous to that of America, that it is unnecessary to describe it ; the only difference is that it has longer leaves and bigger cones, and attains a much greater elevation ; according to M. Burgsdorf, grand-forester of Prussia, it is sometimes 150 feet high and 6 feet in diameter. The wood of the

two species is similar in its general character, and though the advantage is on the side of the Silver Fir of Europe, it is still inferior to the Norway Spruce Fir, which is the more to be regretted on account of its size.

PLATE CL.

*A branch with a cone of the natural size. Fig. 1, A seed.*

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## CYPRESSES.

THE researches of botanists have made us acquainted with only seven species of Cypress, of which two belong to the New Continent and are indigenous to the United States. Among the exotic species, the Pyramidical Cypress, *Cupressus fastigiata*, deserves attention in the Southern States. This tree has been celebrated from antiquity for the excellence of its wood and the singularity of its form. From the gloomy appearance of its tufted branches compressed about the trunk and charged with dark, impenetrable foliage, it was consecrated to funeral solemnities, and planted about temples and tombs.

“ The Pyramidical Cypress, originally from Crete, is 30 or 40 feet in height, smooth, and free from the defect observed in the Virginian Cedar, of cracking at the insertion of the limbs. The wood is hard, odoriferous, of an uniform texture and a brilliant red complexion. Pliny affirms that it is very durable, and that its colour is unchangeable: *Cariem vetustatemque non sentit Cupressus. . . . Materiae nitor maximè valet æternus.* PLIN: lib. 16, cap. 40. Formerly the rarest and most precious objects were preserved in boxes of Cypress, and we are informed that the doors of St. Peter's at Rome, which had lasted 1200 years, from Constantine to Eugene IV, were of this wood. It is also employed for tables, mu-



sical instruments and the tubes of organs. The fruit, which is known by the name of *Cypress nut*, is employed in medicine as an astringent; and Pliny assures us that the leaves pounded and mingled with seeds preserve them from worms.

The Cypress is multiplied from the seed, which is the best method; by layers and by slips: In the beginning of spring the seeds are sown and lightly covered in vessels filled with mould and sand. The young plants must be kept in the shade and protected from the frost. To obtain good seed, Duhamel says that in March or April we should select the cones which begin to open, and store them in a dry place; the seeds which fall out are the best; those which are obtained by opening the cones very rarely germinate." — *Desfontaines, Hist. des Arb. et Arbriss. tom. 2, p. 567.*

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# CYPRESS.

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**CUPRESSUS DISTICHA.** *C. foliis planis, quasi pinnatim distichis, deciduis; floribus masculis aphyllò-racemosis; strobilis subgloboso-ovoïdeis.*

*Taxodium distichum Rich.*

THIS species is the most interesting of its genus for the varied applications of its wood and for its extraordinary dimensions in a favourable soil and climate. In Louisiana it is called *Cypre* or *Cypres*, and in the ancient Southern States *Cypress*, and sometimes *Bald Cypress*. The names of *Black* and *White Cypress*, in the Carolinas and Georgia, are founded only on the quality and colour of the wood.

The banks of Indian river, a small stream that waters a part of Delaware in latitude 38° 50', may be assumed as its northern boundary. Hence, in proceeding southward, it becomes constantly more abundant in the swamps; but in Maryland and Virginia it is confined to the vicinity of the sea, where the winter is milder and the summer more intense. Beyond Norfolk its limits coincide exactly with those of the *pine-barrens*, and in the Carolinas and Georgia it occupies a great part of the swamps which border the rivers after they have found out their way from among the mountains and have entered the low lands.



Cathart sculp

East Florida, which I have visited, is similar in its aspect to the maritime parts of the Southern States, except that the soil is in general more uniform; hence the Long-leaved Pine and the Cypress are accompanied by a smaller variety of trees, and are consequently more abundant, the one on the low grounds and the other on the uplands.

The Mississippi, from its mouth to the river of the Arkansas, a distance, in following its windings, of more than 600 miles, is bordered with marshes, which, at the annual overflowing of this mighty stream, form a vast expanse of waters. In Louisiana those parts of the marshes where the Cypress grows almost alone are called *Cyrières*, Cypress swamps, and they sometimes occupy thousands of acres. As in the Floridas the swamps are contiguous to immeasurable plains covered with Pines, or oftener with tall grass mingled with other plants. In the midst of these Pine forests and savannas is seen here and there a bog or a splash of water filled with Cypresses, whose squalid appearance, when they exceed 18 or 20 feet in height, proves how much they are affected by the barrenness of a soil which differs from the surrounding waste only by a layer of vegetable mould a little thicker upon the quartzous sand. From these particulars a sufficiently just idea may be formed of the geographical situations and of the soil in which the Cypress is found, over an extent of more than 1,500 miles, from its first appearance towards the north to

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the Mississippi. Towards the south-west my information does not reach beyond Louisiana, though I have some reason to believe that it is seen as far as the mouth of the river *Del Norte*, latitude  $26^{\circ}$ , which, if we measure the circuit of the Gulf of Mexico, makes a distance of more than 3000 miles.

M. de Humboldt, in his interesting account of New Spain, mentions several trees of this species in the ancient gardens of the Emperor of Mexico, which were planted before the arrival of the Spaniards, and are now of considerable size.

In the swamps of the Southern States and the Floridas, on whose deep miry soil a new layer of vegetable mould is every year deposited by the floods, the Cypress attains its utmost developement. The largest stocks are 120 feet in height, and from 25 to 40 feet in circumference above the conical base, which, at the surface of the earth, is always three or four times as large as the continued diameter of the trunk : in felling them the negroes are obliged to raise themselves upon scaffolds five or six feet from the ground. The base is usually hollow for three quarters of its bulk, and is less regularly shaped than that of the Large Tupelo. Its surface is longitudinally furrowed with deep channels, whose ridges serve as cramps to fix it more firmly in the loose soil. The roots of the largest stocks, particularly of such as are most exposed to inundation, are charged with conical protuberances, commonly from 18 to 24 inches,



ripe in October, and retain their productive virtue for two years.

The wood is fine-grained, and, after being for some time exposed to the light, of a reddish colour: it possesses great strength and elasticity, and is lighter and less resinous than that of the Pines. To these properties is added the faculty of long resisting the heat and moisture of the southern climate. The colour of the bark and the properties of the wood vary with the nature of the soil; the stocks which grow near the natural bed of the rivers, and are half the year surrounded with water to the height of three or four feet, have a lighter coloured bark than those which stand retired in places which the waters do not reach, or where they sojourn but a moment. The wood, also, is whiter, less resinous and less heavy. These are called *White Cypresses*. The others, of which the bark is browner and the wood heavier, more resinous, and of a duskier hue, are called *Black Cypresses*. When destined to be employed in the arts, both varieties should be felled in the winter, and kept till, by a long process, the wood has become perfectly dry. A resin of an agreeable odour and a red colour exudes from the Cypress; it is not abundant enough to be collected for commerce, though more copious than that of the White Cedar, which is probably the reason of the wood's being denser and stronger: the negroes prefer it to that of the Pines as a dressing for suppurating wounds.



This wood is more generally employed in Louisiana than in any other part of the United States : it is profitably substituted for the White Oak and the Pine, which are rare, and it is proved to be twice as durable as the Pine. Nearly all the houses in New Orleans are still of wood, and the frame, the interior work and the outer covering are of Cypress. It was almost as generally employed in Georgia and the Carolinas soon after their settlement; but it is now replaced by other species, as all the large stocks have been consumed in the populous districts: near the swamps, where it abounds, the houses are still built, or at least covered, with it. Of whatever materials the building is constructed in these States, the roof is universally covered with Cypress shingles, which, if made from trees felled in the winter, last forty years. They are split off in a direction parallel to the concentric circles. At Norfolk in Virginia, near the *Dismal Swamp*, where immense quantities are made both of this species and of White Cedar, those of Cypress are preferred; at Philadelphia and Baltimore, where they are also procured at equal prices, the preference is given to those of White Cedar. This fact seems to support the conclusion that each unites the principles which ensure durability only in the soil and climate in which they respectively abound.

In the towns of the Southern States where the White Pine is cheap it has in a great measure taken place of the Cypress for the interior work of houses; but Cypress

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boards are still preferred for the inside of brick houses, and for window-sashes and the panels of doors exposed to the weather : cabinet-makers also choose it for the inside of mahogany furniture.

I have been assured that in Louisiana it is found highly proper for the masts and sides of vessels, and it has the same reputation in Charleston and Savannah, though at present it is little employed. Wherever it grows it is chosen for canoes, which are fashioned from a single trunk and are 30 feet long and 5 feet wide, light, solid, and more durable than those of any other tree.

On the banks of the Mississippi it is used to enclose plantations, and posts made of the perfect wood last a long time in the ground. For this last usage it is preferred to every other tree in those districts of Georgia in which it abounds or is easily procured. It makes the best pipes to convey water under ground ; especially the Black Cypress, which is more resinous and solid.

The inexhaustible Cypress-swamps on the Mississippi not only supply materials for every species of building in Lower Louisiana, but furnish for exportation to the West Indies. This branch of commerce, which consisted principally of boards and shingles, has declined within a few years, in consequence of the great exportation from the Northern States of different species of Pine, particularly the White Pine, which are sold at half the price and devoted to nearly the same uses.

At the Havannah the White Pine has generally superseded the Cypress for sugar-cases, for which it was once extensively used; for the covering of houses Cypress shingles are still preferred, and the consumption in the French, English and Danish Colonies is estimated at 100 millions of shingles annually, of which the greater part come from Norfolk, Wilmington and Savannah: more than 15 millions have been brought in a single year from Norfolk, and more than 30 millions from Wilmington. They are 22 or 44 inches long, and from 3 to 6 inches wide: in February 1808, the price of the longest was from 4 to 5 dollars a thousand at Philadelphia, and they usually bear a double price in the West Indies.

Such is, in substance, the information which I have collected concerning a tree of inestimable value to the Southern States, and particularly to Lower Louisiana, which is still more scantily furnished with good timber. If I had visited that State I could have rendered my description more complete; it is still the most detailed and exact that has appeared. To learned amateurs I leave the task of celebrating a tree so important for its uses, and so admirable for the luxuriance of its vegetation and the majesty of its form.

In Europe the patrons of useful culture and ornamental gardening have laboured zealously for more than fifty years to multiply the Cypress. Many of them are of opinion that, as it supports the winter of Paris and even of Belgium and England, it might be profitably

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planted in many vacant marshes and watery grounds. The warmest praise is due to the intentions with which this plan is recommended, but I cannot fully adopt the sanguine hopes that are entertained of its result: probably it will always be more advantageous to occupy these spots with the Ashes, the Willows, the Alders, the Poplars and the Maples, which are incomparably more rapid in their growth, which sprout afresh when felled, and whose wood is as useful in Europe where the houses are built of stone and covered with tiles or slate. I am convinced that the Cypress can never be profitably cultivated above the 44th degree of latitude; it requires heat as well as humidity, and the moderate temperature of our scanty summers is insufficient to ripen the seeds of the Bald Cypresses which were planted about Paris more than 40 years since, and which bloom every year. To the same cause must be attributed the slowness of their growth; the greater part of them are not more than 20 or 25 feet in height. The largest stocks in France are on the ancient estate of Duhamel, about 60 miles from Paris. Planted more than forty years ago, in a congenial situation, they have reached the height of 40 feet with a diameter of 11 or 12 inches; but the seeds are rarely matured. An agriculturist of excellent practical views, whose property lies partly in the plains of Bordeaux, where he has formed an establishment for the naturalization of exotic trees, has attempted the cultivation of the Cypress with the most satisfactory success.

It would be unavailing to recommend the preservation and multiplication of the Cypress in the maritime districts of the Carolinas and Georgia, though for an extent of more than 900 miles they have neither stone nor slate for building; it becomes daily more profitable for the increasing population to convert the marshes into rice-grounds, which afford a sure subsistence to the inhabitants and swell the mass of exported produce. Instead of wood, the houses will be constructed of bricks, which is already beginning to be done, and covered with slate imported from the Northern States or from Europe. It is highly probable that in less than two centuries the Cypress will disappear from the Southern States.

#### PLATE CLI.

*A branch with leaves of the natural size. Fig. 1, A cone. Fig. 2, A seed. Fig. 3, A kernel. Fig. 4, The half of a seed. Fig. 5, A conical excrescence from the roots.*

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## WHITE CEDAR.

**CUPRESSUS THYOIDES.** *C. foliis squamulatum imbricatis ;  
ramulis compressis ; strobilis minutis , globulosis.*

Among the resinous trees of the United States, the White Cedar is one of the most interesting for the varied utility of its wood. North of the river Connecticut it is rare and little employed in the arts : in the Southern States I have not seen it beyond the river Santee, but I have been assured that it is found, though not abundantly, near Augusta on the Savannah : it is multiplied only within these limits, and to the distance of 50 miles from the shore of the Ocean.

At New York, and in New Jersey and Pennsylvania, it is known by the name of *White Cedar*, and in Maryland, Virginia and North Carolina, by that of *Juniper*. I have adopted the first denomination, which is not unknown where the second is habitually used, because the tree belongs to a different genus from the Junipers. At Boston and in Vermont, New Hampshire, and the more northern parts of America, the Arbor Vitæ is called White Cedar, but I have thought proper to retain the name for the species we are considering.

The White Cedar grows only in wet grounds. In the maritime districts of New Jersey, Maryland and Virginia, it nearly fills the extensive marshes which lie ad-



adjacent to the *salt-meadows*, and are exposed in high tides to be overflowed by the sea. In New Jersey it covers almost alone the whole surface of the swamps, of which the Tupelo and Red Maple occupy the skirts. Farther south it is mingled with the Cypress, by which it is at length entirely supplanted. In Lower Jersey and Maryland the swamps are accessible only during the dryest part of the summer and when they are frozen in the winter. The trees stand so thick in them that the light can hardly penetrate the foliage, and in their gloomy shade spring at every step tufts of the Dwarf Rose Bay, Honey-suckle and Andromeda, whose luxuriant vegetation proves that they delight in dark and humid exposures.

The White Cedar is 70 or 80 feet high, and rarely more than 3 feet in diameter, unless perhaps in the great swamps which have not been thoroughly explored, such as the *Dismal Swamp* near Norfolk in Virginia, which is covered with this species and the Cypress. When the White Cedars are close and compressed, the trunk is straight, perpendicular, and destitute of branches to the height of 50 or 60 feet: they are observed to choose the centre of the swamps, and the Cypresses the circumference.

The epidermis is very thin on the young stocks; but as they grow older it becomes thick, of a soft filaceous texture, of a reddish colour, and similar to that of an old Vine. When cut, a yellow transparent resin of an agreeable odour exudes, of which a few ounces could

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The foliage is evergreen : each leaf is a little branch numerously subdivided , and composed of small, acute; imbricated scales , on the back of which a minute gland is discerned with the lens. In the angle of these ramifications grow the flowers , which are scarcely visible and which produce very small rugged cones of a greenish tint , which changes to bluish towards the fall , when they open to release the fine seeds.

The concentrical circles are always perfectly distinct even in stocks of considerable size, but their number and compactness prove that the tree arrives at its full growth only after a long lapse of years. I have counted 277 annual layers in a trunk 21 inches in diameter and 5 feet from the ground, and 47 in a plant only 8 inches thick at the surface , which proved it to be already 50 years old. I was told that the swamp in which it grew had been burnt at least half a century before , and had been re-peopled from a few stocks that escaped the conflagration , or perhaps by the seeds of the preceding year.

The wood is light , soft , fine -grained , and easily wrought. When perfectly seasoned and exposed for some time to the light it is of a rosy hue. It has a strong aromatic odour , which it preserves as long as it is guarded from humidity. The perfect wood resists the succession of dryness and moisture longer than that of any other species , and for this quality principally , as well

as its extreme lightness, it is preferred at Baltimore and Philadelphia for shingles, which are cut transversely to the concentric circles, and not parallel like those of the Cypress. They are from 24 to 27 inches long, from 4 to 6 inches broad, and 3 lines thick at the larger end: in the advertisements of Baltimore they are called *Juniper shingles*, and are sold at 4 or 5 dollars a thousand. At Philadelphia and Baltimore they are generally preferred to those of Cypress, as they are larger and are free from the defects of splitting when nailed upon the rafters. The houses in those cities, as well as in New York and the smaller circumjacent towns, are covered with them; they usually last 30 or 35 years. The domestic consumption is great, and the exportation to the West Indies is estimated at several millions.

The White Cedar has long since ceased to be employed for the frames of houses: stocks of sufficient dimensions are rare, and are more profitably reserved for shingles and for other works of joinery, for which this species is superior to the White Pine, being still more durable and more secure from worms. It continues to be used in building only near the great swamps in which it abounds, as about Great-egg Harbour and Indian river in New Jersey, and near the Dismal Swamp in Virginia.

The superior fitness of this wood for various household utensils has given rise, in Philadelphia, to a distinct class of mechanics called *Cedar coopers*, and a great

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number of workmen are employed for the domestic and foreign market. They fabricate principally pails, wash-tubs and churns of different forms. This ware is cheap, light and neatly made; and instead of becoming dull, like that of other wood, it grows whiter and smoother by use. The hoops are made of young Cedars stripped of the bark and split into two parts. The saplings are appropriated exclusively to this object, and vary in price from 5 to 15 dollars a thousand, according to their length: the largest are 2 inches thick at the base and 11 or 12 feet long.

At the mouth of the river Cape Fear the pilots and fishermen cover the sides of their boats with *clap-boards* of White Cedar, which they prefer to those of Cypress, as being lighter, more durable, and less liable to split.

I have been assured that this wood, selected with care, makes excellent sound-boards for forte-pianos. The merchants of Philadelphia find it the best for preserving oils. Charcoal highly esteemed in the manufacture of gun-powder is made of young stocks about an inch and a half in diameter deprived of their bark; and the seasoned wood affords beautiful lamp-black, lighter and more intensely coloured, though less abundant, than that obtained from the Pine.

In the lumber-yards of Philadelphia White Cedar boards from New Jersey, 10 or 12 feet long and of a mean breadth less than 13 inches, are sold at 20 dollars a thousand feet.

In New Jersey, not far from Philadelphia, the farmers on the borders of the Cedar swamps employ this tree for field-fence: the rails, formed of young stocks entire or split in the middle, last from 50 to 60 years when deprived of the bark: they are sold at 6 or 8 dollars a hundred, and the stocks proper for posts at 12 or 15 cents a piece.

Swamps which produce the White Cedar are a valuable species of property, and might be rendered more profitable by more judicious management.

#### PLATE CLII.

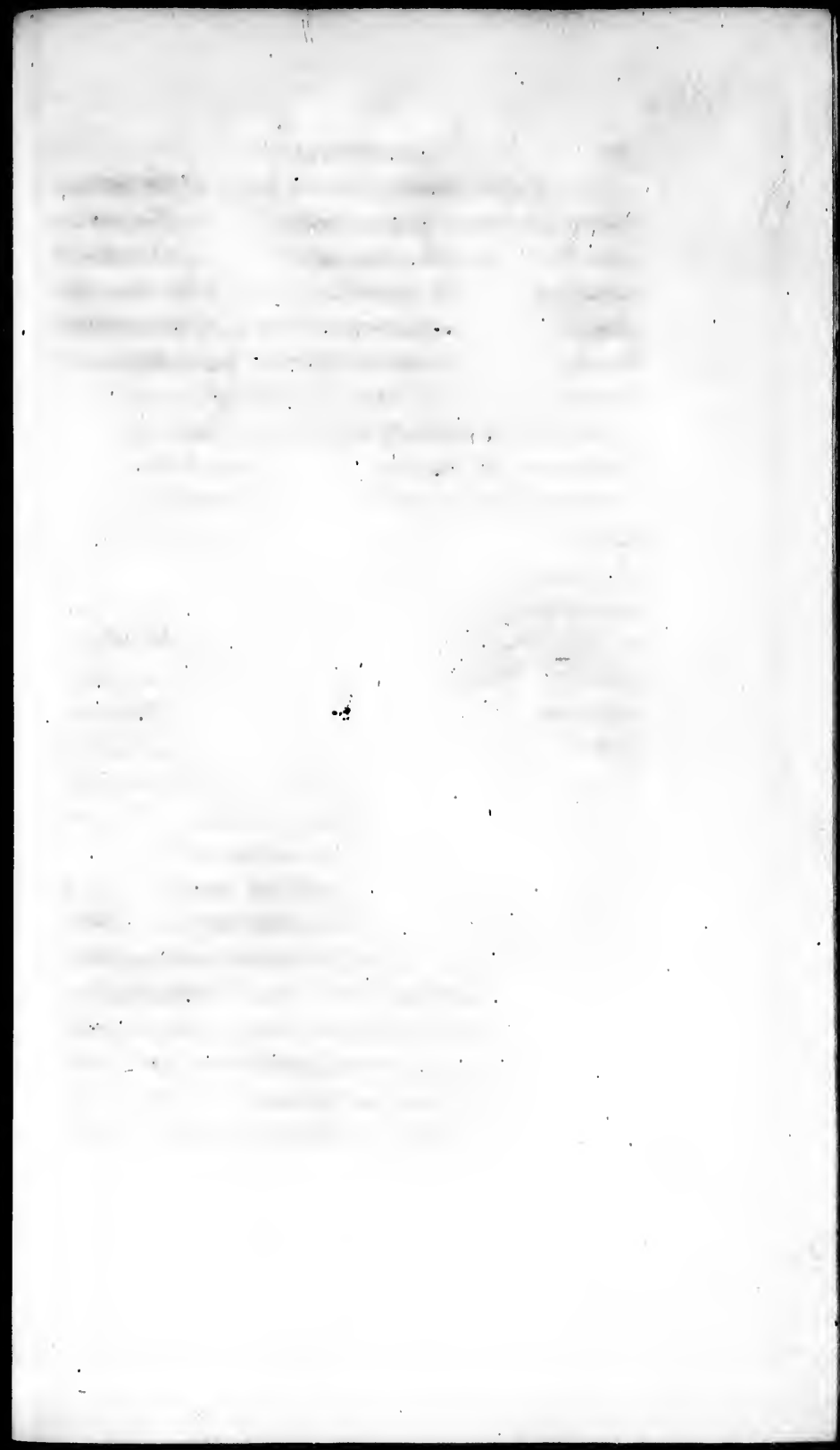
*A branch with leaves of the natural size. Fig. 1, A cone.  
Fig. 2, A seed.*

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## AMERICAN LARCH.

**LARIX AMERICANA.** *L. foliis brevioribus, deciduis; strobilis parvis, ovoideo-subglobosis; squamis paucioribus.*

IN the north of the United States this tree is commonly designated by the name of *Hackmatack*, but I have preferred that of *American Larch*, which is not unknown where the other is habitually used. The French Canadians call it *Epinette rouge*.

The European and American Larches are more strictly confined than any other resinous trees to the northern zone of the two Continents, and they are the first to disappear in approaching a milder sky. The American species is most abundant in Vermont, New Hampshire, and the district of Maine; but though the soil is well adapted to its growth and the winter is long and severe, it does not form the hundredth part of the resinous growth, which consists principally of the Black Spruce, the Hemlock Spruce and the Red Cedar. According to my father's observations in his journey to Hudson's Bay, it is only beyond the St. Lawrence, particularly near lake St. John and the great and the little lake Mistassin, that it begins to abound and to form masses of woods, some of which are several miles in extent. I have been informed that it is profusely multi-



plied in Newfoundland, in nearly the same latitude. New Jersey, Pennsylvania, and the coldest and gloomiest exposures in the mountainous tracts of Virginia; are the limit of its appearance towards the south: but it is rare in these States, and in Lower Jersey in the vicinity of New York it is seen only in the swamps of White Cedar, with which it is scantily mingled. The numerous descendants of the Dutch in New Jersey call it *Tamarack*.

I have remarked that in Vermont and the District of Maine the Larch grows only in low and moist places, and never on uplands, as about Hudson's Bay and in Newfoundland; hence we may conclude that the climate of the northern extremity of the United States is too mild for its constitution.

The American Larch, like that of Europe, is a magnificent vegetable with a straight slender trunk 80 or 100 feet in height and 2 or 3 feet in diameter. Its numerous branches, except near the summit, are horizontal or declining. The bark is smooth and polished on the trunk and longer limbs, and rugged on the smaller branches. The leaves are flexible, shorter than those of the European species, and collected in bunches: they are shed in the fall and renewed in the spring. The flowers, like those of the Pines, are separate upon the same tree: the male aments, which appear before the leaves, are small, oblong and scaly, with two yellow anthers under each scale; the female flowers are also disposed in aments,

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and are composed of floral leaves covering two ovaries, which in process of time become small erect scaly cones 3 or 4 lines long. At the base of each scale lie two minute winged seeds. On some stocks the cones are violet-coloured in the spring instead of green; but this is an accidental variation, for the trees are in no other respect peculiar.

The wood of the American Larch is superior to any species of Pine or Spruce, and unites all the properties which distinguish the European species, being exceedingly strong and singularly durable. In Canada it is considered as among the most valuable timber, and has no fault except its weight. In the District of Maine it is more esteemed than any other resinous wood for the knees of vessels, and is always used for this purpose when proper pieces can be procured. Turpentine is never extracted from it in America, as is done from our native species in Europe.

The Larch is justly appreciated in the United States, but it is little employed because it is rare and may be replaced by several resinous trees which are cheaper and more abundant.

Sir A. B. Lambert, in his splendid work upon the Pines, describes two species of American Larch, the first of which is evidently the tree we have been considering; the second he denominates *Larix microcarpa*, and characterizes it by smaller fruit and drooping branches. My father doubtless considered it as a variety,

and has omitted to mention it : as I have never visited the northern parts of America, I cannot decide the question.

The cones of the European Larch are twice as large as those of the American species, but the two trees are so analogous that a separate description is unnecessary.

PLATE CLIII.

*A branch with leaves and cones of the natural size. Fig. 1,  
A seed.*

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Cedar of Lebanon.  
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## CEDAR OF LEBANON.

**LARIX CEDRUS.** *L. foliis fasciculatis, perennantibus; strobilis ovatis, obtusis, erectis; squamis adpressis, rotundatis.*

THE Cedar of Lebanon is the largest and most majestic among the resinous trees of the Old World, and one of the finest vegetable productions of the globe. Till Pallas discovered it in the north of Russia in 1770, it was believed to be peculiar to the mountains of Lebanon in Asia Minor.

Modern travellers, and among others Mr. Labillardière, who visited that part of the East in 1788, inform us that the large forests seen by Belon in 1550 upon Mount Aman have disappeared, and that a few of these trees only are found upon the highest ridge, where they grow immediately below the snow which caps the summit during a great part of the year. He computes their number at about 100, of which he observed seven of extraordinary size, and measured one that was 30 feet in circumference, with the primary limbs 9 or 10 inches in diameter. Standing alone, and enjoying the free access of the light and air, they were less remarkable for stature than for expansion. In massive forests they probably attain a height proportioned to their diameter; but this tree has always been remarked for the length of its limbs, as is proved by the



allusion of the Hebrew poet : " They shall spread out their branches like the Cedar."

The ancients ascribed to the wood of the Cedar a duration of many ages. The sacred historians inform us that it was chosen for the building of Solomon's temple; it was also employed in that of Apollo at Utica.

Other proofs might be adduced in evidence of the opinion entertained by the Greeks and Hebrews of the durability of this wood, which they brought at a great expense from Mount Lebanon; but Professor Martyn justly observes that there is great obscurity in the passages of the ancient authors, as different species, and even different genera, were confounded under the name of Cedar. Their accounts of the Cedar of Lebanon are in some respects inapplicable to the tree we are considering, which is an inferior kind of deal, soft, inodorous, and of short duration.

If these remarks detract from the interest which we attach to the Cedar of Lebanon, the majestic and beautiful form of this species renders it highly deserving of our notice.

The few remaining stocks upon Mount Lebanon are preserved with religious veneration by the christians of that country. According to the missionaries in the East, the Patriarch of the Maronite Christians inhabiting Mount Lebanon, attended by a number of bishops, priests and monks, and followed by five or six thousand devotees, annually celebrate in their shade the festival

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of the Transfiguration, which is called the *Feast of Cedars*; and ecclesiastical censures are denounced against those who shall injure these consecrated trees.

About the year 1680 the first stocks were brought to Europe and planted in the medical garden of Chelsea near London; 100 years after, two of them were upwards of 12 feet and a half in circumference at 2 feet from the ground, and diffused their limbs more than 20 feet in every direction. They have yielded seed abundantly for more than half a century, and have given birth to the fine stocks that adorn the parks and gardens of the Continent of Europe.

The beauty of the Cedar of Lebanon is due to the arrangement of its branches, which are verticillate with a slight inclination towards the earth, and to its thick dark green foliage, which casts a dense and impervious shade.

It flowers in the month of October: the cones are about 3 inches long and 2 broad, and do not arrive at complete maturity before the second year. They are greyish, and very hard in consequence of the compactness of the scales. To obtain the seeds, of which three fourths are usually barren, the cone is pierced with a gimlet at the base, left to soak two days in water, and, after it is dry, opened by means of a small wooden wedge driven into the hole.

This tree is in great request for the fineness of its form: it is not difficult in the choice of soils, and develops itself luxuriantly on gravelly lands.



The young stock should be transplanted when the circulation begins to be renewed, which is indicated by the swelling of the buds; as much earth as possible should be left adhering to the roots, and they should be replaced in the ground without delay. When permanently fixed its branches should never be lopped, and the main stem, which constantly inclines towards the north, should be carefully preserved.

PLATE CLIV.

*A branch with a cone of the natural size.*

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## RED CEDAR.

**JUNIPERUS VIRGINIANA.** *J. foliis ternis, basi adnatis, junioribus imbricatis, senioribus patulis.*

THE Red Cedar, which belongs to the Junipers, is the most common species of its genus in the United States, and the only one which attains such dimensions as to be useful in the arts. Next to that which grows in Bermuda it is the largest hitherto discovered. According to my father's observations on the topography of American plants, Cedar Island in Lake Champlain, nearly opposite to Burlington, in latitude  $44^{\circ} 25'$ , may be assumed as one of the remotest points at which it is found towards the north. Eastward, on the border of the sea, I have not seen it beyond Wiscasset, a small town of the District of Maine, at the mouth of the Kennebeck, and in nearly the same latitude with Burlington. From Wiscasset it spreads without interruption to the Cape of Florida, and thence round the Gulf of Mexico to a distance beyond St. Bernard's Bay; an extent of more than 3000 miles. In retiring from the shore it becomes gradually less common and less vigorous, and in Virginia and the more Southern States it is rare at the point where the tide ceases to flow in the rivers; farther inland it is seen only in the form of a shrub in open, dry, sandy places. In the Western States it is

confined to spots where the calcareous rock shews itself naked, or is so thinly covered with mould as to forbid the vegetation of other trees.

Though the Red Cedar grows naturally in the District of Maine and on some of the islands of Lake Champlain, it is repressed by a winter as intense as that of the north of Germany, and develops itself less vigorously than in Virginia and farther south, where the soil and climate are favourable to its expansion and to the perfection of its wood. Upon the downs it is usually buried in the sand cast up by the waves, except the summit of the branches, which appears like young trees above the surface. When unincumbered with sand, as in the middle of the islands and on the borders of the narrow sounds that flow between them and the main, it is 40 or 45 feet in height and 12 or 13 inches in diameter; but it would be difficult at present to find stocks of this size north-eastward of the river St. Mary within the ancient limits of the United States.

The foliage is evergreen, numerously subdivided, and composed of small sharp scales enchased in one another. It diffuses a resinous, aromatic odour when bruised; dried and reduced to powder it has the same effect as the common Juniper, of increasing the efficacy of blister-plasters. The male and female flowers are small, not conspicuous, and borne separately on the same or on different stocks. The seeds are small, ovate berries, bluish when ripe, and covered with a white exudation.

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They arrive at maturity about the beginning of the fall; and if sown immediately the greater part of them shoot the following spring, but not before the second year if they are kept several months. The quantity of gin made from them in the United States is small compared with what is imported from Holland.

The name of *Red Cedar* is descriptive only of the perfect wood, which is of a bright tint; the sap is perfectly white.

The most striking peculiarity in the vegetation of the Red Cedar is that its branches, which are numerous and close, spring near the earth and spread horizontally, and that the lower limbs are during many years as long as the body of the tree. The trunk decreases so rapidly that the largest stocks rarely afford timber for ship-building of more than 11 feet in length. Its diameter is very much diminished by deep, oblong crevices in every part of the trunk, which are occasioned by the large branches persisting after they are dead. My own observations and experiments lead me to believe that the growth of the tree might be quickened, and this deformity prevented, by cutting the limbs even with the trunk for two thirds of its height.

The wood is odorous, compact, fine-grained and very light, though heavier and stronger than that of the White Cedar and Cypress. To these qualities it unites the still more precious character of durability, and is consequently highly esteemed for such objects as re-

quire it in an eminent degree. But as it is procured with difficulty, and is every day becoming scarcer, it is reserved exclusively for the most important uses. The reproduction is too trifling to be mentioned in comparison with the consumption in the ports of the United States at large, and particularly at New York, Philadelphia and Baltimore. In the upper part of the frame of vessels it is joined with the Live Oak to compensate its excessive weight, and this usage, more than any other, has wasted the species. Recourse is now had to the coast of East Florida between the St. Mary and the St. John, which will soon be exhausted in its turn. The nearer the Red Cedar grows to the sea, and the farther southward, the better is its wood. Next to ship-building it is most commonly used for posts, which are highly esteemed and are reserved for enclosing court-yards and gardens in the cities and their vicinity. The barriers of the side-walks in the streets of Philadelphia are made of this wood: they are 10 or 11 feet long and 8 inches in diameter, and are sold at 80 cents each, while those of White Cedar cost only 16 or 17 cents. It is eminently fitted for subterranean water-pipes, but is rarely employed from the difficulty of obtaining stocks of sufficient diameter. Small round or oval tubs, very neatly wrought and hooped with brass, are made with staves consisting partly of the sap and partly of the heart. I have observed that the turners at Philadelphia make the large stop-cocks of

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this wood. In the Southern States it is commonly chosen for coffins.

In some parts of Lower Virginia, particularly in the County of York, the Cedars are trimmed and the branches are interlaced with stakes driven into the earth at small distances for the enclosure of cultivated fields; but this is a poor resource, the only advantage of which is the economy of wood.

The Red Cedar is exported to England, but I am unable to say for what purpose; probably it is not solely for the manufacture of pencils, though it seems as well adapted to that object as the Juniper of Bermuda.

The Red Cedar has been naturalized more than fifty years in the pleasure-grounds of France and England: its growth would be rapid on the borders of the sea in our southern departments, where its propagation cannot be too warmly recommended.

#### PLATE CLV.

*A branch with leaves and berries of the natural size.*





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 AMERICAN ARBOR VITÆ,

OR

## WHITE CEDAR.

**THUYA OCCIDENTALIS.** *T. ramulis ancipitibus, foliis quadrifariam imbricatis, ovato-rhombeis, adpressis, nudis, tuberculatis; strobilis ovatis; squamis oblonge-ovalibus; seminibus alatis.*

THIS species of *Thuya*, the only one that has been discovered in the New World, is the most interesting of the genus for the properties of its wood. My father mentions the shores of Lake St. John in Canada as its northern limit, beyond which he saw no trace of it in travelling in that direction more than 300 miles. It abounds in favourable situations between the parallels of 48° 50' and 45°; farther south it becomes rare, and solitary stocks are seen only on the sides of torrents and on the banks of certain rivers, as on the Hudson amid the highlands, and near the *rapids* of the Potowmack in Virginia. Goat's Island, round which the Niagara divides itself to form the stupendous cataract which is one of the most wonderful spectacles of Nature, is seen from the banks of the river to be bordered with the Arbor Vitæ.

In Canada and the northern part of the United States this tree is called *White Cedar*, but in the District of Maine it is frequently designated by the name of



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Arbor vitae or White cedar.  
*Thuja occidentalis.*

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*Arbor Vitæ*, which I have preferred, though less common, because the other is appropriated to the *Cupressus thyoides*.

The *Arbor Vitæ* is 45 or 50 feet in height and sometimes more than 10 feet in circumference; usually, however, it is not more than 10 or 15 inches in diameter at five feet from the ground. From the number and the distinctness of the concentric circles in stocks of this size its growth must be extremely slow: I have counted 117 in a log 13 inches and 5 lines in diameter. They are more compressed near the centre, as in the Cypress and White Cedar, which is contrary to the arrangement observed in the Oaks, the Beeches and the Maples.

The foliage is evergreen, numerously ramified, and flattened or spread. The leaves are small, opposite, imbricated scales; when bruised they diffuse a strong aromatic odour. The sexes are separate upon the same tree. The male flowers are in the form of small cones: to the female blossom succeeds a yellowish fruit about 4 lines in length composed of oblong scales, which open through their whole length for the escape of several minute seeds surmounted by a short wing.

In Lower Canada, New Brunswick, Vermont and the District of Maine, the *Arbor Vitæ* is the most multiplied of the resinous trees, after the Black and the Hemlock Spruces. A cool soil seems to be indispensable to its growth. It is never seen on the uplands among the Beeches, the Birches, etc., but is found

on the rocky edges of the innumerable rivulets and small lakes which are scattered over these countries, and occupies in great part, or exclusively, swamps from 50 to 100 acres in extent, some of which are accessible only in the winter when they are frozen and covered with several feet of snow. It abounds exactly in proportion to the degree of humidity, and in the driest marshes it is mingled with the Black Spruce, the Hemlock Spruce, the Yellow Birch, the Black Ash; and a few stocks of the White Pine. In all of them the surface is covered with a bed of Sphagnum so thick and surcharged with moisture that the foot sinks half-leg deep while the water rises under its pressure.

The full-grown Arbor Vitæ is easily distinguished by its shape and foliage. The trunk tapers rapidly from a very large base to a very slender summit, and is laden with branches for four fifths of its height. The principal limbs, widely distant and placed at right angles with the body, give birth to a great number of drooping secondary branches, whose foliage resembles that of the White Cedar.

On the borders of the lakes, where it has room and enjoys the benefit of the light and air, it rises perpendicularly, grows more rapidly and attains a greater size than when crowded in the swamps, where its thick foliage intercepts the light and impedes the circulation of the air. I have besides remarked that in the swamps its trunk is rarely straight, but forms the arch of an ellipse more or

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less inclined. Its sides swell into two or three large ridges, which are a continuation of the principal roots.

The bark upon the body is slightly furrowed, smooth to the touch and very white when the tree stands exposed. The wood is reddish, somewhat odorous, very light, soft and fine-grained: in the northern part of the United States and in Canada it holds the first place for durability. From the shape of the trunk it is difficult to procure sticks of considerable length and an uniform diameter; hence in the District of Maine it is little employed for the frame of houses, though in other respects proper for this object, and still less for the covering. It is softer than the White Pine, and gives a weaker hold to nails, for which reason the Canadians always join it with some more solid wood. The following extract from my father's journal confirms what I have said of its durability: "In my journey to Hudson's Bay in 1792, I arrived in August in the vicinity of Lake *Chicoutomé*, in latitude 48°. I found the mansion-house of the church established by the Jesuits for the instruction of the natives yet standing. This building, constructed in 1728, as was proved by an inscription over the door, with square beams of the Arbor Vitæ laid one upon another without covering on either side, remained perfectly sound after more than 60 years."

The most common use of this tree is for rural fence, for which it is highly esteemed. The posts last 35 or 40 years, and the rails 60, or three or four times as long

as those of any other species. The posts subsist twice as long in argillaceous as in sandy lands. While the usage of such fences continues the utmost economy should be practised in cutting the Arbor Vitæ according to the rules prescribed for resinous trees. In Canada it is selected for the light frame of bark canoes. Its branches garnished with leaves are formed into brooms, which exhale an agreeable aromatic odour. Kalm affirms that the leaves, pounded and moulded with hog's lard, form an excellent ointment for the rheumatism.

The Arbor Vitæ was introduced into France more than 200 years since : the superior beauty of its form and foliage entitle it to preference over the Chinese *Thuya* as an ornament of pleasure-grounds, and the quality of its wood is a sufficient motive for propagating it in unimproved marshes in the north of Europe ; but the White Cedar, which is taller and of a more uniform diameter, more rapid in its growth, and of equal durability, would be a still more valuable acquisition.

#### PLATE CLVI.

*A branch with leaves and cones of the natural size. Fig. 1, Seeds.*

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## RECAPITULATION

### *Of the Uses of the North American Trees.*

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IN the history which I have thus completed of the forest-trees of North America, and particularly of the United States, my principal aim has been to impart an accurate knowledge of the several species, by describing the characters of their leaves, flowers and fruit, and explaining all their distinguishing peculiarities. My object in the following recapitulation is to exhibit in one view those which are the most useful in the mechanical arts, so that it may be readily known what wood is employed in the different parts of the United States in all the branches of industry of which wood is a material.

It would have been highly useful to have entered into a critical examination of the reasons for adopting or rejecting each species in each of the arts: These reasons may be purely local, or they may be founded on custom or experience. But I must acknowledge my incompetency to a task which would require a knowledge of all the arts in question, with which I am wholly unacquainted. It is only from information procured from others that I have composed this summary, in which I venture to affirm that more omissions will be observed than errors.



## SHIP-BUILDING.

DISTRICT OF MAINE, NEW BRUNSWICK, AND NOVA SCOTIA.

*Keel.* The Sugar Maple holds the first place, and the White Elm the second. In these regions both species attain their fullest development, and consequently afford timber of ample dimensions.

*Lower frame.* From the scarcity and even the total want of the White Oak throughout the greater part of the District of Maine, and the inadequate supply of the Grey and Red Oaks, they are reserved for those parts of the frame which are exposed to be alternately wet and dry. In the lower parts they are replaced by inferior species of wood, such as the Yellow Birch, the Red Beech, the Sugar Maple and the White Ash, which would very speedily decay if they were not constantly in the water. Of these, the Yellow Birch and Red Beech are the best, and the White Ash the worst. They are felled at the proper season of the year, stript of the alburnum, and perfectly seasoned before they are used.

## BOSTON.

At Boston, though situated only a few degrees farther south than the ports of the District of Maine, the influence of a milder climate is sensibly felt. A greater variety of Oaks is found in the forests of the surrounding country, the White Oak is more abundant, and the materials for ship-building are better.

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*Keel.*

*Keel.* Of White Oak.

*Frame.* Principally of White Oak. In the lower frame the Red Oak is sometimes employed, and under that denomination are also comprised the Grey and Scarlet Oaks. Some old writers inform us that the Swamp White Oak was formerly in repute: that it is no longer used is probably owing to its rarity.

*Knees.* As much as possible of White Oak; but as this is rare, recourse is had to the Black Spruce, especially for repairing old vessels.

*Sides.* Of White Oak, with the gunwales of Long-leaved Pine imported from the Southern States.

*Trunnels.* Commonly of White Oak, and sometimes of Locust from Virginia.

*Deck.* Of White Pine; but the Norway Pine is preferred. This is brought from New Hampshire by the Middlesex Canal, which connects the river Merrimack with the harbour of Boston: it is called Yellow Pine, though that name belongs to the *Pinus mitis*, which is not found in so high a latitude.

*Masts and yards.* As in the District of Maine, the masts of White Pine, and the topmasts and yards of Black Spruce.

*Observation.* A few vessels are constructed at Boston of Live Oak and Red Cedar.

## NEW YORK,

*Keel.* Always of White Oak. Formerly the Shell-bark

Hickory was sometimes employed ; but no stocks of sufficient size are now found near the ports.

*Lower frame.* Principally of White Oak , with which is joined the Rock Chesnut Oak.

*Upper frame.* Of Live Oak and Red Cedar alternated : both are imported from East Florida.

*Sides.* Of White Oak : I believe the Rock Chesnut Oak is also used ; for I have seen planks 2 or 3 inches thick in the dock-yards , which were easily recognized by the bark upon the edges , and which seemed destined for this use.

*Knees.* As much as possible of White Oak ; and when this cannot be procured , of Rock Chesnut Oak from the upper part of the North River.

*Deck.* Of Yellow Pine from New Jersey and the eastern shore of Maryland.

*Masts.* Of White Pine , with the topmasts and yards of Black Spruce.

#### PHILADELPHIA.

*Keel.* Almost always of White Oak , and in a few instances of Shell-bark or Pignut Hickory : the Pignut , which is tougher than the other species , is preferred.

*Lower frame.* Of White Oak , with a small proportion of Black Walnut , Locust and Red Mulberry.

*Upper frame.* In the best built vessels , of Live Oak and Red Cedar , as in New York. The Cedar is very durable , and its lightness compensates for the weight of

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the Oak. A small quantity of the Red Bay, imported from the Southern States and from Florida, is advantageously substituted for the Cedar. The Locust, the Red Mulberry and the Black Walnut are also admitted. They are lighter than the Oaks, stronger than the Cedar, and almost as durable as either; but they cannot be procured in sufficient abundance. Their perfect wood, when thoroughly seasoned, lasts longer than the White Oak. The Black Walnut, in particular, must be entirely freed from the sap, which is soft and rapidly decays. These species grow on the banks of the Susquehannah, and large Red Mulberry Trees are found also on the Delaware. The White Oak is excluded from vessels of the best workmanship.

*Sides.* Always of White Oak.

*Trunnels.* Of Locust.

*Knees.* As at New York, of White Oak when it can be procured, and of Rock Chesnut Oak; of these the consumption is nearly equal. The Black Walnut is highly esteemed, but rarely employed on account of its scarcity. The Red Mulberry makes excellent floor-timbers.

*Deck.* Commonly of Yellow Pine from the upper part of the Delaware or from the eastern shore of Maryland, and of Long-leaved Pine from North Carolina and Georgia.

*Masts.* Of White Pine, the topmasts of Yellow Pine, and the yards of Black Spruce from the District of Maine.

## BALTIMORE AND ALEXANDRIA.

The art of ship-building is carried to great perfection in these ports, and nearly the same materials are employed as at Philadelphia, viz: the White Oak for the keel and lower part of the frame, and the Live Oak and Red Cedar for the upper part. The Locust is admitted as well as the Red Cedar, and as both species are much more abundant than in the vicinity of Philadelphia, they are more extensively used. The knees are of White Oak; Rock Chesnut Oak and Post Oak. The masts are commonly of Yellow Pine, and sometimes of Long-leaved Pine from the river Elisabeth near Norfolk.

## CHARLESTON AND SAVANNAH.

*Keel.* Always of the Long-leaved Pine, which is not inferior to the White Oak.

*Lower frame.* Principally of Live Oak, and partly of the perfect wood of the Long-leaved Pine, which is thought to be as solid as the White Oak. The Post Oak and the Spanish Oak are also admitted.

*Upper frame.* Of Live Oak and Red Cedar. The Locust and Red Mulberry are little used, as they are rare in the neighbouring country; a small quantity is brought from Upper Georgia to Savannah by the river of that name.

*Deck.* Of the Long-leaved Pine, which is the best species of its genus in North America.

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*Knees.* Commonly of Live Oak, which is the best wood for this purpose.

*Sides.* Almost always of the heart of the Long-leaved Pine, which is esteemed as solid and durable as the White Oak, but is said to form less perfect joints at the stem and stern.

*Trunnels.* Of the heart of the Long-leaved Pine when the side-planks are of the same species, and of Live Oak, Locust, or Red Mulberry (which is as good as the Locust), when the sides are of Oak.

*Masts.* Of Long-leaved Pine, which is stronger than White Pine; the topmasts are of Long-leaved Pine, and the yards of Black Spruce from the District of Maine.

When these materials are perfectly seasoned before they are employed, the vessels constructed with them are more durable than those built at New York and Philadelphia, which consist in a greater proportion of White Oak.

#### LOUISVILLE ON THE OHIO.

*Keel.* Of White Oak.

*Upper frame.* Of White Oak and Black Walnut.

*Lower frame.* Of White Oak, with a large proportion of Locust, Red Mulberry and Black Walnut, and a mixture of Wild Cherry Tree and Red Elm. These species are excellent when thoroughly seasoned. The Black Walnut in particular should be wholly deprived of its alburnum.

*Knees.* Of Locust, Red Mulberry, Black Walnut, and White Oak : those of Locust and Red Mulberry are less easily procured.

*Sides.* Always of White Oak.

*Trunnels.* Of Locust.

*Deck.* Of Yellow Pine.

*Masts.* Of White Pine ; the yards are of Black Spruce from the sources of the river Alleghany.

*Keel'd boats.* On the banks of the Ohio I saw building a great number of large boats, of which the ribs, without exception, were of Black Walnut, and the sides of White Oak.

#### NEW ORLEANS.

I have never visited Lower Louisiana, and cannot speak with certainty of the manner of constructing vessels at New Orleans. I have been told that the frame is of Live Oak and Red Cedar ; the sides, deck and masts, of the perfect wood of the Bald Cypress, which is said to be far superior, when thoroughly seasoned, to any species of Pine.

*Pumps.* At New York, Philadelphia and Baltimore, of Pitch Pine ; and in the Southern ports, of Loblolly Pine.

*Pullies, cleats and oars.* Always of White Ash in the Northern States ; at New York and Philadelphia, in equal proportions of White Ash and of Red Ash, which becomes more common in advancing southward.

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Many persons are aware that the Red Elm would be preferable for pullies; but eastward of the Allehanies it is too little multiplied to supply the consumption. The Pride of India is also well adapted to this purpose.

The White Ash, from its strength and elasticity, makes the best oars

I have been informed that the Hickories are used with advantage for cleats; they are stronger than those of Ash, but require to sit loosely in the holes, as they swell with moisture and would speedily decay.

*Handspikes.* Of White Ash; but more generally, in the Middle and Southern States, of Hickory, which is preferred on account of its strength.

*Images on the bow.* Always of White Pine.

#### CIVIL ARCHITECTURE.

Throughout the United States nineteen twentieths of the houses in the small towns and in the country are of wood. In the larger cities, five sixths of them are of brick, and one fifth, or perhaps one third, in a dozen secondary towns.

The wooden houses are of two sorts: those of a great proportion of the husbandmen in the interior parts of the country are built of logs, and are so simply constructed that they are rendered habitable in three or four days. The logs, which are 20 or 30 feet long and 4 or 5 inches in diameter, are laid one upon another, crossed at the ends, and confined by notches. The inter-



stices are filled with clay. The roof is formed of lighter sticks of the same length, gradually approximating on each side, and supplying the place of rafters; to these the shingles are attached by small wooden pins. Two doors, which frequently serve instead of windows, are cut directly opposite to each other in the middle of the walls. The chimney is at one end of the house, and a partition divides the building into two apartments. The barns and stables are similarly constructed, but less carefully closed.

The *framed houses* are commonly two stories high, spacious and commodiously planned. They are covered with *clap-boards*, and when painted white have an agreeable appearance and indicate the easy circumstances of their tenants. When proper care is bestowed upon the covering, and the paint is renewed every 10 or 12 years, it lasts 30 or 40 years.

The frame, the inner and outer sheathing, the floors, and the shingles of the roof, are made, in different parts of the United States, of different species of wood which have been found best adapted to these objects.

NEW HAMPSHIRE, VERMONT, MASSACHUSETTS,  
RHODE ISLAND AND CONNECTICUT.

At Boston, Portsmouth, Portland, Hollowel, and other less considerable towns, as well as in the country, the White Pine has always been preferred for wooden houses. But as it has become rare it is partly replaced

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by the Black and Hemlock Spruces, which are cheaper and more abundant.

*Frame.* Of White Pine; but the joists and rafters are more frequently of Black Spruce.

*Sheathing of the frame.* Of Hemlock Spruce.

*Clap-boards.* Of White Pine.

*Floors.* Generally of White Pine. In the country the Black Spruce is sometimes preferred, as being tougher and less liable to be bruised by the furniture: on the other hand, it does not bear so good a polish, and is apt to crack.

*Roof.* Always of White Pine shingles, which last 15 or 20 years. The Arbor Vitæ would be preferable for this object; but in the Northern States it is too small to be cut with advantage for shingles, and is reserved for posts.

*Lathes.* Of Hemlock Spruce.

*Doors, window-sashes and mouldings.* Of White Pine.

#### NEW YORK AND NEW JERSEY.

*Frame.* Of White Pine in houses built entirely of wood.

*Covering and inside work.* Of White Pine.

*Floors.* Of White Pine, when they are to be carpeted; otherwise, of Yellow Pine, which is stronger and tougher.

*Roof.* Of White Cedar shingles.

*Observation.* In the city of New York the frame of

brick houses is often of Oak, the joinery within and the doors and windows are of White Pine, and the roof is slated or covered with White Cedar shingles.

PENNSYLVANIA AND DELAWARE.

At Philadelphia the houses in the city are of brick; those of the suburbs are generally of wood, and are built of the same materials as in New York, except that the Yellow Pine is employed as well as the White Pine. In brick houses the sills and the joists of the upper stories are of White Oak; at present the Black Oak is also extensively used, and the Sweet Gum is admitted for the upper stories.

*Rafters.* Preferably of the White and Black Oaks: the Tulip Tree or Poplar, which unites lightness with solidity, is equally esteemed.

*Floors.* Commonly of Yellow Pine.

*Roof.* Of White Cedar or Cypress shingles imported from the Southern States.

*Doors, windows and mouldings.* The panels of White Pine; the casings and the window-sashes of Yellow Pine; the mouldings of the outer doors, the cornices of the apartments, and the mouldings about the fire-places, of White Pine.

At Conelville on the Yohiogany, and at Brownsville on the Monongahela, in the western part of Pennsylvania, I observed that the frame was of White Oak; the floors, of narrow boards of the same species; the

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shingles, of Black Oak, which are less easily detached than those of White Oak; the clap-boards, the interior joinery, the doors, window-sashes, etc., of Poplar or Tulip Tree.

At Pittsburgh and Wheeling on the Ohio the frame is of White Oak; the outside, the joinery within, and the roof, of White Pine. Many houses in this part of Pennsylvania are built wholly of White Oak, except the roof, which is made of Black Oak in the absence of the Pine and Poplar. The Poplar or Tulip Tree is inferior to the Pines, but it is more durable than the Oaks, and is wrought with greater ease and neatness. Chesnut shingles are more lasting, but they are not easily found.

#### MARYLAND AND THE EASTERN PART OF VIRGINIA.

At Baltimore and Alexandria one third of the houses are of brick; the rest are principally of Yellow Pine, with the inside work of White Pine, and the roof of White Cedar, which is here called *Juniper*. At Petersburg and in its vicinity the wooden houses are of Loblolly Pine, with the roof of Cypress.

#### NORTH CAROLINA, SOUTH CAROLINA, AND THE LOWER PART OF GEORGIA.

Three quarters of the houses in Charleston, and four fifths of those in Wilmington and Savannah, are of wood.

*Frame.* Wholly of Long-leaved Pine; the outer covering is of White Pine, and the interior work of Cypress and of White Pine.

*Doors, windows and cornices.* Sometimes of White Pine, but more generally of Cypress, which is far better.

*Roof.* Of Cypress for houses of every description.

*Observation.* The Cypress was formerly used almost exclusively in building, but it is now replaced by the Long-leaved and White Pines. Farther inland the houses are still constructed wholly of Cypress, and are more lasting than such as are made of the Long-leaved Pine: both are painted white.

#### UPPER PART OF THE CAROLINAS.

The houses are built of Yellow Pine, and covered with shingles of the same wood or of the Tulip Tree.

#### KENTUCKY.

At Lexington, the largest town of the Western States, more than three quarters of the houses are of wood. They are composed in the following manner, both there and in the surrounding the country:

*Frame.* Of Blue Ash and White Oak. The Oak is preferable, though less easily wrought than the Ash.

*Floors.* The lower floors are of Blue Ash or of White Oak, and sometimes of Tulip Tree or Poplar. Pine would

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be preferred if it could be easily procured. The upper floors are of Poplar.

*Outside.* Of Blue Ash or Tulip Tree : the last species is liable to warp.

*Inside work.* Commonly of Poplar or Wild Cherry Tree, and sometimes of Black Walnut:

*Roof.* The rafters are covered with boards of the Hackberry, and these with Poplar shingles, which are made very short to prevent their warping : they are said to last forty years, and not to split from the effects of frost or sunshine.

#### LOWER LOUISIANA.

I have been informed that all the buildings in this part of the United States are of Cypress.

#### CABINET-MAKING.

##### MASSACHUSETTS, NEW HAMPSHIRE AND VERMONT.

Wood proper for Cabinet-making becomes more rare in America in advancing into the higher latitudes ; but several species are found in the north of the United States, which, though inferior to Mahogany, form elegant furniture. The superiority of Mahogany consists not so much in the richness of its colouring as in the fineness of its grain and in its hardness, which render it susceptible of a brilliant polish, and preserve it from injury by the impression of other bodies. As it is cheaply obtained

from the West Indies, it is used by all persons in easy circumstances residing at a moderate distance from the ports. Among the native trees, in the Northern States, the Black Birch, the Yellow Birch, the Canoe Birch, the Red-flowering Curled Maple, the Bird's-eye Maple, the Wild Cherry Tree and the Sumac, are chiefly employed in cabinet-making.

The Black and Yellow Birches are of a roseate hue, which deepens with age; as they are very fine-grained they receive a brilliant polish and have a silky surface. They are usually employed for tables, writing-desks, the balustrade of staircases, the frame of sofas and hair-bottomed chairs, etc. The Curled Maple and Bird's-eye Maple form elegant bedsteads. Divided into thin sheets, they serve to inlay Mahogany, and the same use is made of a section of the Canoe Birch immediately below the first division of the trunk. The cabinet-makers of Boston select the Birch logs proper for these purposes among the wood exposed for sale as fuel.

#### MIDDLE AND WESTERN STATES.

In the large towns the furniture is usually made of Mahogany; in the country it is of Wild Cherry, Black Walnut, Curled Maple, Buttonwood and Sweet Gum. The Wild Cherry and the Black Walnut are preferred, as being the most like Mahogany, particularly the Cherry Tree; the Walnut, naturally of a dusky hue, becomes

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nearly black with age. The Curled Maple, the Buttonwood and the Sweet Gum, are more especially reserved for bedsteads. To render the undulations of the Curled Maple more apparent, after being polished it is lightly rubbed with nitric acid and again with linseed oil.

## SOUTHERN STATES.

The greater part of the furniture was formerly made of Red Bay, which is of a beautiful red colour, fine-grained, silky, and perfectly adapted to this use; but it is now almost wholly superseded by Mahogany.

## COOPER'S TRADE.

This art employs a great number of hands in North America, where, besides the ordinary use of containing liquids, casks are employed, instead of sacks, for corn and flour, for produce of other kinds, and for certain species of merchandize that are exported or consumed at home. A great quantity of staves is also sent to England, to the Madeira Isles and to the West Indies.

In 1807, the value of the staves imported into Liverpool from the United States exceeded 720,000 dollars. Tables of the exportation from the United States in 1791 and 1792 exhibit the following statement of the number of staves sent abroad during these years :



## RECAPITULATION.

|                         |            |
|-------------------------|------------|
| New Hampshire. . . . .  | 1,250,000  |
| Massachusetts. . . . .  | 5,250,000  |
| Rhode Island. . . . .   | 270,000    |
| Connecticut. . . . .    | 1,100,000  |
| New York. . . . .       | 5,560,000  |
| Pennsylvania. . . . .   | 2,800,000  |
| New Jersey. . . . .     | 50,000     |
| Delaware. . . . .*      | 40,000     |
| Maryland. . . . .       | 1,700,000  |
| Virginia. . . . .       | 7,400,000  |
| North Carolina. . . . . | 2,300,000  |
| South Carolina. . . . . | 500,000    |
| Georgia. . . . .        | 860,000    |
| TOTAL. . . . .          | 29,080,000 |

The country west of the Alleghanias has for several years furnished large supplies of this article, which pass down the Ohio and the Mississippi to New Orleans. Great quantities are also carried from Lake Champlain to Quebec. The staves of Virginia, Maryland and Pennsylvania, from the influence of a milder climate and a less humid soil, are much superior to those of the Northern States.

Besides the White Oak, several other species, such as the Rock Chesnut Oak, the Post Oak, the Chesnut White Oak, the Overcup White Oak, etc., have their pores so imperfectly closed as to absorb liquids, especially such as are of a spiritous nature. But for train

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oil, for melasses and other fermenting fluids, these species are too compact, and are less eligible than the Red Oak, which is of so loose a texture that water may be made to bubble by putting one end of a staff into it and blowing at the other; the air disengaged by fermentation is thus allowed to escape, and the fluid is retained, unless, like the finer oils, it is extremely subtile. When melasses is put into White Oak casks, as the wood refuses a passage to the air which is produced in fermentation at a temperature like that of the West Indies, the cask is apt to become distended and leaky.

*Red Oak staves* are made of several species, all similar in their organization, viz: in the Northern States, of the Red Oak and the Grey Oak; in the Middle and Western States, chiefly of the Black Oak, and also of the Scarlet, Red and Pin Oaks; in Maryland, Lower Virginia, and all the southern parts of the United States, of the Spanish Oak, which is the best of the class. This sort is one third or even one half cheaper than the *White Oak staves*; but the price of both is four times as great as it was fifty years ago, owing to the great development of American commerce, to the prodigious consumption of a population which doubles in a little more than 20 years, and to the neglect of all measures for renewing the forests.

Throughout the United States, with the exception of the District of Maine and the northern parts of Vermont, casks of all capacities are hooped with young

Hickories, and perhaps one twentieth of them with young White Oaks. The saplings of both species are split in the middle, and the hoops are crossed and confined by notches instead of ligatures as in Europe.

The young stocks are exported for hoops to the West Indies; but I do not know that they are sent to Europe, where the Chesnut is preferred and is cultivated for this purpose — an example deserving of imitation in the United States, especially near the commercial capitals.

At Nova Scotia, barrels for containing salted fish are made of the heart of the Red Spruce bound with saplings of Yellow Birch, which are easily distinguished by their brilliant bark. In the District of Maine these barrels are of White Pine; a great number of staves are also made of White Ash, and are esteemed the best for salted provisions. The hoops are of Beech, Yellow Birch and Black Ash, which are inferior to the Hickory and White Oak; but the Hickory does not grow so far north, and the Oak is rare. Plantations of White Oak for hoops would be highly profitable in the District of Maine. (*See the description of the Chesnut, and the recapitulation of the properties of the Hickories.*)

#### CHAIR - MAKING.

*Windsor chairs.* In all the cities of the United States this branch of industry forms a distinct trade. Windsor chairs are in general use, and they are exported from

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the Northern States to the Southern and to the West Indies.

At Hollowel, Portland, Portsmouth, etc., the seat is of Basswood, the lower frame of Sugar Maple, and the bow and rods which compose the back, of White Ash.

At New York, Philadelphia, Baltimore and Richmond, the seat is of 'Tulip Tree, the legs of Red-flowering Maple, the rods of the back, of Shell-bark Hickory, and the bow of White Oak. These species are not preferable to those in use in the more northern States, except the Tulip 'Tree, which is firmer and more durable than the Basswood.

In the Northern States, particularly at Boston, chairs of this sort are made wholly of White Pine, except the bow, which is of White Oak: they are light and cheap, but easily broken and of little value. In well-furnished apartments *japanned chairs* are fashionable; they are made of Red Maple, painted, varnished and gilt; the seat is of cane or of rushes (*Tipha angustifolia*) cut in the salt-meadows.

In the country, common chairs are made of Maple, and sometimes of Hickory, with the bottom of straw.

#### COACH-MAKING.

At Boston the panels of coaches and chaises are made of the Tulip Tree or Poplar, which is brought from the Middle States; the top and bottom are of White Pine;

the frame of the body, of Black or Yellow Birch, and the carriage of White Ash.

In New Hampshire and the District of Maine the panels are of Basswood, and the other parts, of the same materials as at Boston.

In Vermont I have seen Butternut boards employed for panels, for which they are said to be well fitted.

At New York, Philadelphia and Baltimore, the panels are of Tulip Tree, which furnishes boards of an extraordinary width. This wood is fine-grained, polishes well, and receives paint in a superior manner. The top and bottom of the body are of White Pine, or still better of White Cedar; the frame and carriage are of White or Red Birch. I have been told in the Southern States that the Persimon is superior to the Ash for shafts, which require great strength united to great elasticity.

Coach-making is carried to a high degree of perfection, especially at Philadelphia, and furnishes articles of exportation to the Southern States and to the Spanish Colonies. To the excellence of the materials are added lightness, strength and elegance in the workmanship.

#### CARTWRIGHT'S WORK.

This trade is more perfected in Philadelphia than in any other part of the United States, both for materials and execution. The frame, boarding and pole of waggons are of Oak, though many farmers prefer the Black or Sour Gum, especially for the bottom, and assert that

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it is twice as durable as the White Oak. The axle-tree, instead of iron, is always of Hickory wood, and preferably of Pignut Hickory : in the District of Maine it is of Sugar Maple.

*Coach-wheels.* At New York, and in all the more northern towns, the nave is of White Elm ; in the Middle States, of Sour Gum ; at Charleston S. C., of Wahoo. The felloes are generally of Red or White Ash, and the spokes of White Oak. Near Richmond in Virginia, I have seen felloes made of Swamp or Willow Oak, which, when seasoned, is stronger than the White Oak, and less liable to split.

*Cart-wheels.* In the District of Maine, and in the northern parts of New Hampshire and Vermont, where the White Oak does not exist, the felloes and spokes of heavy wheels are made of Sugar Maple and Grey Oak. In the Middle States they are commonly of White Oak, and in some parts of Maryland and Virginia the felloes are of Spanish Oak, and occasionally of Swamp or Willow Oak. The nave is of White Elm ; but in the Middle and Western *Sections* the Sour Gum is preferred. In the maritime parts of the Southern States the nave is of Live Oak, which is superior to every other species.

Ploughs and harrows are made of White Oak. The sides of wheel-barrows are of Pine, the wheel of White Oak, and the arms of Ash. In the District of Maine, ox-yokes are made of Yellow Birch, and farther south, of Maple. In the country, common sledges are of White Oak,

framed and *shod* with Hickory heart or Dogwood thoroughly seasoned.

The frame of water-mills is of White Oak when it can be procured. The cogs of the wheels are of Sugar Maple in Maine, and of seasoned Hickory in the Middle States. The frame of rice-mills is of Long-leaved Pine, with the teeth of White Oak, and the cylinder of Black Gum, whose organization renders it eminently proper for this object. In the upper part of the Carolinas the Dogwood is used for teeth; but it splits unless perfectly dry.

#### TRUNK-MAKING.

At Boston, trunks are made of White Pine; at New York, Philadelphia and Baltimore, of Tulip Tree or Poplar, which is more solid: they are covered with neat-skins dressed with the hair.

#### HOUSEHOLD STUFF AND OTHER SMALL OBJECTS MANUFACTURED AT HINGHAM NEAR BOSTON.

In the Northern States a great number of small articles, principally for domestic use, are made of wood. This branch of industry is very extensively practised at Hingham, about 15 miles from Boston. Sloops are constantly plying between that place and the capital, and with a fair wind the passage is performed in two hours. A part of these wares is exported to the Middle

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and Southern States, to the West Indies, and even to England.

*Pails.* The bottom is of White Pine, and the staves are of chosen pieces of the heart of the same tree. The hoops are of White Ash, half a line thick, and wide enough to cover three fourths of the vessel: they are attached by one tack of iron and two of wood, or are confined by cutting lateral notches in one end, and inserting it in a triangular hole made in the other:—hence the name of *lock-pails*. The handle is of White Oak. These pails are sold at two dollars a dozen.

*Measures for corn, fruit, potatoes, etc.* These are the bushel, corresponding to the ancient *minot* of Paris, the half-bushel, the peck, etc. The bottom is of White Pine, and the circle, which is a single piece, is of Black, Red or Grey Oak. It is reduced to the proper thickness, boiled to render it flexible, and bent upon an iron cylinder. The measures made at Hingham are always of a dull blue colour, which is produced by the gallic acid of the wood acting upon the iron vessel in which it is boiled.

*Butter-boxes.* These are light boxes; of which the largest are 8 or 10 inches in diameter, and less than half as much in height; four others, a little smaller, contained one in the other, are put into the first, and this forms a *nest of boxes*, which is sold for 40 cents. The top and bottom are of White Pine, and the circular piece, of White Ash.



*Wafer-boxes.* Great numbers of these little boxes are sold at 1 dol. 20 cents the gross. The bottom is of White Pine, and the circle of Sugar Maple.

*Sieves.* The rim is of White Ash, taken partly from the heart and partly from the sap.

*Stopcocks.* The smallest are made of Sugar Maple; the largest, of White Oak: the key is of Lignum Vitæ.

*Rakes.* The head and handle are of White Ash; the teeth, of Mockernut Hickory, which is extremely hard.

*Scythe-handles.* Of White Ash.

*Pullies, etc.* These articles are made at Hingham; as I have already said, they are of White Ash.

#### WOODEN WARE IN THE MIDDLE AND SOUTHERN STATES.

The manufacture of various utensils of wood for domestic use, such as pails, washing-tubs and churns, constitutes a separate and extensive trade at New York, and still more at Philadelphia, where these articles are furnished for exportation as well as for domestic consumption. They are made of White Cedar, with handles of Hickory and hoops of young stocks of the same species stript of their bark and split in the middle. The pails are better made and more durable than those of Pine from Hingham, and they are sold one third dearer. This ware is skilfully wrought, and, if carefully preserved, it becomes whiter and harder by use.

At New York and in the Southern States, pails are also made of Red Cedar. The staves, formed from the

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heart and sap, are party-coloured red and white; the hoops are of brass, and the utensil is light and glossy.

*Sieves.* These are of two sorts : those with the bottom of hair, and those destined for coarser substances with the bottom formed of interwoven strips of wood, usually of Black or Water Ash. The circle of both is of White Oak or Hickory. The sieves used in making gun-powder should be of Hickory, which is not shredded by friction like the Oak.

*Baskets.* The large baskets (*corn-baskets*) used in the harvest of maize, etc., are generally of White Oak, and sometimes of Shell-bark Hickory. Light baskets are made of the European Willow, which is preferable to any American species.

*Whip-stocks.* Carrier's whips are made by dividing a stem of White Oak, as far as the handle, into several parts, which are braided together and covered with leather; coach-whips are of a single piece of Hickory. Ramrods for muskets are made of the same wood.

*Brooms.* At New York, Philadelphia and Baltimore, common brooms are of Hickory, and in the Southern States, of White Oak. They are formed by dividing the end of a stick into fine shreds, which are reversed and bound together : to prevent their twisting and breaking, they are dipt in boiling water. The handle of hair-brooms is of Pine, and the head, of Tulip Tree. The back of coarse brushes is of Black Oak.

*Spade handles.* These are of Ash, as well as the frame

of hand-saws. At Baltimore I have seen saws mounted with Black Walnut, which is less elastic, and consequently less proper than the Ash.

*Picture-frames.* Those that are to be gilded are of White Pine; and the smaller ones, which are commonly blacked, are of Sweet Gum.

*Plane-stocks.* Always of White or Red Beech thoroughly seasoned.

*Gun-stocks.* For rifles and fowling-pieces, the Red Maple or Curled Sugar Maple is selected; for muskets, the Black Walnut. The Maple, after being well polished, is rubbed with a little sulphuric acid and linseed oil.

*Saddle-trees.* Of Red Maple or Sugar Maple, as one or the other species happens to be more abundant. The Sugar Maple has more solidity.

*Screws of book-binder's presses.* Of Hickory: light screws are sometimes made of Dogwood.

*Hatter's blocks.* Always of Sour Gum, which, from its peculiar organisation, is not liable to split.

*Corn-shovels.* The best are of Butternut.

*Wooden bowls.* Generally of Tulip Tree; sometimes of Black Gum and Butternut, which are less easily split. The most solid are made of the excrescencies on the trunk of the Black Ash; but they are rare, as the large stocks, from which they are taken, have been consumed.

*Spinning-wheels and twisting-wheels.* The lower part of the frame is of Red-flowering Maple; the nave of the

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wheel and the spokes, of the same species; the felloes, of Black Oak; the block, of Ash; and the distaff-rods, of Hickory. The circle of twisting-wheels is of White Oak or White Ash.

*Axe-handles.* Of Hickory, and preferably of Pignut; in the District of Maine, of White Oak.

*Shoe-lasts.* The best are of well-seasoned Beech: at Philadelphia they are sometimes of Persimon, which is sufficiently hard; and in the more northern States, of Black or of Yellow Birch, which are less eligible because more liable to warp.

*Posts and rails.* The use of this description of fence subsists throughout the United States. The cultivated ground still bears a small proportion to the forests; but as the population multiplies, this proportion is every day becoming greater. The borders of the Ocean are the most extensively cleared, and the country approaches nearer to the state of Nature as the distance from the shore increases. The farms insulated in the forests are less remote in some districts than in others; but as the population is thin, a proprietor sometimes cultivates not more than one acre out of a hundred and fifty of his land: the rest forms a part of the continued forests, in which cattle of every sort live in common during three quarters or even the whole of the year. To guard against their intrusion, every cultivated spot must be enclosed.

The fences are generally of two sorts: in the Northern and near the large towns of the Middle States, where

wood is less plentiful, they are formed of posts set ten or twelve feet apart, and connected by five or six rails three or four inches in diameter; farther inland, where materials are still abundant, they are made in a zig-zag direction, by laying the rails one upon another, and crossing them at the angles. As these fences are seven or eight feet high, it is easily conceived that in so extensive a country they must consume an immense quantity of wood, and that their maintenance must be very expensive in the anciently settled districts. Within a few years they have begun to be replaced by quickset hedges. The duration of the fence depends upon the species of wood of which it is made, and this is regulated by the nature of the forests in the different parts of the country. In Vermont, a great part of New Hampshire, the District of Maine, New Brunswick and Lower Canada, the *Arbor Vitæ* furnishes the best and most durable wood, and every proprietor esteems it an advantage to have a sufficient proportion of it upon his estate to keep up his fences. In clay lands the posts last 30 or 40 years, but not more than half as long in sandy soils: I have been told that the rails endure 45 or 50 years. The posts, which are 7 or 8 feet long, are made of trunks 6 or 8 inches in diameter split in two; in 1807 they were sold at 4 dollars a hundred in the neighbourhood of Norridgewock in the District of Maine.

When the *Arbor Vitæ* cannot be procured, the posts are made of Hemlock Spruce, and the rails of Black

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Spruce. These species are not more than half as durable as the preceding. After the Hemlock Spruce, the Grey and Red Oaks are taken for posts which last only nine or ten years.

In Genessee and the upper part of New York, the new settlements are enclosed with zig-zag fence made of the Sugar Maple and Basswood, which are the most common trees in the country.

In the lower part of New York, New Jersey and Pennsylvania, the posts of the best fences are made of Red Cedar and White Oak, and the rails of White Cedar. The posts last 20 or 30, and the rails 30 or 40 years. The price of the posts is 13 cents each, and that of the rails, 6 dollars a hundred. On the sea-coast of Pennsylvania, the White Cedar is used for posts, and is found equally durable. In the Western Countries, particularly between Laurel Hill and the Ohio, the enclosures are all made with zig-zag fence of White Oak, and are more lasting than any other except those of Chesnut.

In Maryland, Virginia and the upper part of the more southern States, in Ohio, Kentucky and Tennessee, the species made use of are too various to be enumerated. The best posts are of Locust, Red Mulberry, Red Cedar, Chincapin, Chesnut, Black Walnut, White Oak and Black Oak; the rails are of White, Red or Black Oak, or of Yellow Pine. If the posts were charred to the distance of six inches above the surface of the ground, and the rails deprived of their bark, a

precaution that is often neglected, they would last one third longer.

In the lower part of the Carolinas and Georgia, almost all the enclosures are formed with zig-zag fence of the Long-leaved Pine. Near Augusta, posts of seasoned Cypress are proved to be very durable; next to the Cypress are those of Chesnut White Oak, which is preferred in the absence of the Locust and White Oak.

In Lower Louisiana, the Cypress is said to be exclusively used for fence.

*Bark for tanning.* In the United States a greater variety of bark is employed in tanning than in Europe: in France, Germany and England, scarcely any other is admitted than that of the common Oak: in America a different practice is adopted from necessity, and not from a desire of perfecting the leather.

In Europe the bark for tanning is taken from stocks less than 6 inches in diameter, and even branches less than an inch thick are stript for this purpose; but in North America, the largest trees are felled for their bark, which is taken only from the trunk and the primary limbs.

The bark of the following species is selected in Canada, Nova Scotia and the United States, viz: the Hemlock Spruce, the Yellow Birch, the Grey, Red, Scarlet, Black, White and Spanish Oaks, the Rock Chesnut Oak, the Chesnut White Oak, the Loblolly Bay, and the White Beech. The remaining Oaks, such as the Pin Oak in the

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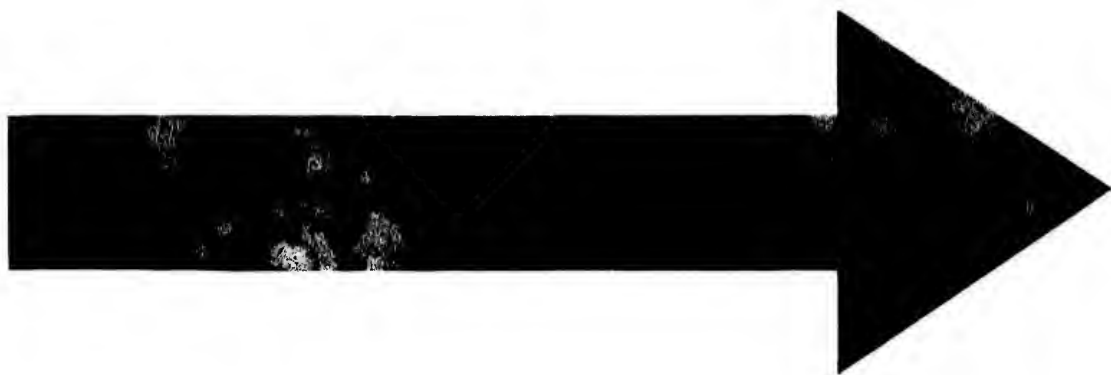
Middle States, and the Willow and Water Oaks farther south, possess the same properties, but are so thinly scattered that they are only accidentally mingled with the preceding species.

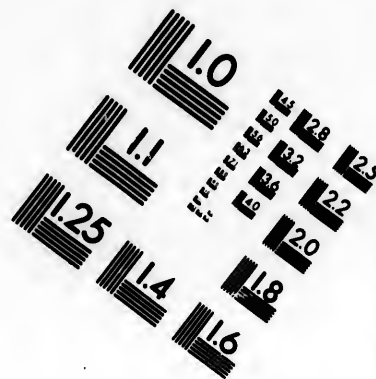
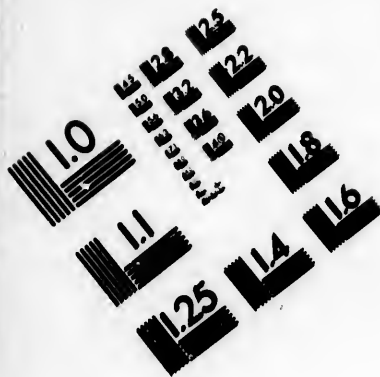
From the rareness of the Oak, the bark of the Hemlock Spruce becomes an invaluable resource to the Northern States : in the District of Maine it is sold at 3 or 4 dollars a cord of 128 cubic feet, and the tree is so abundant that it will probably for a long time supply the consumption. This bark is inferior to that of the Oaks, but it is preferred to that of the White and Red Beeches, which I have seen employed only in some parts of the Western States.

A small quantity of Yellow Birch bark is used in the District of Maine only for what is called *fair leather*.

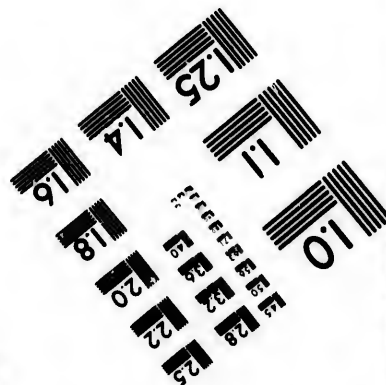
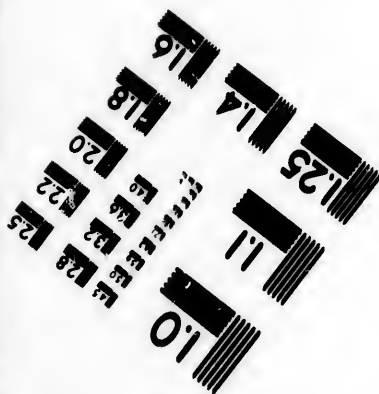
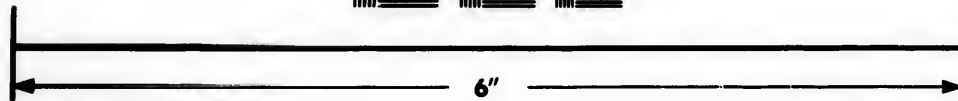
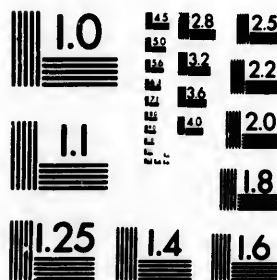
In the lower part of Connecticut and New York, in New Jersey, Pennsylvania, Maryland, the upper part of the Carolinas, and throughout the Western States, seven tenths of the bark is furnished by the Red, Scarlet and Black Oaks. The two first are confounded in use; the last possesses a more active principle, but it imparts a yellow tinge to the leather, which is made to disappear by a subsidiary process. The remaining three tenths are taken from the Rock Chesnut and Spanish Oaks. The bark of the Rock Chesnut Oak is brought to New York from the banks of the Hudson; it is more esteemed than that of the Red and Black Oaks, and sold one fourth higher: it is taken only from stocks and limbs less than







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8 inches in diameter, and is not easily procured. The Spanish Oak bark, which begins to be used immediately south of Philadelphia, is also preferred to that of the Red Oak, and is dearer in the same proportion. This superiority consists in giving to the leather a better quality, and a degree of whiteness which renders it proper for more delicate and more varied uses. This species is selected in the lower part of the Southern States; but as it cannot be procured in sufficient quantities, though the tanners are few, it is replaced by that of the Loblolly Bay. The bark of this last species makes good leather, which is, however, improved by a mixture of that of the Spanish Oak, called in those States Red Oak.

On the banks of the Ohio and in some parts of Kentucky, where the Oaks are rare, the White Beech is resorted to, though allowed to be inferior to every species of Oak. In the Middle States, the White Oak bark is sometimes seen in the *tan-yards*; it makes excellent leather, but the tree has become too precious to be felled for its bark, and the cellular integument, which alone contains the tannin is extremely thin compared to the epidermis: the contrary fact, observed in the Red, Scarlet and Pin Oaks, is probably the reason of their being so generally employed.

The bark of the American Oak is exported to England, where it is esteemed inferior to that of the Common European Oak, and sold one fourth cheaper.

**FUEL.** Except a few persons in the cities who use coal imported from England; wood is the common fuel throughout the United States. Coal is also burnt by a part of the inhabitants of Pittsburgh and its vicinity. It abounds in that part of Pennsylvania and in all the Western States, and sometimes appears at the surface of the ground: it is so easily extracted that it is delivered at the house of the purchaser for 4 cents a bushel weighing 60 or 80 pounds. Boats laden with it descend the Ohio and Mississippi to New Orleans, whence it is embarked for Philadelphia and New York, and sold, as I am informed, at a lower price than what is imported from England. This is an invaluable resource in a country which keeps on foot no public forests, and where the natural growth is rapidly disappearing.

The large towns are furnished with fuel by individuals who are subject to none of the regulations adopted in Europe. In our cities every wood-merchant is obliged to have a certain quantity of fuel in his yard at the entrance of winter, and effectual measures are taken to render the price independent of the variations in the seasons. In the United States the markets are supplied from day to day with wood exposed to sale as soon as it is felled; hence, when the navigation of the rivers is suddenly arrested by frost, the supply is cut off: the price once rose, on such an occasion, at New York, to 40 dollars a cord.

In Genessee, Vermont, New Hampshire, the District

of Maine, and the Provinces of New Brunswick, Nova Scotia and Lower Canada, the best fuel is the Sugar Maple, after which rank the Yellow Birch, the Canoe Birch, and the Red and White Beeches. In 1806, the price of a cord of wood at Wiscasset and Hollowel was a dol. 50 cents, and half as much in the small towns of the interior districts.

*Boston.* The fuel is distinguished into that which is brought 150 or 200 miles by sea from the Province of Maine, which is made up of Sugar Maple, Yellow Birch, White Birch and Beech, and which varies in price from 6 to 8 dollars the cord; and that which comes from the surrounding country to the distance of 15 or 20 miles, which consists of Hickory and White Oak, and is sold one fourth dearer. These two descriptions of wood furnish seven eighths of the consumption.

*New York.* The wood is divided into Hickory and Oak: the first comprises the four species which grow in the Atlantic States, among which the Shell-bark Hickory predominates; the second consists of the Rock Chesnut Oak, the White Oak, and a smaller proportion of the Red, Scarlet and Black Oaks. The Rock Chesnut Oak is the best after the Hickory, but it is rarely sold apart. The price of Hickory wood varies in general from 12 to 15 dollars a cord, and that of Oak, from 8 to 10 dollars. Almost all the fuel consumed at New York descends the North River.

*Philadelphia.* The best wood consists exclusively of

Hickory, in which the Mockernut Hickory appeared to predominate. The second quality is the Black Jack Oak from the southern extremity of New Jersey, which rarely exceeds five inches in diameter, and is covered with a thick, black, rugged bark. The third class is mixed, consisting of Oak, Ash, Beech and Sweet Gum. The fourth is bakers' wood, which is formed of the Pitch Pine, the Jersey Pine and the Yellow Pine : this is the only fuel consumed in the brick-kilns in the neighbourhood of Philadelphia. Large logs of Black Gum and Tupelo are sold separately, and are usually bought for the taverns : they retain the fire a long time in the back of the chimney. Towards the end of October 1807, the price of the best wood was 9 dollars and a half a cord ; of the second quality, 7 dollars and a half ; of the third, 6 dollars and a half ; and of the fourth, 4 dollars. The Black Gum logs were 6 or 8 cents apiece.

*Baltimore.* Here, also, the Hickory is sold apart, at the price of 10 dollars a cord : the Shell-bark Hickory, which does not grow in the vicinity, is never seen in the market. The second class is the Black Jack Oak, which is brought from the distance of 18 or 20 miles, and is sold at 8 dollars a cord. The third class is composed of different species of Oak, viz : the White Oak, the Post Oak, the Spanish Oak, the Willow Oak and the Black Oak : the price is from 5 to 6 dollars. Bakers and brick-makers use Pine, which is a third cheaper.

*Wilmington, N. C.* The fuel of this place is inferior

to that of any other town in the United States; it is distinguished, however, into two classes, the first consisting of twisted stocks of the Scrub Oak about as large as the arm, cut in the neighbouring *barrens*, and sold at 4 dollars a cord; the second, of Ash, of different species of Oak, of the Red and White Bays, the Red-flowering Maple, etc.

*Charleston.* The Black Jack Oak holds the first place, and is sold at 6 dollars a cord. The second class, composed of the White Oak, the Post Oak and the Chesnut White Oak, is sold at 5 dollars; the third, made up of different species, such as the Live Oak, the Hickory, the Spanish Oak, the Water Oak, the Sassafras, the Red Bay, the Big Laurel and the Sweet Gum, at 4 dollars. The Live Oak and Hickory are thrown in with the rest, as the quantity is too small to repay the trouble of selection.

*Augusta, Georgia.* The Chesnut White Oak is the best fuel, and sells at 4 dollars a cord. In the second class are the Spanish Oak, the Water Oak, etc., the price of which is 3 dollars.

Such are the species of wood principally consumed for fuel in the cities of the United States, and such, in 1806 and 1807, were their prices, which had doubled within 25 years.

The dearness of wood in New York and Philadelphia, situated as they are on navigable rivers flowing through extensive countries covered with woods, must appear



surprising; the price nearly equals and sometimes exceeds that of the best wood in Paris, though this immense capital annually requires more than 300,000 cords, and is surrounded to the distance of 300 miles by cultivated plains. The advantages enjoyed in this respect by Paris and other cities of France and Germany, is owing to the careful preservation and skilful management of the forests.

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## GENERAL TABLE

### OF THE ENGLISH AND LATIN NAMES.

*N. B.* The English synonyms are in italic characters.

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## ERRATA.

### VOL. I.

- Page 5, line 21, after *however*, insert a comma.
- 23, l. 12, in, *read on*.
- 22, l. 10, employed, *read used*.
- 56, l. 10, points, *read point*.
- 65, l. 5, instruments, *read implements*.
- 80, l. 7, tree forms, *read trees form*.
- 145, l. 18, be presented, *read shall be presented* — l. 20, center, *read centre*.
- 175, l. 6, rigour, *read rigour*.
- 181, l. 6, *dele of the*; — l. 17, Mohawk river, *read river Mohawk*.
- 182, l. 5, non, *read not*.
- 183, l. 24, *dele*, *read sessile*.
- 184, l. 2, pedicle, *read peduncle*.
- 195, l. 2, accompany, *read accompany*; — l. 24, The, *read They*.
- 198, l. 19, four, *read four or six*.
- 214, l. 19, inclosed, *read enclosed*.
- 222, l. 8, woodman, *read forester*.
- 226, l. 1, in, *read by*.
- 227, l. 3, making, *read obtaining*.
- 233, l. 25, in greatest, *read in the greatest*; — l. 26, it, *read in*.
- 234, l. 3, Alleghany, Monongahela and Ohio rivers, *read rivers Alleghany, Monongahela and Ohio*.
- 235, l. 20, break through their enclosures, *read break into enclosures*.
- 236, l. 7, exhibit, *read exhibit: dele the note*.
- 251, l. 28, *dele it*.
- 265, l. 28, *dele there are*.
- 266, l. 6, picturesque, *read picturesque*.
- 277, l. 10, whiskey, *read whisky*.
- 278, l. 17, atmosphere, *read air*.
- 284, l. 9, Nolschachuky, *read Nolschuky*.
- 509, l. 5 and 16, pannels, *read panels*.
- 510, l. 16, fellies, *read fellows*.
- 545, l. 3, most congenial, *read the most congenial*.
- 551, l. 16, 17 and 18, *read* The surface of these regions, in general very irregular and diversified in every direction with hills and vallies, is occupied, etc.
- 554, l. 2, soals, *read soles*.
- 558, l. 15, soals of shoes, *read soles of the shoes*.
- 560, l. 4, wood, *read woods*; — l. 16, inchantment, *read enchantment*.
- 561, l. 10, *dele an*.
- 574, l. 17, after *sofas*, *dele the*.

### VOL. II.

- Page 11, l. 9, *dele a*.
- 13, l. 14, this variety, *read it*.

- Page 15, l. 8, hence, *read thus*.
- 16, l. 26, these, *read those*.
- 18, l. 15, thrifty, *read thriving*.
- 26, l. 20, *dele pods*.
- 28, l. 17, the Sussufra, *read it*.
- 30, l. 13, unfold, *read unfold themselves*.
- 34, l. 23, art, *read process*.
- 39, l. 22-23, but they do not afford it in, *read but not in*.
- 45, l. 9, *dele and glabrous*; — l. 21, the acidity of its leaves has procured this tree, *read from the acidity of the leaves is derived*.
- 50, l. 21, aside from, *read besides*.
- 53, l. 25, are, *read is*.
- 68, l. 22, its, *read his*.
- 74, l. 6, considered degrading, *read considered as degrading*.
- 84, l. 9, Havanna, *read Havannah*.
- 86, l. 18, achievements, *read achievements*; — l. 23, achieved, *read done*; — l. 24, which forms the admiration of, *read which is admired by*.
- 92, l. 1, bear the greatest analogy, *read are the most analogous*.
- 110, l. 2, considered unfit, *read considered as unfit*.
- 119, l. 4, their, *read the*.
- 137, line 5, its, *read their*.
- 146, l. 15, in West Tennessee and in the Southern States, *read into West Tennessee and the Southern States*.
- 151, l. 4 and 6, *dele have*; — l. 18, *dele a*.
- 154, l. 19, the handles, r, and the handles.
- 159, l. 17, being, *read is*.
- 169, l. 22, these, *read trees*; — l. 24, trees, *read stocks*.
- 175, l. 8, name, *read names*.
- 185, l. 4, *dele and*.
- 188, l. 1, collecting, *read gathering*.
- 189, l. 16, *dele have*.
- 226, l. 5, in about the latitude, *read in the latitude of about*.
- 226, l. 13, gunwhale, *read gunwale*.
- 234, l. 8, *dele have*.
- 237, l. 1, White Lime, *read White Lime tree*.
- 241, l. 1, usually, *read generally*.
- 264, l. 5, in, *read by*.
- 283, l. 8, Hollowell, *read Hollowel*.
- 321, l. 6, lathes, *read laths*.
- 377, l. 21, after furnish, *read articles*.
- 382, l. 10, At, *read in*.
- 390, l. 23, excrescencies, r. excrescences.
- 397, l. 15, where, *read in which*.

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