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HOUGH'S  
AMERICAN  
WOODS.

PART XII.

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THE  
AMERICAN WOODS,

EXHIBITED BY ACTUAL SPECIMENS

AND WITH COPIOUS EXPLANATORY TEXT,

BY

ROMEYN B. HOUGH, B. A.

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PART XII.

REPRESENTING TWENTY-FIVE SPECIES

BY

TWENTY-FIVE SETS OF SECTIONS.

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LOWVILLE, N. Y., U. S. A.

PUBLISHED AND SECTIONS PREPARED BY THE AUTHOR

1911.

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WEED-PARSONS PRINTING CO.  
ELECTROTYPERS AND PRINTERS  
ALBANY, N. Y.



TO

*William I. Starr,*

PATRON OF THE SCIENCES AND PROMOTER OF FORESTRY, THIS

**PART XII, AMERICAN WOODS,**

IS DEDICATED AS AN EXPRESSION OF ESTEEM.



## PREFACE TO THE SERIES.

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The necessity of more generally diffused information concerning the variety and importance of our forest trees is justification enough for the appearance of this work, especially at this day, when the demands of Forestry in this country are constantly more and more keenly felt. The work was undertaken at the suggestion of my father, whose intense interest in Forestry, and a kindred taste, at once gave me inspiration to the work. It was entered upon with the expectation of his valuable companionship and counsel during its progress, but, alas ! that I was destined to have only at the outset, and, while I was then left ever to mourn the loss of a kind father, companion and teacher, the reader must fail to find in these pages that value and finish which his mind would have given them

Among the happiest pictures of my memory are those in which I see my father's delight, as I would show to him, from time to time, my successful progress in devising a way of making the sections for this work, and if only for the happiness which its appearance would have caused him, could he have lived until this day, I have felt duty-bound to go on with it, even though left to do it alone.

The work is the outgrowth of one, of somewhat similar plan, proposed by my father some years since, but which he did not carry into effect. Its design is primarily and principally to show, in as compact and perfect a manner as possible, authentic specimens of our American woods, both native and introduced. For that end three sections, respectively transverse, radial and tangential to the grain (see Glossary), are made of each timber, sufficiently thin to allow in a measure the transmission of light, and securely mounted in well made frames.

The three planes above mentioned show the grain from all sides, so to speak, no plane being possible but that would be either one of them or a combination of them. The difficulty, however, of cutting a great number of sections exactly on those planes is obvious, so let it be understood that the terms, "transverse," "radial" and "tangential," are, in many cases, only approximately exact in their application.

My endeavor is to show, either in a part or all of the sections standing to represent a species, both the heart and sap-wood, but with some woods

as the Sumach, for instance, where usually only the outermost ring, or a part of it, could be said to represent the sap-wood, the display of that is quite impossible. In certain other woods, as the Spruce, etc., the transition from sap to heart-wood is almost indistinguishable by any difference in color, and, although both may be shown in the sections, one can scarcely distinguish between them.

The sequence of the numbers given to the various species is of importance only to show the botanical arrangement within a given Part, each Part being independent of the others.

The text of this work has been added rather as a secondary matter, to supply to those not having it in other form, such information as is of importance, in connection with the wood specimens, to give a fairly good acquaintance with the trees represented. It contains little, if any thing, new to the botanist, but to others it is hoped it may be of some value.

In its preparation some use has been made of my father's Elements of Forestry, and thanks are due the publishers of that work — Messrs. Robert Clarke & Co. of Cincinnati, Ohio — for the use of cuts in reproducing a number of its illustrations. Other valuable books of reference have been the works of Drs. Gray, Wood and Bessey, LeMaout and Decaisne's Descriptive and Analytical Botany, Prof. C. S. Sargent's Report on the Forest Trees of North America (constituting Vol. IX, Tenth Census of the United States, 1880), Micheaux and Nuttall's North American Sylva, George B. Emerson's Trees and Shrubs of Massachusetts, D. J. Browne's Trees of America, etc.

The authenticity of the timbers represented in this work has been a subject of personal attention and special care on the part of the author. The trees selected for specimens have been identified in the field, before felling, while the leaves, flowers or fruit (one or more) have been obtainable, and he can, hence, vouch for the authenticity of every specimen represented.

Succeeding Parts, uniform in style with Part I, and representing in each case twenty-five additional species, are planned to appear later, with the ultimate end in view of representing, as nearly as possible, all of the American woods, or at least the most important, in such a series of volumes as this one.

Upon the reception which this meets in public favor, and upon the co-operation of those interested in the cause, must naturally depend the carrying out of that plan. It is hoped that greater experience and skill will enable us to obviate in future parts the faults which occur, from lack of those qualities, in this.

Notice of errors in this work will be thankfully received in hopes of profiting therefrom in the future.

LOWVILLE, N. Y., *March 30, 1888.*

## PREFACE TO PART XII.

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In Part XII AMERICAN WOODS we have a continuation of the trees of the Atlantic and Central States, and several rare and particularly interesting ones are included. We regret that unavoidable circumstances have delayed its appearance considerably more than anticipated, when we closed the work on Part XI, but such has been the course of fate.

We have thought it advisable to include in this Part the same Key based upon Leaves which appeared in Part XI, as it covers also the species of this Part.

The desirability of general indexes, both vernacular and botanical, covering all of the series of AMERICAN WOODS to date, has become the more apparent as the work has progressed, and we have prepared such indexes for the close of the present volume (pp. 57 to 64). Following them (p. 65) we give a brief announcement of our other lines, thinking they may be of interest to those who may desire to form a more intimate knowledge of botanical and other characters or of wood-technology.

For courtesies which have been of material assistance in the field-work, in collecting the woods for Part XII, we wish to mention with gratitude Prof. Wm. Trelease, Director of the Missouri Botanical Garden, whose ever interest in the progress of AMERICAN WOODS, is a source of pleasure and encouragement to its author. We gratefully acknowledge, too, assistance kindly rendered by Prof. C. D. Beadle, Mr. T. B. Harbison, Dr. N. M. Glatfelter, Mr. G. W. Letterman, Mr. A. Lincoln Hough, Mr. Francis Kiefer and Mr. H. A. Brinkerhoff.

It is our purpose now to take up the interesting subtropical trees of Florida. Many of them range extensively through the West Indies, Mexico and even Central and South America. Several of them are of great commercial importance, though as the chief source of supply is within the tropics few people think of them as trees found native within the United States. While engaged in this work it is our purpose, as heretofore, to make photographs of such scenes and objects as we may find particularly illustrative of habits of growth and other characteristic features of the various trees.

LOWVILLE, N. Y., Nov. 18, 1911.



# A KEY BASED UPON LEAVES, TO THE TREES OF THE NORTHERN STATES AND CANADA.

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Abbreviations. — a. = apex or at apex; ab. = above; b. = base or at base; bn. = beneath; fr. = fruit; l. = long (usually omitted and implied after dimensions); lf. = leaf; lfts. = leaflets; lvs. = leaves.

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**a SIMPLE LEAVES.**

**b With well marked blade and petiole, or without petiole (sessile);**

**c MAIN RIB SINGLE — PINNATELY VEINED**

**d Margin entire;**

**e** Leaves lance-oblong, thick,

**f** Acuminate at both ends, 3-9 in.,

**g** Rugose-reticulate, deciduous; fr. an elongated dry drupe.

CORK-WOOD (*Leitneria floridana*).

**g**<sup>2</sup> Smooth and lustrous; fr. a dark blue drupe; veins beneath and petioles

**h** Rusty tomentose, evergreen.....SWAMP BAY (*Persea pubescens*).

**h**<sup>2</sup> Glabrous or nearly so, evergreen.....RED BAY (*P. Borbonia*).

**f**<sup>2</sup> Acute at both ends, 1½-4 in.; fr. an acorn.

WILLOW OAK (*Quercus Phellos*).

**e**<sup>2</sup> Leaves lance-obovate, embeate, rounded a., mostly

**f** Clustered on lateral spurs; fr. a black drupe; beneath and petioles

**g** Densely tomentose.....WOOLLY BUCKTHORN (*Bumelia lanuginosa*),

**g**<sup>2</sup> Glabrous or nearly so.....SOUTHERN BUCKTHORN (*B. lycioides*).

**f**<sup>2</sup> Alternate on the branchlets.

**g** Thinnish, glabrous above, deciduous; fr. 2-celled capsules.

LEATHERWOOD (*Cyrilla racemiflora*).

**g**<sup>2</sup> Very thick, lustrous above, persistent; fr. acorn.

LIVE OAK (*Quercus Virginiana*).

**e**<sup>3</sup> Leaves ovate.

**f** Inequilateral, long taper-pointed and narrow; fr. drupe.

MISSISSIPPI HACKBERRY (*Celtis mississippiensis*).

**f**<sup>2</sup> Equilateral, broad, lustrous ab. rounded b., long-acuminate; fr. compound, orange-like.....OSAGE ORANGE (*Toxylon pomiferum*).

**e**<sup>4</sup> Leaves ovate-oblong, abruptly narrowed b.

**f** Alternate, acuminate, lustrous dark gr. ab., paler pubescent bn.; fr. large berry.....PERSIMMON (*Diospyros Virginiana*).

**f**<sup>2</sup> Opposite, rough-pubescent above, without stipules; fr. drupe.

ROUGH-LEAVED DOGWOOD (*Cornus asperifolia*).

**f**<sup>3</sup> Verticillate (some opposite) glabrous ab., with stipules; fr. in globular head.....BUTTON-BUSH (*Cephalanthus occidentalis*).

**e**<sup>5</sup> Leaves oblong, mostly embeate b.,

**f** Deciduous.

- g Alternate, acute or obtuse both ends, glabrous ab.; fr. acorn.  
SHINGLE OAK (*Quercus imbricaria*).
- g<sup>2</sup> Opposite, acute or acuminate both ends; fr. drupe.  
FRINGE-TREE (*Chionanthus Virginica*).
- f<sup>2</sup> Persistent, thick and coraceous, clustered near tips of branchlets,  
g Obtuse or acute both ends,  
h Broad, lustrous ab., white bn.; fr. aggregation of follicles.  
SWEET BAY (*Magnolia glauca*).
- h<sup>2</sup> Narrow, glabrous ab., paler bn.; fr. capsule.  
ROSE BAY (*Rhododendron maximum*).
- g<sup>2</sup> Acuminate both ends; fr. capsule. MOUNTAIN LAUREL (*Kalmia latifolia*).
- e<sup>6</sup> Leaves obovate-oblong,  
f Narrow and sometimes falcate; fr. acorn.  
LAUREL OAK (*Quercus laurifolia*).
- f<sup>2</sup> Wider, coriaceous, lustrous ab., acute or acuminate; fr. drupe.  
SOUR GUM (*Nyssa sylvatica*).
- e<sup>7</sup> Leaves obovate,  
f Large (3-20 in.) membranaceous.  
g Cuneate b.,  
h Short acuminate, 8-12 in. narrow; fr. fleshy baccate.  
PAWPAW (*Asimina triloba*).
- h<sup>2</sup> Acute to obtuse a., 12-20 in.; fr. aggregation follicles.  
UMBRELLA-TREE (*Magnolia tripetala*).
- g<sup>2</sup> Ear-lobed b.; fr. aggregation follicles.  
h 10-12 in. long.....FRASER MAGNOLIA (*M. Fraseri*).
- h<sup>2</sup> 15-30 in. long.....LARGE-LEAF MAGNOLIA (*M. macrophylla*).
- f<sup>2</sup> Small (4-6 in.) cuneate.  
g Membranaceous, wide, rounded a., glabrous ab.; fr. drupelet.  
AMERICAN SMOKE TREE (*Cotinus Americanus*).
- g<sup>2</sup> Coriaceous, narrow, mostly acute; fr. drupe.  
WATER GUM (*Nyssa biflora*).
- e<sup>8</sup> Leaves oval, membranaceous, deciduous.  
f Rounded or subcordate b., 7-10 in.; fr. aggregation follicles.  
CUCUMBER-TREE (*Magnolia acuminata*).
- f<sup>2</sup> Cuneate b., acuminate a., veins arcuate.  
g Alternate or clustered; fr. blue drupe.  
BLUE DOGWOOD (*Cornus alternifolia*).
- g<sup>2</sup> Opposite or clustered; fr. red drupe.  
FLOWERING DOGWOOD (*Cornus florida*).
- d<sup>2</sup> Margin both entire and dentate or denticulate; leaves  
e Linear-lanceolate, 2-5 in., entire or remotely denticulate; fr. capsule.  
SANDBAR WILLOW (*Salix fluviatilis*).
- e<sup>2</sup> Oblanceolate, 3-5 in., entire or remotely serrate, fragrant; fr. small drupe.  
WAX MYRTLE (*Myrica cerifera*).
- e<sup>3</sup> Lance-obovate, cuneate b., rounded to acute a., entire or appressed-serrate,  
evergreen; fr. drupaceous.....CASSENA HOLLY (*Ilex cassine* L.).
- e<sup>4</sup> Ovate-oblong, 5-10 in., acuminate with long stems and both entire and with  
from 1-5 large pointed teeth; fr. drupe.  
COTTON GUM (*Nyssa aquatica*).



- e<sup>5</sup> Oblong, acute to acuminate both ends, entire and irregularly serrulate, 3-7 in., glaucous bn.; fr. capsule.....SORREL-TREE (*Oxydendrum arboreum*).
- e<sup>6</sup> Obovate-oblong, cuneate to rounded b., 1-3 in., whitish pubescent bn.; fr. capsule.....BEBB'S WILLOW (*Salix Bebbiana*).
- e<sup>7</sup> Elliptical, very thick and firm, glabrous, with few remote spine-tipped teeth, evergreen; fr. drupe.....HOLLY (*Ilex opaca*).
- e<sup>8</sup> Obovate, ½-2 in., subsessile, firm thick and lustrous, entire and obscurely denticulate; fr. berry.....SPARKLEBERRY (*Vaccinium arboreum*).
- d<sup>3</sup> Margin both entire and lobed, the latter mostly on vigorous shoots, very short-stemmed; the entire leaves are
- e Lance-obovate to spatulate, cuneate b., wide and rounded or obscurely 3 lobed a. (other leaves sharply pinnately 3-7-lobed) tardily deciduous; fr. acorn.....WATER OAK (*Quercus nigra*).
- e<sup>2</sup> Ovate-oblong, 2-7 in., abruptly narrowed b., acute or obtuse a. (other leaves with large lobe on one or both sides); fr. drupe.  
SASSAFRAS (*Sassafras sassafras*).
- e<sup>3</sup> Broad-ovate, large, long-stemmed, the lowest pair of veins branching; arrangement
- f Ternate (some opposite) subcordate, acute or acuminate, pith of twigs not segmented; fr. pod-like; leaves
- g Acute or short acuminate; fringe of hairs on seeds pointed.  
CATALPA (*Catalpa catalpa*).
- g<sup>2</sup> Long-acuminate, fringe of hairs of seeds wide.  
HARDY CATALPA (*Catalpa speciosa*).
- f<sup>2</sup> Opposite, cordate., acute or bluntly pointed, pith of twigs segmented; fr. capsule.....PRINCESS TREE (*Paulownia tomentosa*).
- d<sup>4</sup> Margin serrate or serrulate.
- e Leaves inequilateral, alternate;
- f Petioles short, veins impressed above and
- g Parallel; mostly doubly serrate, firm
- h Smooth above; fr. samara; branchlets
- i Not corky-winged; leaf-buds smooth and blunt.  
WHITE ELM (*Ulmus Americana*).
- i<sup>2</sup> Some corky-winged; leaf-buds acnminate, puberulous;
- j Leaves 2-6 in.; a northern tree.....CORK ELM (*Ulmus Thomasi*).
- j<sup>2</sup> ¾-3 in.; a southern tree.....WINGED ELM (*Ulmus alata*).
- h<sup>2</sup> Very rough above.; fr. samara.....SLIPPERY ELM (*Ulmus pubescens*).
- g<sup>2</sup> Not parallel, arcuate and ramose; simply serrate, thin; fr. drupe.  
HACKBERRY (*Celtis occidentalis*).
- f<sup>2</sup> Petioles long; veins little if at all impressed, arcuate, ovate-orbicular, prominently reticulated; fr. nut-like with parachute.
- g Leaves smooth and greenish beneath.....BASSWOOD (*Tilia Americana*).
- g<sup>2</sup> Leaves silvery-pubescent beneath, with small if any axillary tufts.  
WHITE BASSWOOD (*T. heterophylla*).
- g<sup>3</sup> Leaves stellate-pubescent beneath, with conspicuous axillary tufts.  
MICHAUX'S BASSWOOD (*T. Michauxii*).
- g<sup>4</sup> Leaves rusty-pubescent beneath; a southern tree.  
DOWNY BASSWOOD (*T. pubescens*).
- e<sup>2</sup> Leaves equilateral or nearly so; fr. a

- f** Drupe with juicy acidulous flesh; leaves alternate; pit of drupe
- g** Bony, hard and
- h** Pit more or less flattened and with ventral groove; leaves
- i** Lance-oblong, tapering b., membranaceous,
- j** Long-acuminate, light green and sharply serrate; pit deeply wrinkled.....PEACH (*Amygdalus Persica*).
- j<sup>2</sup>** Acute or apiculate, glandular serrate, infolded lengthwise; pit nearly smooth.....CHICKASAW PLUM (*Prunus angustifolia*).
- i<sup>2</sup>** Lance-ovate, rounded or tapering b., long-acuminate, closely glandular serrate, firm; mid-rib hairy bn.  
WILD GOOSE PLUM (*Prunus hortulana*).
- i<sup>3</sup>** Ovate-oblong,
- j** 2½-5 in., veins strongly impressed ab. and prominent bn.; rounded or obtuse b.
- k** Sharply and sometimes doubly serrate; stems mostly glandless.  
AMERICAN WILD PLUM (*Prunus Americana*).
- k<sup>2</sup>** Bluntly serrate; stems with glands near blade.  
CANADA PLUM (*Prunus nigra*).
- j<sup>2</sup>** 1½-3 in. long, thick and firm; fr. blue-black or purple with bloom; leaves with
- k** Rounded or obtuse b.; fr. ½ in. or less, dark purple.  
ALLEGHANY SLOE (*Prunus Alleghaniensis*).
- k<sup>2</sup>** Cuneate b., wrinkled; fr. ¾-1 in., blue with bloom.  
GARDEN PLUM (*Prunus domestica*).
- h<sup>2</sup>** Pit turgid (nearly subglobose) marginless; leaves
- i** Lance-oblong (occasionally wider) rounded or obtuse b. acuminate
- j** Membranaceous; cherries small, translucent, red, in clusters, and very tart.....PIGEON CHERRY (*Prunus Pennsylvanica*).
- j<sup>2</sup>** Firm, with glandular incurved teeth; cherries purple-black, in racemes and of pleasant vinous flavor.  
BLACK CHERRY (*Prunus scrotina*).
- i<sup>2</sup>** Obovate-oblong, rounded or obtuse b.
- j** Bluntly and unevenly serrate; fr. single or few in cluster;
- k** Leaves thin and drooping; fr. sweet.  
SWEET CHERRY (*Prunus Avium*).
- k<sup>2</sup>** Leaves thickish and little if at all drooping; fr. tart.  
SOUR CHERRY (*Prunus Cerasus*).
- j<sup>2</sup>** Sharply and evenly serrate; fr. in racemes, about ¼ in. and astringent.....CHOKE CHERRY (*Prunus Virginiana*).
- g<sup>2</sup>** Pit bony and yielding, flat; flesh blackish and sweet; lvs. opposite, finely and sharply serrate.
- h** Acute or obtuse a., tapering b.,
- i** Smooth bn.; petioles not winged.  
BLACK HAW (*Viburnum prunifolium*).
- i<sup>2</sup>** With rufous hairs bn. on midrib and principal veins; petioles little if at all winged.....RUSTY NANNYBERRY (*Viburnum rufidulum*).
- h<sup>2</sup>** Acuminate, rounded b., black-dotted beneath; petioles slightly winged.  
NORTHERN NANNYBERRY (*Viburnum Lentago*).

- f<sup>2</sup> Drupe-like, but containing 2-6 one-seeded nutlets; lvs. lanceolate to oblong, membranaceous and markedly wrinkled.  
MOUNTAIN HOLLY (*Ilex monticola*).
- f<sup>3</sup> A pome (apple); leaves ovate to oblong or oval, firm, mostly rounded b. and leaf stalks
- g Slender, long and smooth.
  - h Leaves glabrous ab. and usually bn., sharply and widely serrate; fr. ½ in. or less, in loose racemes.  
SERVICE-BERRY (*Amelanchier Canadensis*).
  - h<sup>2</sup> Leaves lustrous ab., smooth bn., appressed serrate or subentire; fr. usually tapering to the stem, containing grit cells.  
PEAR (*Pyrus communis*).
- g<sup>2</sup> Short, stout, gray-tomentose as is the under surface of lvs.; fr. hollowing at stem and without grit-cells.....APPLE (*Pyrus Malus*).
- f<sup>4</sup> Capsule, which is
  - g<sup>2</sup> 1-celled, dehiscent by 2 valves, ¼ in. or less l; seeds with silky hairs;
    - h Leaf-buds covered with single scale; leaves
      - i Linear-lanceolate, very long taper-pointed and drooping.  
WEeping WILLOW (*Salix babylonica*).
      - i<sup>2</sup> Narrow-lanceolate, green bn.; petioles not glandular; finely serrate.  
BLACK WILLOW (*Salix nigra*).
      - i<sup>3</sup> Lanceolate; petioles
        - j Glandular; glabrous bn., coarsely serrate; branchlets greenish and very brittle.....BRITTLE WILLOW (*S. fragilis*).
        - j<sup>2</sup> Not glandular; pale bn.; stipules.
          - k Foliaceous; branchlets hoary-pubescent.  
WARD'S WILLOW (*Salix longipes*).
          - k<sup>2</sup> Deciduous; leaves
            - l Glabrous ab., whitish and glaucous bn.; branchlets yellow.  
YELLOW WILLOW (*S. vitellina*).
            - l<sup>2</sup> Silky-pubescent both sides; branchlets greenish.  
WHITE WILLOW (*S. alba*).
      - i<sup>4</sup> Broad lanceolate, smooth above, pale and glaucous bn.; petioles long and not glandular....PEACH-LEAF WILLOW (*Salix amygdaloides*).
      - i<sup>5</sup> Lance-ovate, very lustrous dark green ab., firm; petioles glandular.  
SHINING WILLOW (*S. lucida*).
      - i<sup>6</sup> Oblanceolate and lanceolate, pale bn., finely serrate; stipules foliaceous; branchlets first season and buds hairy.  
MISSOURI WILLOW (*S. Missouriensis*).
      - i<sup>7</sup> Ovate-oblong, rounded or subcordate b., acute a.  
BALSAM WILLOW (*Salix basamifera*).
    - h<sup>2</sup> Buds covered by several scales;
      - i Leaves lanceovate, cuneate or rounded b., bluntly pointed a.  
NARROW-LEAF COTTONWOOD (*Populus augustifolia*).
      - i<sup>2</sup> Leaves ovate-orbicular, subcordate.  
TWEEDY'S COTTONWOOD (*P. Tweedyi*).
  - g<sup>2</sup> 5-celled, dehiscent by 5 valves; leaves lance-obovate to oblong, tapering both ways, remotely serrate above the middle and

- h** Persistent, thick, coriaceous; seeds winged.  
 LOBLOLLY BAY (*Gordonia Lasianthus*).
- h<sup>2</sup>** Deciduous, membranaceous; seeds not winged.  
 FRANKLINIA (*Franklinia Altamaha*).
- f<sup>5</sup>** Nutlet,
- g** Not winged, each
- h** Subtended by a 3-lobed leaf-like braet and arranged in aments; lvs. unequally and sharply serrate, glabrous bn. except for silky hairs in the axils of veins. . . . . BLUE BEECH (*Carpinus Caroliniana*).
- h<sup>2</sup>** Enclosed in a membranous sac and arranged in loose cone-like aments; leaves ovate-oblong, unequally and sharply serrate, pubescent bn.  
 IRONWOOD (*Ostrya Virginiana*).
- g<sup>2</sup>** Winged both sides and borne in the axils of scales which form a cone; scales
- h** 3-lobed, thin and falling away at maturity of seed;
- i** Bark chalky white and peeling in strips around the trunk; lvs.
- j** Ovate, rounded or obtuse b., acuminate a.; bark peeling readily.  
 CANOE BIRCH (*Betula papyrifera*).
- j<sup>2</sup>** Deltoid, long-acuminate, petioles long and slender; bark peeling with some difficulty. . . . . WHITE BIRCH (*Betula populifolia*).
- i<sup>2</sup>** Bark smooth, lustrous reddish brown; lvs. broad ovate.  
 WESTERN RED BIRCH (*B. fontinalis*).
- i<sup>3</sup>** Bark sealy, gray-brown; lvs. ovate-oblong, narrow and rounded or subcordate b., aromatic when bruised.  
 SWEET BIRCH (*Betula lenta*).
- i<sup>4</sup>** Bark silvery yellow, separating in thin layers and hanging in curls; lvs. ovate-oblong, narrow and mostly heart shaped b., aromatic.  
 YELLOW BIRCH (*Betula lutea*).
- i<sup>5</sup>** Bark reddish brown, separating in thin persistent scales; lvs. rhombic ovate. . . . . RIVER BIRCH (*B. nigra*).
- h<sup>2</sup>** Thickened, woody and persistent; lvs.
- i** Ovate-oblong, mostly acute or acuminate a., lustrous dark green ab.; fls. in late summer. . . . . SEA-SIDE ALDER (*Alnus maritima*).
- i<sup>2</sup>** Orbicular-obovate, rounded to notched a., dull green ab.; fls. in early spring. . . . . EUROPEAN ALDER (*Alnus glutinosa*).
- f<sup>6</sup>** Nut.
- g** Enveloped by a 2-4-valved prickly-covered involucre, lateral veins of lvs. straight, parallel, and each terminating in a tooth; nut
- h** Triangular, each involucre inclosing a pair; lvs. ovate-oblong, acuminate, hairy along veins bn. . . . . BEECH (*Fagus Americana*).
- h<sup>2</sup>** Globose — top-shaped, single in involucre; lvs. narrow-oblong with slender teeth and white-tomentose bn.  
 CHINQUAPIN (*Castanea pumila*).
- h<sup>3</sup>** Compressed ovoid-globose, 2 or 3 in an involucre; lvs. lance-oblong with coarse teeth, green and glabrous both sides.  
 CHESTNUT (*Castanea dentata*).
- g<sup>2</sup>** Subtended by an involueral cup — an acorn; lvs. lance-oblong, obovate, coarsely and sharply serrate;
- h** Large trees. . . . . CHINQUAPIN OAK (*Quercus acuminata*).

- h<sup>2</sup> Shrubs or very small trees. . . DWARF CHINQUAPIN OAK (*Q. prinoides*).
- d<sup>5</sup> Margin both serrate or serrate-dentate and lobed in the same lvs., though the lobed lvs. may be on vigorous shoots only, and the latter lvs. are not considered in these further descriptions.
- e Fruit a small pome (apple)
- f With 1-5 bony, 1-seeded nutlet-like carpels; small trees and shrubs with thorny branches; lvs.
- g Obovate (large ones more elliptical) entire, cuneate b., rounded or acute a.; petioles short, winged above and glandless;
- h Leaves lustrous dark-green ab., thick; fr. globose-oblong,  $\frac{1}{2}$  in., dull red; nutlets 1-3. . . . . COCK-SPUR THORN (*Crataegus crus-galli*).
- h<sup>2</sup> Leaves dull gray-green ab., more membranaceous; fr. subglobose,  $\frac{1}{2}$ -1 in., dull red or yellow with white dots.
- DOTTED THORN (*C. punctata*).
- g<sup>2</sup> Obovate-oblong, wider and short cuneate b., petioles longer and winged ab.
- h Irregularly serrate-dentate, acute or blunt-pointed and slightly, if at all, lobed, dark green and smooth ab.; fr. scarlet or orange,  $\frac{1}{4}$  in. or less; nutlets usually 5. . . . . SOUTHERN THORN (*C. viridis*).
- h<sup>2</sup> Crenate-serrate or with short crenate toothed lobes, rounded or obtuse a.; fr. oblong-globose,  $\frac{1}{2}$  in., dark red or orange, black dotted, with 2-3 nutlets. . . . . MARGARETTA THORN (*C. Margaretta*).
- h<sup>3</sup> With short acute-toothed lobes or doubly serrate-dentate, obtuse to acute a., pubescent bn. 2-5 in.; petioles glandular; fr. oblong-globose,  $\frac{1}{2}$  in.; nutlets 2-3 with ventral cavities.
- PEAR THORN (*C. tomentosa*).
- g<sup>3</sup> Obovate-orbicular, rounded or obtuse a., coriaceous, coarsely and irregularly serrate-dentate, or very slightly lobed; thorns 2 $\frac{1}{2}$ -4 in.; fr. lustrous crimson,  $\frac{1}{4}$ - $\frac{1}{2}$  in., subglobose, on erect stems; nutlets with deep ventral cavities. . . . LONG-SPINE THORN (*Crataegus macracantha*).
- g<sup>4</sup> Leaves broad-ovate;
- h Waxy-coated, slightly 5-angled and flattened subglobose, apple-green becoming purplish red; lvs. subcordate b., acute, with 3 or 4 pairs short pointed lobes, thickish. . . . . WAXY THORN (*C. pruinosa*).
- h<sup>2</sup> Fruit pubescent at least at the ends.
- i Subglobose,  $\frac{3}{4}$ -1 in., in small drooping villous clusters; calyx-lobes large and deciduous; nutlets 4 or 5; lvs. truncate or subcordate b., with appressed pubescence ab., pubescent bn.
- RED-FRUITED THORN (*C. mollis*).
- i<sup>2</sup> Obovoid-oblong, in erect compact clusters with prominent and persistent calyx-lobes and tube; lvs. rounded b., acute or obtuse a.
- CHAMPLAIN THORN (*C. Champlainensis*).
- h<sup>3</sup> Smooth and lustrous, about  $\frac{3}{4}$  in.; lvs. scabrous ab.; fr.
- i Orange red with pale dots, obovoid, calyx-lobes enlarged and persistent; lvs. thickish. . . . . RED-FRUITED THORN (*C. submollis*).
- i<sup>2</sup> Bright scarlet with dark dots; lvs. membranaceous.
- SCARLET THORN (*C. pedicellata*).
- g<sup>5</sup> Triangular-ovate, 1 $\frac{1}{2}$ -3 in., truncate b., acute or acuminate a., lustrous dark green ab., coarsely serrate-dentate and incisely 3-5-lobed.
- WASHINGTON THORN (*C. cordata*).

g<sup>6</sup> Oval to orbicular.

h Membranaceous, hairy on veins bn.,

i Rounded or obtuse a. and b., sharply serrate with 2-3 short lobes, glabrous yellow-green ab., paler and concave bn.

PRINGLE'S THORN (*C. Pringlei*).

i<sup>2</sup> Acute or acuminate a., rounded b., sharply serrate-dentate, and with 3 or 4 pairs short lobes, scabrous ab., pubescent on veins bn.

HOLME'S THORN (*C. Holmesiana*).

h<sup>2</sup> Coriaceous, finely doubly serrate-dentate.

SCARLET THORN (*C. coccinea*).

f<sup>2</sup> With 5 papery usually 2-seeded carpels; small flat waxy fragrant apples; lvs.

g Tomentose or pubescent bn., oblong-ovate to oval,

h Crenate-serrate and usually with short crenate lobes; fr. stems slender and glabrate.....PRAIRIE CRAB (*Pyrus Ioensis*).

h<sup>2</sup> Crenate and very much wrinkled; fr. stems short.

SOULARD CRAB (*Pyrus Soulardi*).

g<sup>2</sup> Glabrous throughout, with long slender stems; fr. hard translucent long-stemmed and calyx-lobes.

h Deciduous; fr. yellowish, red-cheeked, scarcely waxy and but little hollowed at b.; lvs. ovate-oblong serrate or sometimes entire, not lobed.....SIBERIAN CRAB (*Pyrus baccata*).

h<sup>2</sup> Persistent in fruit; fr. yellow-green, waxy, deeply hollowed at b., very sour; lvs. triangular ovate to truncate or subcordate b., acute a., serrate-dentate and usually with few short lobes.

FRAGRANT CRAB (*Pyrus coronaria*).

e<sup>2</sup> Fruit a juicy syncarp (blackberry-like), edible; lvs. with arcuate lateral veins, the lowermost pair branching; lvs.

f Lustrous ab., glabrous bn., broad-ovate, coarsely serrate; fr. pinkish white.

WHITE MULBERRY (*Morus alba*).

f<sup>2</sup> Dull dark green and roughish ab., pubescent and strongly reticulate bn., orbicular ovate; petioles glabrate; fr. purple-black.

RED MULBERRY (*Morus rubra*).

e<sup>3</sup> Fruit a globular head with seeds exerted on red fleshy stipes; lvs. rough ab., under surface and petioles velvety-pubescent.

PAPER MULBERRY (*Broussonetia papyrifera*).

d<sup>6</sup> Margin crenate-serrate;

e Leaves opposite, mostly

f Oblong, tapering b., acuminate; small trees and shrubs; lvs.

g Glabrous bn., 2-3 in.; inhabits wet lowlands; fr. drupe.

SWAMP PRIVET (*Forestiera acuminata*).

g<sup>2</sup> Pubescent bn., 2-5 in., membranaceous and very finely crenate-serrate; an upland tree; fr. fleshy capsule.

BURNING BUSH (*Euonymus atropurpureus*).

f<sup>2</sup> Broad-ovate to oval, 1½-5½ in., rounded b., obtuse to acute a., the lateral veins very prominent and arcuate; fr. drupe-like.

BUCKTHORN (*Rhamnus cathartica*).

e<sup>2</sup> Leaves alternate,

- f** Lance-ovate, rounded or apiculate a.; fr. a small flt waxy-coated apple.  
NARROW LEAF CRAB (*Pyrus angustifolia*).
- f<sup>2</sup>** Lance-oblong, finely rugose ab., glaucous bn.; fr. a small capsule with cotton-tufted seeds.....GLAUCOUS WILLOW (*Salix discolor*).
- f<sup>3</sup>** Lance-obovate, 4-6 in., cuneate b., acute or acuminate a., very lustrous ab., thick and with short stems; fr. dry drupe.  
SWEET LEAF (*Symplocos tinetoria*).
- f<sup>4</sup>** Rhombic-lanceolate to ovate, with long slender stems, cuneate to nearly rounded b., acuminate a.; a tree of the eastern foot-hills of the Rocky Mountains; fr. capsule...LANCE-LEAF COTTONWOOD (*Populus acuminata*).
- f<sup>5</sup>** Ovate, cuneate to rounded b., acute to acuminate, strongly reticulate, whitish and often rusty bn.; fr. capsule.  
BALSAM POPLAR (*Populus balsamifera*).
- f<sup>6</sup>** Heart-shaped, 3-8 in., with long round stems; fr. capsule; lvs.  
**g** Acuminate, whitish and often rusty bn.  
BALM-OF-GILEAD (*Populus candicans*).
- g<sup>2</sup>** Obtuse to subacute a., hairy bn. and on stems.  
SWAMP POPLAR (*Populus heterophylla*).
- f<sup>7</sup>** Ovate-oblong, 1-3 in., rounded or obtuse and more or less inequilateral b.; fr. coriaceous drupe.....PLANER-TREE (*Planera aquatica*).
- f<sup>8</sup>** Oblong, 2-4 in., acute or rounded both ends, lustrous and veins impressed ab., obscurely crenate-serrate; a very small tree or shrub of the southern states; fr. drupe-like.....YELLOW BUCKTHORN (*Rhamnus Caroliniana*).
- f<sup>9</sup>** Obovate, 4-8 in., obtuse or acute b., acute or acuminate a., regularly crenate; fr. an acorn.....COW OAK (*Quercus Michauxii*).
- f<sup>10</sup>** Deltoid-ovate, truncate or wide cordate b., acute or short-acuminate, stems long and laterally compressed; fr. capsule.  
COTTONWOOD (*Populus deltoides*).
- f<sup>11</sup>** Orbicular-ovate, 1-2 in., rounded to subcordate b., obtuse to acute or apiculate a., glabrous and fragrant; fr. drupe.  
PERFUMED CHERRY (*Prunus Mahaleb*).
- d<sup>7</sup>** *Margin erenate or crenulate; lvs.*
- e** Lance-obovate, 1½-3 in., cuneate b., rounded, obtuse or notched a.; fr. drupe-like.....SWAMP HOLLY (*Ilex decidua*).
- e<sup>2</sup>** Oblong, 1-2 in., thick, evergreen; fr. a bright red drupe-like berry; fr. drupe-like.....YAUPON (*Ilex vomitoria*).
- e<sup>3</sup>** Suborbicular, 1½-3 in., rounded or obtuse b., abruptly acute or short acuminate, finely crenate; petioles long and compressed laterally; fr. capsule.  
QUAKING ASP (*Populus tremuloides*).
- e<sup>4</sup>** Broad-deltoid or rhombic, blade commonly wider than long, cuneate to truncate b., short acuminate or acute a.; petioles long, laterally compressed; fr. capsule; branches  
**f** Spreading.....BLACK POPLAR (*Populus nigra*).
- f<sup>2</sup>** Strictly upright.....LOMBARDY POPLAR (*Populus dilatata*).
- d<sup>8</sup>** *Margin dentate,*
- e** Finely dentate, mostly oblong, acute or obtuse b., acuminate a., with prominent arcuate veins; fr. dry winged drupe.  
SILVER-BELL TREE (*Mohrodendron Carolinum*).
- e<sup>2</sup>** Coarsely dentate, broad-ovate to orbicular; petioles

**f** Laterally compressed and long, blades rounded b., acute or short acuminate a., glabrous and firm (white velvety when young); fr. capsule.

LARGE-TOOTH POPLAR (*Populus grandidentata*).

**f<sup>2</sup>** Terete, slender and short, blades mostly rounded or obtuse both ends, membranaceous; fr. drupe-like.

WESTERN SERVICEBERRY (*Amelanchier alnifolia*).

**d<sup>9</sup>** Margin sinuate or sinuate-dentate,

**e** Lance-oblong to ovate, obtuse to subcordate b., bluntly acute a., with 10-16 pairs of straight lateral veins.....ROCK OAK (*Quercus Prinus*).

**e<sup>2</sup>** Obovate-oblong, cuneate b., rounded or obtuse a., 6-8 pairs of lateral veins, whitish bn.....SWAMP WHITE OAK (*Quercus platanooides*).

**e<sup>3</sup>** Oval-obovate, rounded or subcordate b., rounded to acute or apiculate a., membranaceous; petioles short and thick; fr. woody capsule.

WITCH HAZEL (*Hamamelis Virginia*).

**e<sup>4</sup>** Suborbicular (on vigerous shoots 3-5-lobed) 2-4 in., dark green ab., white velvety tomentose bn. on stems, etc.; fr. capsule....ABELE (*Populus alba*).

**d<sup>10</sup>** Margin lobed; fruit a

**e** Small apple, containing a single 2-seeded bony nutlet; branchlets thorny and lvs. with 1-3 pairs of wide-spreading lobes.

HAWTHORN (*Crataegus Oxyacantha*).

**e<sup>2</sup>** Narrow upright cone, made up of closed carpels; lvs. with one or two pairs of wide-spreading entire lobes and turecate or with wide sinus at apex.

TULIP TREE (*Liriodendron tulipifera*).

**e<sup>3</sup>** Acorn; lvs. pinnately lobed and

**f** Lobes bristle-tipped; acorns maturing in the autumn of the second year; sinuses

**g** Narrow at bottom; lobes wide at base and narrowing towards apex; lvs.

**h** Oval to ovate, lobes 4-5 pairs, each lobe with

**i** One to three sharp teeth; fruit

**j** Scarcely  $\frac{1}{4}$  enveloped by its shallow saucer.

RED OAK (*Quercus rubra*).

**j<sup>2</sup>** Half enveloped by its deep saucer.

GRAY OAK (*Q. borealis*).

**i<sup>2</sup>** Entire, triangular and wide-spreading.

SWAMP SPANISH OAK (*Quercus pagodaefolia*).

**h<sup>2</sup>** Obovate and lobes generally in

**i** Four pairs, symmetrically arranged, the larger lobes 1-4 toothed.

YELLOW OAK (*Q. velutina*).

**i<sup>2</sup>** One to three pairs.

**j** Not symmetrically arranged, lobes scarcely dentate and those of some lvs. finger like.....SPANISH OAK (*Q. digitata*).

**j<sup>2</sup>** Symmetrically arranged and generally in

**k** Two pairs; shrubs or very small trees.

BEAR OAK (*Quercus nana*).

**k<sup>2</sup>** A single pair of wide-spreading lobes near a., or scarcely lobed and very wide at a.; a medium-size tree.

BLACK JACK OAK (*Q. Marilandica*).

**g<sup>2</sup>** Sinuses wide, rounded and deep; lobes narrow, widening toward the apex, the larger with 1-4 spreading teeth or sometimes toothed lobes; acorn



h Oblong and with

i Very shallow saucer-like cup.

SOUTHERN RED OAK (*Quercus Texana*).

i<sup>2</sup> Deep top-shaped cup about half enveloping the acorn.

HILL'S OAK (*Q. ellipsoidalis*).

h<sup>2</sup> Subglobose, half enveloped by its deep turbinate cup of closely appressed scales.....SCARLET OAK (*Q. coccinea*).

h<sup>3</sup> Flattened-globose to almost hemispheric, with shallow saucer-shaped or slightly top-shaped cup.....PIN OAK (*Q. palustris*).

f<sup>2</sup> Lobes rounded or bluntly pointed and acorns maturing in the autumn of the first year; lvs.

g Obovate-oblong, under surface

h Glabrous, larger lobes long and narrow, acorn about one-third invested by the cup.....WHITE OAK (*Q. alba*).

h<sup>2</sup> White-tomentose, lobes shorter and more triangular; acorn nearly enveloped by its thin-edged cup.....OVER-CUP OAK (*Q. lyrata*).

g<sup>2</sup> Broad-obovate with

h 1 or 2 pairs of rounded lobes, the one next the apex much the largest and commonly truncate or with wide sinus at apex.

POST OAK (*Q. minor*).

h<sup>2</sup> 3 or 4 pairs — deeply lyrate pinnatifid; acorns generally large with fringed cup.....BUR OAK (*Q. macrocarpa*).

e<sup>2</sup> MAIN RIBS SEVERAL — PALMATELY VEINED:

d *Leaves alternate with*

e 5-7 deep lobes — star-shaped; fr. globose head of capsules.

SWEET GUM (*Liquidambar styraciflua*).

e<sup>2</sup> 3-5 short lobes; b. of leaf-stem enveloping the new leaf-bud; fr. globose head of akenes.....SYCAMORE (*Platanus occidentalis*)

e<sup>3</sup> Not lobed, entire, orbicular-cordate; fr. pod.

REDBUD (*Cercis Canadensis*).

d<sup>2</sup> *Leaves opposite*; fr. samaras in pairs united at base.

e Large or medium-size trees with rather firm lvs.:

f Sinuses rounded at bottom and lobes entire or nearly so; sinuses

g Moderately deep; lvs. pale and glabrous bn., without stipules.

SUGAR MAPLE (*Acer Saccharum*).

g<sup>2</sup> Shallow; lvs. green and pubescent bn., edges drooping; stipules often present.....BLACK MAPLE (*A. nigrum*).

f<sup>2</sup> Sinuses pointed at bottom and lobes more or less toothed; lvs.

g<sup>3</sup> Deeply 5-lobed with narrow sinuses.....SILVER MAPLE (*A. dasycarpum*).

g<sup>2</sup> Moderately 3-5-lobed with wide sinuses; under surface pale and

h Glabrate; rather thin, subcordate b.....RED MAPLE (*A. rubrum*).

h<sup>2</sup> Moderately hairy, especially along the veins, firm, mostly tapering and entire b. obovate-orbicular, small and sometimes without lobes.

CAROLINA MAPLE (*A. Carolinum*).

h<sup>3</sup> Velvety pubescent, thick, wide-orbicular; a southern tree.

DRUMMOND MAPLE (*A. Drummondii*).

e<sup>2</sup> Small trees or tall shrubs with membranaceous leaves; lobes

h Doubly serrate; lvs.

i Acuminate, 3-lobed at a. only, eastern.

STRIPED MAPLE (*A. Pennsylvanicum*).

i<sup>2</sup> Acute or obtuse, 3-5-lobed, or even 3-parted or 3-foliolate, western.

DWARF MAPLE (*A. glabrum*).

h<sup>2</sup> Coarsely serrate-dentate, pubescent bn.

MOUNTAIN MAPLE (*A. spicatum*).

b<sup>2</sup> Without well-marked blade and petiole (latter present, but very small in leaves of Hemlocks);

c LEAVES LINEAR AND IN FLAT 2-RANKED SPRAYS.

d *Sessile*.

e Deciduous, soft, light green (those of fruiting-branchlets scale-like); fr. subglobose cones.....BALD CYPRESS (*Taxodium distichum*).

e<sup>2</sup> Evergreen, more rigid, dark green ab., whitish and keeled bn., leaving a flat or depressed scar when breaking away from branchlet; cones erect, 2 to 3½ in. long and falling apart at maturity.

f Bracts of cone shorter than scales.....BALSAM FIR (*Abies balsamea*).

f<sup>2</sup> Bracts longer than the scales, exerted and reflexed.

FRASER'S FIR (*Abies Fraseri*).

d<sup>2</sup> With very small appressed petioles.

e Leaves obtuse or rounded a.; cones less than 1 in. and with suborbicular scales which expand but little at maturity.....HEMLOCK (*Tsuga Canadensis*).

e<sup>2</sup> Leaves notched or rounded a.; cones more than 1 in. and oblong scales expanding widely at maturity...CAROLINA HEMLOCK (*Tsuga Caroliniana*).

c<sup>2</sup> LEAVES SCALE-LIKE IMBRICATED AND CLOSELY APPRESSED OR AWL-SHAPED, in four ranks and making a conspicuously

d Flat 2-edged branchlet; cones ½ in. or less, with few leathery scales, 4 only being fertile.....ARBOR VITAE (*Thuja occidentalis*).

d<sup>2</sup> 4-angled branchlet; fr.

e Subglobose cones, ¼ in., with peltate, valvate scales.

WHITE CEDAR (*Chamaecyparis thyoides*).

e<sup>2</sup> Fleshy, dark blue and glaucous berries (really modified cones);

f Leaves of two kinds, both scale like and awl-shaped; buds naked; fr.

g Maturing in autumn of first season.....RED CEDAR (*J. Virginiana*).

g<sup>2</sup> Maturing in autumn of second season.

ROCKY MOUNTAIN RED CEDAR (*J. scopulorum*).

f<sup>2</sup> Leaves all awl-shaped, buds scaly.....COMMON JUNIPER (*J. communis*).

c<sup>3</sup> LEAVES NEEDLE-SHAPED; FRUIT A CONE;

d Leaves not in fascicles (scattered), short, stiff, pointing every way, ridged above and below (4-sided), with woody and persistent bases;

e Branchlets pubescent and foliage

f Yellowish-green; cones 1¼-2 in., oblong-cylindrical, on stalks which are slightly if at all incurved; cones with subentire scales.

RED SPRUCE (*Picea rubens*).

f<sup>2</sup> Blue-green; cones ¾-1¼ in., with incurved stalks; cones with erose margined scales.....BLACK SPRUCE (*Picea Mariniana*).

e<sup>2</sup> Branchlets glabrous; cones oblong-cylindrical; about

f 2 in. long, with nearly orbicular scales, truncate and entire at apex.

WHITE SPRUCE (*Picea Canadensis*).

f<sup>2</sup> 2½-4 in. long, with rhomboidal, flexuose scales, narrow erose-dentate and elongated at apex.....BLUE SPRUCE (*P. Parryana*).

d<sup>2</sup> *Leaves in fascicles,*

e Evergreen, quite stiff and in fascicles of

f 2 each, a membranaceous sheath inclosing the base of each fascicle, about

g 1 in. long, sheaths very short.....JACK PINE (*P. divaricata*).

g<sup>2</sup> 1½-2½ in. long; sheaths ⅛ in. or less; branchlets smooth and purple.  
JERSEY PINE (*P. Virginiana*).

g<sup>3</sup> 3-5 in. long; branchlets rough.

h Cones 1½-2 in., narrow ovoid, scales armed with weak prickles.

YELLOW PINE (*P. echinata*).

h<sup>2</sup> Cones 3-4 in., broad-ovoid, scales armed with very thick stout prickles.

TABLE-MOUNTAIN PINE (*P. pungens*).

g<sup>4</sup> 5-6 in. long, thick and with smooth-bossed cones.

RED PINE (*P. resinosa*).

f<sup>2</sup> 3 each and 3-6 in. long; cones 1½-3 in.....PITCH PINE (*P. rigida*).

g<sup>5</sup> 5-8 in. long; cones

h 2-3 in., globular-ovoid, persisting closed on the branches for some years.

POND PINE (*P. serotina*).

h<sup>2</sup> 3-5 in., narrow-ovoid, opening and discharging its seeds the year of maturity; resin-ducts in leaves near surface.

LOBLOLLY PINE (*P. Taeda*).

g<sup>6</sup> 8-15 in., resin-ducts not near surface; cones cylindrical-ovoid, 6-10 in. long, breaking away from branch within its b.

LONG-LEAF PINE (*P. palustris*).

f<sup>3</sup> Both 2 and 3 each; Rocky Mountain trees.

ROCK PINE (*P. ponderosa scopulorum*).

f<sup>4</sup> 5 each, slender, 3-5 in.; cones 4-6 in., curved-cylindrical, with stems.

WHITE PINE (*P. Strobus*).

e<sup>2</sup> Deciduous, soft, short and in fascicles of many each (scattered on shoots of the season).....TAMARACK (*Larix Americana*).

a<sup>2</sup> **COMPOUND LEAVES;**

b **Pinnately compound,**

c **ALTERNATE AND**

d *Entire;*

e Leaflets 3, subsessile, obovate-oblong, remotely crenate-serrate; fr. samara.

HOP-TREE (*Ptelea trifoliata*).

e<sup>2</sup> Leaflets 7-9, short-stemmed, ovate to suborbicular and alternately arranged; fr. pod.....YELLOW WOOD (*Cladrastis lutea*).

e<sup>3</sup> Leaflets 9-13, short-stemmed, ovate-oblong, abruptly acuminate; fr. shining white drupelet.....POISON SUMACH (*Rhus vernix*).

e<sup>4</sup> Leaflets 11-21, short-stemmed, oblong, obtuse or rounded b., rounded and notched or bristle-tipped a.; fr. pod.

f Petioles and branchlets glabrous.....LOCUST (*Robinia Pseudacacia*).

f<sup>2</sup> Petioles and branchlets viscid.....CLAMY LOCUST (*R. viscosa*).

e<sup>5</sup> 12-25, short-stemmed, lance-falcate; fr. drupe.

WESTERN SOAPBERRY (*Sapindus Drummondii*).

d<sup>2</sup> *Entire, but remotely serrate toward a.*; stem winged between the leaflets; fr. crimson drupelets.....DWARF SUMACH (*Rhus copallina*).

- d<sup>3</sup> Entire, but with 1-4 glandular teeth at b.; fr. twisted samara.  
 TREE-OF-HEAVEN (*Ailanthus glandulosa*).
- d<sup>4</sup> Serrate;
- e Leaflets 3-11, the lateral sessile, and successively larger towards the terminal one; fr. a nut enveloped in a 4-valved woody husk; leaflets
- f 3-5, lanceolate; nut small, compressed,
- g 4-angled; husk rather thick and parting to b.  
 SOUTHERN SHELL-BARK HICKORY (*H. Carolinae-Septentrionalis*).
- g<sup>2</sup> Scarcely angled, husk rough, very thin and splitting with difficulty if at all.....NORTHERN HICKORY (*H. borealis*).
- f<sup>2</sup> 5, lance-ovate to obovate; fr. with very thick husk splitting freely to b.  
 SHAG-BARK HICKORY (*H. ovata*).
- f<sup>3</sup> Both 5 and 7; fruit
- g More or less compressed pyriform; husk thin and tardily dehiscent; nut quite smooth and thick-shelled.....PIG-NUT HICKORY (*H. glabra*).
- g<sup>2</sup> Subglobose with husk splitting freely; nut small,
- h Thin-shelled.....SMALL-FRUITED HICKORY (*H. microcarpa*).
- h<sup>2</sup> Thick-shelled.....PALE-LEAF HICKORY (*H. villosa*).
- f<sup>4</sup> 7-9, mostly obovate and large; fr. with thick free-splitting husk and thick-shelled ribbed nuts; petioles and new growths
- g Densely hirsute; bark with rough firm ridges (not shaggy); nut globular or little compressed.....MOCKER-NUT HICKORY (*H. alba*).
- g<sup>2</sup> Glabrous or pubescent; bark shaggy with long strips; nut very large, compressed.....KING-NUT HICKORY (*H. laciniosa*).
- f<sup>5</sup> 7-11, lanceolate to narrow obovate, the lower ones somewhat falcate; fr. with elevated sutures; nut with thin shell and generally bitter cornel.
- g Nut smooth, whitish and little compressed.  
 BITTER-NUT HICKORY (*H. minima*).
- g<sup>2</sup> Very rugose, ridged and compressed, brownish.  
 WATER HICKORY (*H. aquatica*).
- f<sup>6</sup> 9-11 lance-ovate, falcate; fr. cylindrical-oblong, husk thin.  
 PECAN (*H. Pecan*).
- e<sup>2</sup> Leaflets 9-15, subsessile (except the terminal one) with reddish stems; fr. very small berry-like apples in loose cymose clusters; leaflets
- f Acuminate, glabrous and teeth scarcely spreading; leaf-buds glutinous.  
 AMERICAN MOUNTAIN ASH (*Sorbus Americana*).
- f<sup>2</sup> Acute or obtuse a.
- g Leaf-buds with rusty appressed hairs; lfts. glabrate ab.; teeth spreading.  
 LARGE-FRUITED MOUNTAIN ASH (*S. scopulina*).
- g<sup>2</sup> Leaf-buds whitish tomentose; lfts. pubescent.  
 ROWAN TREE (*Sorbus Aucuparia*).
- e<sup>3</sup> Leaflets 11-19 and
- f Sessile, viscid-pubescent as is all new growth; fr. nut with indehiscent husk.....BUTTERNUT (*Juglans cinerea*).
- f<sup>2</sup> Petiolulate, glabrous and leaf-stems spiny bn.; fr. capsule.  
 PRICKLY ASH (*Xanthoxylum Clava-Herculis*).
- e<sup>4</sup> Leaflets 13-25,
- f Lance-ovate and green bn.; twigs glabrate; a large tree; fr. nut with indehiscent husk.....BLACK WALNUT (*Juglans nigra*).
- f<sup>2</sup> Lanceolate, pale pubescent bn.; twigs velvety; a small tree; fr. drupelets with crimson hair.....STAG-HORN SUMACH (*Rhus hirta*).

c<sup>2</sup> LEAVES OPPOSITE; LEAFLETS

d 3-7, entire at base, serrate or serrate lobed above; fr. samaras obliquely winged and in pairs jointed together at b. . . . . BOX ELDER (*Acer Negundo*).

d<sup>2</sup> 5-11 and fr. a straight samara with terminal wing.

e Samara with seed-bearing portion flattened and wing extending the entire length

f Lateral leaflets sessile; calyx in the fertile flowers none.

BLACK ASH (*F. nigra*).

f<sup>2</sup> Lateral leaflets stalked; calyx present

g Samara obovate to spatulate; twigs terete.

WATER ASH (*F. Caroliniana*).

g<sup>2</sup> Samara elliptic to spatulate; twigs 4-sided.

BLUE ASH (*F. quadrangulata*).

e<sup>2</sup> Samara with seed-bearing portion subterete; wing not extending to base; leaflets stalked; calyx present in fertile flower

f Wing almost entirely terminal—slightly if at all decurrent on body

g Leaves and branchlets glabrous or nearly so.

WHITE ASH (*F. Americana*).

g<sup>2</sup> Leaves beneath and branchlets pubescent.

BILTMORE ASH (*F. Biltmoreana*).

f<sup>2</sup> Wing decurrent somewhat on sides of body but not to base

g Wing of samara spatulate

h Branchlets and leaves glabrous or nearly so; leaves green beneath.

GREEN ASH (*F. lanceolata*).

h<sup>2</sup> Branchlets and petioles velvety pubescent

i Samara less than 2 in. long; calyx small.

RED ASH (*F. Pennsylvanica*).

i<sup>2</sup> Samara mostly 2 in. long or more; calyx enlarged.

PUMPKIN ASH (*F. profunda*).

g<sup>2</sup> Wing of samara long-linear. . . . . DARLINGTON ASH (*F. Darlingtonii*).

b<sup>2</sup> **Palmately compound**; fr. large coriaceous capsule; leaflets membranaceous and usually

c 7, lance-obovate, cuneate, apiculate a., wrinkled.

HORSE CHESTNUT (*Aesculus Hippocastanum*).

c<sup>2</sup> 5 (sometimes 6 or 7)

d Oval or oblong, subsessile or acute or short acuminate a.

OHIO BUCKEYE (*Aesculus glabra*).

d<sup>2</sup> Obovate-oblong, short-stemmed, acuminate.

SWEET BUCKEYE (*Aesculus octandra*).

a<sup>3</sup> **DECOMPOUND LEAVES:**

b Evenly bipinnate, with 8-12 pairs of pinnae each with many oblong oblique leaflets about ½ in. long; fr. pod. . . . . MIMOSA TREE (*Albizia Julibrissin*).

b<sup>2</sup> Irregularly bipinnate or sometimes ternate, single leaflets taking the place of some pinnae; petioles

c Armed with prickles; fr. many small dark purple berries.

HERCULES CLUB (*Aralia spinosa*).

c<sup>2</sup> Unarmed; fr. large broad pods with large seeds and sweet pulp.

COFFEE-TREE (*Gymnocladus doicus*).

**a<sup>4</sup> BOTH COMPOUND AND DECOMPOUND LEAVES**, the former often in fascicles, tree armed with large branching thorns; fr. a shining

**c** Long contorted and twisted linear many-seeded pod.

HONEY LOCUST (*Gleditsia triacanthos*).

**c<sup>2</sup>** Short, oblique-ovate, 1-seeded pod.

WATER LOCUST (*Gleditsia aquatica*).

# A SYSTEMATIC STUDY

OF THE

SPECIES WHOSE WOODS ARE REPRESENTED IN THE ACCOMPANYING  
SECTIONS.

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The timbers comprised in the series which this text is designed to accompany belong to what are known, botanically speaking, as *Flowering* and mostly *Exogenous Plants*. At the outset, therefore, we will, once for all, define these groups: and, as the characters herein given are equally true of all the species enumerated in the following pages, they need not be repeated in the further definition of the various sub-groups and species.

## FLOWERING OR PHÆNOGAMOUS PLANTS.

Plants producing flowers which consist essentially of stamens and pistils, the latter bearing ovules or seeds.

In distinction from the *Flowering Plants* are the *Flowerless* or *Cryptogamous Plants*, comprising the rest of the vegetable kingdom, from the very simply organized Slime Moulds and Bacteria up to the highly organized Ferns and Club-Mosses. But in the study of timbers this group is unimportant, as only in a few rare cases do any of its representatives attain the dimensions of trees. Those exceptions are the Tree-Ferns of tropical countries — gigantic ferns, which sometimes attain the height of fifty or sixty feet, with straight shafts quite like tree trunks and tops consisting of a bunch of enormous plume-like fronds. They, however, are of practically no value as timber.

## EXOGENOUS OR DICOTYLEDONOUS PLANTS.

Flowering plants whose stems consist of a central column of pith surrounded by wood in concentric layers, and this in turn by bark; the stems increasing in thickness by the addition of a new layer each year to the wood externally and to the bark internally. Leaves mostly netted-vein. First leaves of the embryo (cotyledons) two and opposite, or (in the

Coniferæ) several in a whorl. Parts of the flower in fours or fives, very rarely in threes.

A second class of *Flowering Plants* and comprising the rest of the group is the *Endogenous* or *Monocotyledonous Plants*, characterized by having stems in which the wood occurs as threads or bundles running through a cellular, pith-like tissue so that a transverse section exhibits the wood as dots and not in concentric rings. Leaves mostly parallel-veined. Embryo with single cotyledon, or rarely two, and then alternate and unequal. Parts of the flower generally in threes. In southern United States and elsewhere in or near the tropics trees are found, such as the Palms, etc., which belong to this class, but none that we have to do with at present.

Exogenous plants are subdivided into two well-marked groups or subclasses — *Angiospermæ* and *Gymnospermæ*. The former includes by far the greater part of the Flowering Plants, and most of the species represented in "American Woods" are representatives of it.

## ANGIOSPERMÆ.

Flowering, exogenous plants in which there is a complete pistil — with stigma and closed ovary — containing ovules which develop into seeds at maturity. This sub-class comprises many groups of plants known as Orders, and such as are represented by plants which attain the dimensions of trees, within the limits of the United States, we purpose to consider in the following pages:

### ORDER ILICINEÆ: HOLLY FAMILY.

*Leaves* simple, mostly alternate, coriaceous, ex-stipulate and mostly evergreen. *Flowers* small, white or greenish, axillary, 4-8 numerous and sometimes diœcious; calyx minute, free, imbricated in the bud; corolla regular, cleft or almost parted, hypogynous, imbricated in the bud; stamens as many as the divisions of the corolla, alternate with them and attached to their base; anthers adnate, opening lengthwise; ovary free from the calyx, 4-8-celled, with a single suspended ovule in each cell; stigmas 4-8 or united into one, nearly sessile. *Fruit* drupaceous, with 4-8 anatropous seeds containing large fleshy albumen and minute embryo.

Trees and shrubs of over one hundred species, some of considerable economic value.

### GENUS ILEX, L.

*Leaves* alternate. *Flowers* lateral, single or clustered and usually perfect (but many are abortive), usually 4 (but sometimes 5-8) numerous; calyx persistent; petals distinct or scarcely united at the base, obtuse, oval or obovate, spreading; stigmas separate or united. *Fruit* a drupe-like berry, and usually red or purple.

Trees and shrubs of about one hundred sixty species of which thirteen inhabit eastern North America (none the western side of the continent) and five of these are trees. (*Ilex* is an ancient Latin name, but originally applied to a species of Oak.)



## 276. ILEX CASSINE, L.

CASSENA HOLLY. DAHOON. HENDERSON-WOOD.

Ger., *Cassena Stechpalme*; Fr., *Hour de Cassena*; Sp., *Acebo de Cassena*.

SPECIFIC CHARACTERS:—*Leaves* persistent, oblanceolate or obovate,  $1\frac{1}{2}$ -3 in. long, cuneate at base, obtuse or acute or emarginate (sometimes rounded or retuse) at apex with revolute and entire margins or very remotely and sharply appressed serrate near apex, thick, shining dark green above, paler and pubescent on midribs beneath; petioles short, stout and usually pubescent. *Flowers* white, scarcely  $\frac{1}{2}$  in. broad, in hairy pedunculate clusters from the axils mainly of the leaves of the year, the staminate 3-9-flowered and the pistillate usually 3-flowered, common peduncles nearly 1 in. long; calyx lobes acute, ciliate. *Fruit* red drupes ripening in autumn and persisting until spring, subglobose,  $\frac{1}{4}$  in. in diameter; nutlets prominently ribbed.

The Cassena Holly, or simply Cassina as it is more often called, is a handsome small tree occasionally attaining the height of 20 or 30 feet (8 m.), with rather broad rounded top and a trunk that may be 12 to 18 inches (0.50 m.) in diameter. The bark of trunk is of a brownish gray color and quite smooth, being but slightly fissured lengthwise with age. In many localities, especially in the northern part of its range, it is known only as a shrub.

HABITAT.—The coast region from southeastern Virginia southward to southern Florida, and westward to southern Louisiana, growing in swamps and moist localities and reaching its largest dimensions in Georgia, Alabama and Florida.

PHYSICAL PROPERTIES.—The wood is rather light but tough, close-grained, easily worked and of a creamy-white color. *Specific Gravity*, 0.4806; *Percentage of Ash*, 0.91; *Relative Approximate Fuel Value*, 0.4762; *Coefficient of Elasticity*, 64192; *Modulus or Rupture*, 572; *Resistance to Longitudinal Pressure*, 349; *Resistance to Indentation*, 113; *Weight of a Cubic Foot in Pounds*, 29.95.

USES.—The trunks are not found abundantly of large enough size to give the wood special commercial value, though possessed of qualities quite similar to those of the common Holly (*I. opaca*) and suitable for the uses to which that is applied. Its shiny evergreen foliage

and bright red berries entitle it to recognition as an ornamental species of value for localities sufficiently moist to meet its requirements.

MEDICINAL PROPERTIES of an emetic nature are said to exist in the leaves, and on account of this they were formerly employed by the Indians together with the leaves of the *I. vomitoria*, in their "black drink," for medicinal and ceremonial purposes.

#### ORDER RHAMNACEÆ: BUCKTHORN FAMILY.

*Leaves* simple, mostly alternate and often 3-nerved; stipules small, mostly deciduous. *Flowers* small, greenish, mostly perfect; calyx 4-5-lobed valvate; petals 4-5 inserted on the calyx; disk annular and lining the calyx-tube or none; stamens opposite the petals and inserted with them on the edge of the fleshy disk; anthers introrse, versatile; ovary superior, 2-5-celled with 1 anatropous ovule in each cell; style columnar with terminal stigma. *Fruit* a drupe or drupe-like, tipped with the remnants of the style; seed usually with albumen.

Trees and shrubs with watery bitter juice and of about five hundred seventy-five species, grouped in forty-five genera. They are natives of warm and temperate regions, and six of the genera have aborescent representatives in the United States, *Rhamus* only being represented in the northeastern states.

#### GENUS RHAMNUS, L.

*Leaves* mostly alternate and deciduous or persistent, petiolate, conduplicate in the bud. *Flowers* perfect or polygamous in small axillary cymes, racemes or panicles; calyx campanulate, 4-5-lobed; petals 4-5, emarginate and hooded around the stamen or none; stamens 4-5 with very short filaments; ovary ovoid, free from the disk; style 3-4-cleft or lobed. *Fruit* a drupe with succulent flesh and 2-4-nutlets each containing a single erect grooved seed with large foliaceous cotyledons and scant albumen.

Trees and shrubs with bitter bark and often spinescent branches, of about seventy species, inhabiting chiefly northern temperate and tropical regions. Five or six species are indigenous to the United States and at least one or two others are naturalized from Europe. (The name is the classical Green name of the European *Buckthorn*.)

#### 277. RHAMNUS CATHARTICA, L.

COMMON OR EUROPEAN BUCKTHORN. WAYTHORN.

Ger., *Stechdorn*; Fr., *Nerprun*; Sp., *Ramno cathartico*.

SPECIFIC CHARACTERS:—*Leaves* opposite, deciduous, broad ovate or oval, 1½-3 in. long, mostly rounded or obtuse at base, obtuse or acute, finely crenate serrate, glabrous, with 2-4 pairs of prominent veins running from near the base nearly to the apex; winter buds scaly. *Flowers* (May-June) about ¼ in. wide, in 2-5 axillary clusters, 4 numerous; petals very narrow. *Fruit* subglobose, black, about ¼ in. across, very bitter and containing 3 or 4 nutlets; seed sulcate on the back.

A small tree, under most favorable conditions only attaining the height of 25 or 30 feet (9 m.), with bushy rounded or spreading top of many crooked spiny branches and small stiff branchlets. Its trunk is short, rarely over 1 ft. (0.30 m.) in diameter and vested in a dark gray bark, rough with firm longitudinal or reticulate ridges. It is much more common as a shrub than a tree of the above dimensions.

**HABITAT.** — The native home of this species is Europe and northern and western Asia, but it has become thoroughly naturalized in localities in this country, as the result of its introduction for hedges and ornamental purposes.

**PHYSICAL PROPERTIES.** — Wood heavy, hard, strong, firm, very durable, of yellowish or pinkish brown color, with thin whitish sapwood, and of markedly characteristic grain.

**USES.** — The qualities of the wood would suggest its usefulness in turnery, for small articles of wooden-ware, tool handles, etc., where hardness and strength are prime requisites, but owing to its scarcity in desirable size it is not of commercial importance. The chief usefulness of the Buckthorn lies in its value for hedges, its very ramose habit with stiff spiny branches making it an effective barrier. Its attractive foliage, close clusters of small black berries and hardy nature make it popular for shrubberies and ornamental planting.

**MEDICINAL PROPERTIES** of a cathartic nature exist in the bark of this species, but it is not now as much used in medicine as it was formerly.

#### ORDER HIPPOCASTANACEÆ: HORSE-CHESTNUT FAMILY.

*Leaves* deciduous, opposite, petiolate, digitately compound, with 3-9 serrate leaflets, and without stipules. *Flowers* appearing after the leaves, conspicuous, polygamous, in showy terminal cymes or panicles, only the lowermost flowers generally fertile; pedicel jointed; calyx campanulate with 5 unequal lobes, imbricated in the bud; petals 4-5, unequal, clawed; disk hypogenous, annular; stamens 5-8, usually 7, unequal with elongated filiform filaments and introrse 2-celled anthers longitudinally dehiscent; ovary sessile, 3-celled, with 2 ovules in each cell; style slender, elongated, curved, and with terminal stigma. *Fruit* a coriaceous 3-valved 1-2-seeded capsule, loculicidally dehiscent; seeds large, round or irregularly hemispherical with smooth shining brown coat, large pale hilum, large thick unequal cotyledons, 2-leaved plumule and remaining underground in germination.

Trees and a few shrubs with ill-scented bark, large branchlets and buds, and of about eighteen species natives of North America and Asia and grouped in two genera, *Aesculus* and *Billia*, the latter a genus of Mexico and Central America.

#### GENUS ÆSCULUS, L.

A genus of ten or twelve species of which four native and one naturalized are represented among the trees of America. The characters are those of the family.

The name is the classical name of a kind of oak and transferred to this genus.

## 278. AESCULUS OCTANDRA, MARSH.

YELLOW BUCKEYE. SWEET BUCKEYE.

Ger., *Gelbe Rosskastanie*; Fr., *Marronnier jaune*; Sp., *Castaño de caballo amarillo*.

**SPECIFIC CHARACTERS:**—*Leaves* with petioles 4-6 in. long and usually 5 (sometimes 6 or 7) obovate-oblong or elliptical leaflets, cuneate at base the lowermost oblique, acuminate, serrate, pubescent at first but finally nearly glabrous and dark green above, duller and hairy tufted in the axils beneath. *Flowers* (April-May) 1½ in. long, yellow, in loose pubescent panicles 5-7 in. long; petals 4, unequal, longer than the calyx; stamens usually 7, shorter than the petals; ovary pubescent. *Fruit* about 2 in. long smoothish, with pale brown seed about 1½ in. long.

Var. *hybrida* (de C.) Sarg. (var. *purpurascens* Gray) has pink or purple flowers and under surface of the leaflets, petioles, etc., pale pubescent.

The Yellow Buckeye is the largest of our native Buckeyes, as it occasionally attains the height of 90 or 100 feet (30 m.), or more, and may have a trunk diameter of 3 or 4 feet (1 m.) but is usually a tree of more medium size. When growing in the open it develops a rounded or oblong top of rather dense foliage, and the bark of trunk is of a dark gray-brown color exfoliating in large rounded or irregular scales.

**HABITAT.**—The Alleghany Mountain region from western Pennsylvania to northern Georgia and westward to Iowa, Kansas and eastern Texas, growing in rich, moist soil.

**PHYSICAL PROPERTIES.**—Wood light, soft, quite tough and strong, close-grained, easily worked and of a yellowish white color with abundant lighter sap-wood. *Specific Gravity*, 0.4274; *Percentage of Ash*, 1.00; *Relative Approximate Fuel Value*, 0.4231; *Weight of a Cubic Foot in Pounds*, 26.64.

**USES.**—The qualities of this wood, like that of the allied Fetid Buckeye, make it peculiarly suitable for use in the manufacture of artificial limbs, splints and other articles of wooden-ware where lightness is an important requisite.

It is said that flour made from the nuts of this tree is excellent for paste which possesses an adhesive power greater than that of ordinary paste.

The tree though occasionally planted for ornamental purposes is not as popular as the introduced Horse-chestnut (*Ae. Hippocastanum*).

## ORDER ANACARDIACEÆ: SUMACH FAMILY.

*Leaves* mostly alternate and without stipules; branchlets terete and with large pith. *Flowers* small, regular, polygamous, diœcious or perfect; calyx lobes mostly 5; petals of same number and imbricated in the bud or none; stamens as many as the petals or twice as many (rarely fewer) and inserted with them on the edge of an annular hypogenous disk; filaments filiform and anthers oblong, introrse, 2-celled, longitudinally dehiscent; ovary usually 1-celled and containing a solitary anatropous ovule suspended by a slender funicle rising from the base of the ovary; styles 1-3, stigmas terminal. *Fruit* generally a small drupe; seed with membranous or crustaceous coat; cotyledons fleshy and containing little or no albumen.

Trees and shrubs with resinous or milky juice, of about fifty genera and four hundred species mainly of warm or tropical regions. Three genera are represented in the trees of the United States.

## GENUS RHUS, L.

*Leaves* mostly unequally pinnate and deciduous, a few simple and persistent, alternate. *Flowers* mostly diœcious in compound axillary or terminal panicles; calyx mostly 5-cleft or parted and persistent; petals spreading and longer than the calyx-lobes; stamens 5, alternate with the petals and inserted with them under the margin of the annular disk; pistil solitary, sessile, with three terminal styles. *Fruit* a subglobose drupelet mostly in thyrses with thin dry hairy or glabrous outer coat and a single bony or crustaceous stone; cotyledons foliaceous.

Trees, shrubs and climbing vines of about one hundred twenty species, natives mainly of the warmer parts of the north and south temperate regions. Some are of great economic value, as those producing the lacquer and vegetable wax of Japan, tannin, etc., and several possess poisonous properties. Sixteen or seventeen species are natives of the United States of which about a half dozen may be considered as trees. (*Rhus* is the classical Greek name of the European *Sumach*.)

## 279. RHUS COPALLINA, L.

## DWARF SUMACH.

Ger., *Zwerg-Sumach*; Fr., *Sumac nain*; Sp., *Zumaque enano*.

SPECIFIC CHARACTERS:— *Leaves* deciduous, pinnate, 6-8 in. long, with pubescent petiole and rachis, the latter winged between the leaflets; leaflets ovate-lanceolate to oblong, subsessile, entire or remotely serrate towards the apex, acute or acuminate, lustrous dark green above, paler and pubescent beneath. *Flowers* in midsummer, about  $\frac{1}{8}$  in. across, yellow-green, in short dense pubescent terminal panicles, 4-6 in. long; the pistillate considerably smaller. *Fruit* in compact erect or nodding clusters, often persisting on the branches through the entire winter; drupe about  $\frac{1}{8}$  in. across, compressed, crimson, covered with short acid hairs; stone smooth.

Var. *lanccolata*, Gray, is a small tree of eastern Texas with narrower and more falcate leaflets and larger bunches of flowers and fruit.

Var. *leucantha* (Jacq.) de C. is another form found in Texas (near New Braunfels) with white flowers.

The Dwarf Sumach is a small tree, at its best only attaining the height of 25 or 30 ft. (9 m.) and 8 or 10 in. (0.20 m.) in diameter

of trunk and is very commonly only a shrub in habit of growth. As a tree its trunk divides into a few large crooked branches and it forms a broad open top. The bark of trunk is of a grayish black color and quite smooth, excepting for the prominent horizontal lenticels which break its surface. Its singular foliage and nodding clusters of crimson fruit make it easily recognizable.

**HABITAT.**— It is a species of wide distribution, being found from southern Maine to Iowa and southward to the Gulf Coast, preferring the dry soil of gravelly hillsides and uplands, which it sometimes occupies in considerable abundance, even to the exclusion of nearly everything else.

**PHYSICAL PROPERTIES.**— The wood is light, soft, not strong and, unlike the golden-tinted woods of most of the Sumachs, is of a light greenish brown color with thin whitish sap-wood. *Specific Gravity*, 0.5273; *Percentage of Ash*, 0.60; *Relative Approximate Fuel Value*, 0.5241; *Coefficient of Elasticity*, 73647; *Modulus of Rupture*, 663; *Resistance to Longitudinal Pressure*, 377; *Resistance to Indentation*, 109; *Weight of a Cubic Foot in Pounds*, 32.86.

**USES.**— The leaves and bark are rich in tannin and largely used, in regions where abundant, for tanning and dyeing purposes.

#### ORDER LEGUMINOSÆ: PULSE OR PEA FAMILY.

*Leaves* alternate, usually compound, with stipules. *Flowers* regular or papilionaceous and usually perfect; stamens 10 or many, with diadelphous (sometimes distinct) filaments and 2-celled anthers opening longitudinally; pistil solitary, with one or several-celled superior ovary. *Fruit* a legume.

A very large and important family of trees, shrubs and herbs of wide distribution throughout all temperate and tropical regions, generally free from obnoxious properties and many of its representatives of the greatest economic importance. There are about 7,000 species grouped in nearly 450 genera, and of these seventeen have arborescent representatives in the United States.

#### GENUS CLADRASTIS, RAF.

*Leaves* deciduous, odd-pinnate, with stout terete petioles enlarged at base and few large entire short-stalked leaflets; buds small, naked superposed and formed within the base of the petiole. *Flowers* white, papilionaceous, in terminal panicles or racemes; calyx narrow-campanulate, 5-toothed; petals with suborbicular reflexed standard and those of the keel incurved and distinct; stamens 10, distinct, with slender filaments and uniform versatile anthers; ovary sessile, linear and tipped with slender incurved style with terminal stigma; ovules several, suspended. *Fruit* a glabrous compressed linear margined tardily dehiscent legume, containing few oblong compressed seeds with slender funicle and no albumen.

Trees of a single species of limited natural distribution in the Atlantic states, but widely planted for ornamental purposes. They have yellowish heart-wood, somewhat watery juice and smooth bark. Another tree (*Maackia Amurensis* Rupr.), of eastern Asia and Japan, is referred by some writers to this genus, but by others is considered to be generically distinct. (Name formed from Greek roots meaning *brittle branches*.)

## 280. CLADRASTIS LUTEA, KOCH.

YELLOW-WOOD. GOPHER-WOOD. VIRGILIA.

Ger., *Gelb-holtz*; Fr., *Bois jaune*; Sp., *Madera amarilla*.

SPECIFIC CHARACTERS:— For botanical characters see generic description, this being the only species.

A tree of medium size, sometimes attaining the height of 50 to 60 ft. (18 m.) and a trunk diameter of 18 in. to 2 ft. (0.60 m.) or rarely somewhat surpassing those dimensions. It is one of the handsomest of our deciduous trees, with a full rounded top of clean rich green umbrageous foliage, and when festooned with its long stems of white pea-like flowers it is an object of uncommon beauty. Its trunk is vested in a thin bark of the smoothness of Beech bark, but of somewhat darker color.

HABITAT.— From Cherokee county, North Carolina, westward through central Tennessee and from southern Kentucky to northern Alabama and Georgia; also in southwestern Missouri. It is a rare and local tree in this limited range, and is found mainly in rich well-drained soil along the courses of streams.

PHYSICAL PROPERTIES.— Wood rather light, hard, strong, close-grained, compact and of a light-brownish yellow color with paler yellow sap-wood. *Specific Gravity*, 0.6278; *Percentage of Ash*, 0.28; *Relative Approximate Fuel Value*, 0.6260; *Coefficient of Elasticity*, 100226; *Modulus of Rupture*, 902; *Resistance to Longitudinal Pressure*, 534; *Resistance to Indentation*, 183; *Weight of a Cubic Foot in Pounds*, 39.12.

USES.— Little use is made of the wood though the heart-wood is used to some extent for making a yellow dye. The chief claim of the tree to economic value is its use as an ornamental shade tree, and as such is sure to grow in public favor as its qualities become more widely known. It is hardy at least as far north as northern New York, and little effected by insect-pest or blight.

ORDER HAMAMELIDACEÆ: WITCH HAZEL FAMILY.

*Leaves* simple, deciduous, alternate, petiolate, with stipules. *Flowers* perfect or unisexual; calyx 4-lobed and with tube coherent to the ovary or none; petals 4 and perigynous or none; stamens 4 or 8 or numerous with 2-celled introrse anthers; ovary compound formed by the union below of 2 carpels, 2-celled and with 2 subulate styles; ovules 1 or many, anatropous and suspended from an

axile placenta. *Fruit* a woody 2-beaked capsule dehiscent at the summit; seeds 1 or several with large straight embryo and scant albumen.

The Witch-Hazel family consists of trees and shrubs of about eighteen genera and thirty-five species of eastern North America, Asia, Madagascar and South Africa. Three of the genera, two of which are arborescent, are represented in North America.

#### GENUS HAMAMELIS, L.

*Leaves* obovate to oblong, undulate-crenate, inequilateral at base, involute in the bud, with veins conspicuous beneath; stipules infolding the bud. *Flowers* appear in autumn in the American species in 3-flowered clusters from the axils of the leaves, perfect, each sub-tended by 2-3 acute bracts; calyx 4-parted, persistent and adnate to base of the ovary; petals 4, strap-shaped, spirally involute in the bud, hypogenous, alternate with the sepals; stamens 8 in 2 rows on margin of receptacle, those opposite the calyx-lobes fertile, the others small and abortive; filaments very short; anthers oblong, opening by valves; ovary 2-celled, each containing a single ovule; styles 2, subulate, spreading, stigmatic at apex. *Fruit* a woody capsule, 2-4-lobed at apex, loculicidally dehiscent and when ripe forcibly discharging its seeds which are lustrous brown, oblong, pointed, cotyledons foliaceous.

Small trees and shrubs of three species, one of eastern United States, one of central China and one of China and Japan. The name is from two Greek words alluding to the flowering of the tree at the same time as the ripening of the fruit of the previous season.

### 281. HAMAMELIS VIRGINIANA, L.

#### WITCH-HAZEL.

Ger., *Zauberstrauch*; Fr., *Noisetier des sorcières*; Sp., *Bruxa-avellano*.

**SPECIFIC CHARACTERS.**—*Leaves* oval to obovate, short-petiolate, rounded or subcordate and very unequal at base, from rounded to acute or acuminate at apex, undulate crenate, membraneaceous, smooth dark green above, lighter and pubescent on veins beneath. *Flowers* nearly sessile; petals bright yellow, deciduous; calyx pubescent, persistent. *Fruit* capsules dull brown, opening elastically.

The Witch-Hazel is ordinarily only a tall shrub but on the slopes of the Alleghany mountains it becomes a tree 30 to 40 ft. (10 m.) in height, with rather wide top of crooked branches. Its trunk is sometimes 8 to 10 in. (0.20 m.) in diameter and is vested in a thin and rather smooth grayish bark.

**HABITAT.**—As a tree the Witch-Hazel is limited in distribution to the Alleghany mountains, but as a shrub is of wide distribution, being found throughout eastern North America generally from Nova Scotia to the Gulf States and westward to the treeless plains of the middle west. It grows in moist, loose loam along the courses of streams and low-lands which are of a more or less sandy nature.

**PHYSICAL PROPERTIES.**—Wood rather heavy, hard, compact, with



exceedingly small evenly distributed ducts and inconspicuous medullary rays. It is of a mottled yellowish brown color with abundant brownish white sap-wood. *Specific Gravity*, 0.6856; *Percentage of Ash*, 0.37; *Relative Approximate Fuel Value*, 0.6831; *Weight of a Cubic Foot in Pounds*. 42.73.

USES.—Very little use is made of the wood of the Witch-Hazel, though possessed of properties that would suggest its usefulness in turnery, as for small articles of wooden ware, etc.

MEDICINAL PROPERTIES.—The bark of the Witch-Hazel has long been used by the North American Indians as a sedative to allay inflammations. An extract is now widely made from the bark and used very extensively in domestic practice on account of the same virtues as recognized by the Indians, and is particularly valuable in allaying inflammations in all mucous surfaces.

#### ORDER CORNACEÆ: DOGWOOD FAMILY.

*Leaves* deciduous, simple, variously arranged and without stipules. *Flowers* regular, in cymes, heads, or solitary; calyx adnate to the ovary, its limb 4-5-toothed or none; petals 4-5 or none; disk epigenous; stamens as many as the petals and inserted with them on the margin of the disk; anthers introrse, 2-celled with a solitary anatropous suspended ovule in each cell. *Fruit* a 1-2-seeded drupe; seed oblong with foliaceous cotyledons and copious albumen.

The Dogwood Family consists of trees and shrubs of about sixteen genera and eighty-five species mainly of north temperate regions. Two genera have arborescent representatives in North America.

#### GENUS NYSSA, L.

*Leaves* alternate, petiolate, conduplicate in the bud. *Flowers* small, greenish, polygamo-diœcious, in capitate clusters (or the fertile ones sometimes solitary) with slender peduncles, from the axils of the lower leaves or of caducous bracts, the staminate flowers numerous; calyx minutely 5-lobed; petals 5, minute and thick or none; stamens 5-15 in the staminate flowers, exerted and inserted with the petals on the edge of the entire or lobed disk; pistillate flowers sessile at the end of the peduncle, few together, bracted; stamens included; ovary 1-2-celled and style elongated, slender, curved and stigmatic towards the apex on one side. *Fruit* an oblong or ovoid drupe with thin tart juicy flesh and thick-walled horny compressed ridged or winged stone; embryo straight.

Trees of five species of which four are natives of eastern North America and the remaining one of southeastern Asia. They produce very fine grained tough wood, with contorted fibre and annual rings indistinctly indicated. The fruit is very tart and is sometimes used in conserves. (*Nyssa* is the name of a water nymph and applied to the genus because of its species growing in wet places.)

## 282. NYSSA AQUATICA, MARSH.

COTTON GUM. TUPELO GUM. LARGE TUPELO.

Ger., *Groszer Gummibaum*; Fr., *Gommier grand*; Sp., *Tupelo grande*.

SPECIFIC CHARACTERS:—*Leaves* ovate-oblong to oval, mostly rounded or subcordate at base, long-acuminate, irregularly angular-dentate or entire, tomentose at first but finally glabrous dark green above, pale and downy pubescent beneath, 5-10 in. long; petioles  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long. *Flowers* appear in March and April, with long slender peduncles from the axils of bud-scales below the new leaves; the staminate in dense capitate clusters, the pistillate solitary; style revolute into a coil. *Fruit* on slender drooping stems, 2-4 in. long, obovoid, tipped with the remnants of the style, about 1 in. long, dark purple with pale dots, tough skin and narrow obovoid stone, compressed and with about 10 sharp wing-like longitudinal ridges.

The Cotton Gum is the largest representative of its genus, as it sometimes attains the height of 100 ft. (30 m.), with straight columnar trunk 3 or 4 ft. (1 m.) in diameter above its wide flaring base. This may be of more than double that diameter at the surface of the ground, and is usually hollow. Unlike the horizontal and drooping habit of branching seen in the allied Sour Gum, the Cotton Gum is of quite upright habit of growth and its branches are less numerous than are those of that tree. The bark of trunk is of an ashen gray color and exfoliates in large irregular scales, showing but little tendency to form prominent ridges such as seen in the other species.

HABITAT.—The Atlantic Coast region from the Dismal Swamp in eastern Virginia southward to central Florida and westward into eastern Texas. It also ranges up the Mississippi River valley to southeastern Missouri, and is particularly abundant in the lower Mississippi basin. It inhabits deep swamps and the margins of streams and ponds, where its base is covered with water during a considerable portion of the year. In the loose miry soil of these localities the exaggerated width of its base is really necessary to give it the requisite stability.

PHYSICAL PROPERTIES.—Wood quite soft, light, tough, compact, difficult to split, with very small and quite uniformly distributed open ducts and exceedingly fine medullary rays. It is of a light brown color with very abundant buff-white sap-wood. *Specific Gravity*, 0.5194; *Percentage of Ash*, 0.70; *Relative Approximate Fuel Value*, 0.5158; *Coefficient of Elasticity*, 51678; *Modulus or Rupture*, 655;

*Resistance of Longitudinal Pressure, 365; Resistance of Indentation, 161; Weight of a Cubic Foot in Pounds, 32.37.*

USES.—The Cotton Gum is the most valuable timber tree of its genus, its large columnar trunks producing lumber especially useful for boxes, fruit-crates, etc., where toughness and lightness are important requisites. The wood is also used in the manufacture of wooden ware and that of the roots is used for floats, etc., as a substitute for cork, and in the manufacture of surgical tents. For the last mentioned use few if any other woods equal it in value.

#### ORDER ERICACEÆ: HEATH FAMILY.

*Leaves* alternate, simple, and without stipules. *Flowers* regular, perfect; calyx free from the pistil, 4-5-lobed; corolla regular, hypogenous, 5-lobed or parted (exceptionally 4-lobed or somewhat 2-lipped) imbricated; stamens as many or twice as many as the lobes of the corolla and mostly free; anthers introrse, 2-celled, each cell opening by a terminal pore commonly prolonged and bearing an appendage; ovary superior (inferior in *Vaccinium*), 4-10-celled, with numerous anatropous ovules; style simple, columnar and with capitate stigma. *Fruit* a capsule, drupe or berry; seeds with small embryo and albumen.

A large and interesting family of trees and shrubs of world-wide distribution in tropical and temperate regions. A few over a thousand species are known, grouped in about sixty genera. Of these twenty-one genera are found within the United States, seven having arborescent representatives.

#### GENUS OXYDENDRUM, D. C.

*Leaves* deciduous, revolute in bud, petiolate, narrow-oblong, about equally pointed at both ends, subentire or denticulate, lustrous, dark green above, paler and with yellowish veins beneath. *Flowers* (in summer) in terminal unilateral racemes, with bibracteolate pedicels; sepals 5, persistent; corolla ovoid-cylindric, white, puberulous, with 5 minute reflexed lobes; stamens 10, with broad filaments and narrower linear anthers opening by clefts; ovary ovoid, 5-celled, with numerous amphitropous ovules and thick exerted style having terminal stigma. *Fruit* a 5-angled, 5-celled, ovoid-pyramidal capsule, tipped with the remnants of the style, loculicidally dehiscent, and at maturity liberating numerous elongated seeds pointed at both ends.

The name is from two Greek words referring to a slightly tart flavor of the leaves.

A genus of a single American species of the south Atlantic and Gulf states and the lower Mississippi basin. They are trees with roughly furrowed bark, somewhat acidulous juices and twigs with segmented pith.

### 283. OXYDENDRUM ARBOREUM, DC.

#### SORREL-TREE. SOUR-WOOD.

Ger., *Sauerampferbaum*; Fr., *Arbre d'oseille*; Sp., *Arbol de acedera*.

SPECIFIC CHARACTERS.—*Leaves* alternate, deciduous, revolute in the bud, oblong to lanceolate, cuncate at base, acute or acuminate at apex, irregularly serrulate with slender teeth, lustrous dark green above, pale and glaucous beneath. *Flowers* (July-August) numerous, white, about  $\frac{1}{2}$  in. long, in terminal

paniced racemes, with pubescent bibracteolate pedicels; calyx deeply 5-lobed, persistent; corolla cylindrical, ovoid, hypogenous, with 5 minute reflexed lobes; stamens 10, the filaments wider than the anthers; disk thin; ovary 5-celled with columnar style and capitate stigma; ovules numerous, amphitropous. *Fruit* a 5-celled ovoid pyramidal capsule, with remnants of persistent style and calyx, loculicidally 5-valved; seeds numerous, the testa pointed at both ends.

The Sorrel-tree is ordinarily of medium or small stature, but under favorable conditions in forest growth attains the height of 75 ft. (22 m.) and 2 ft. (0.60 m.) in diameter of trunk. It develops a rather narrow top of shortish branches, and interspersed among its dark green foliage are always conspicuously to be seen its ample clusters of tiny white cup-shaped flowers or, later in the season, of small fruit-capsules, which often persist until after the appearance of the crop of the subsequent year. The bark of trunk is of a brownish gray color, furrowed longitudinally with narrow rounded ridges.

**HABITAT.**—The Alleghany mountain region from southern Pennsylvania to northern Florida and from near the Atlantic coast to Indiana, Tennessee and Louisiana, occupying mainly well-drained slopes and ridges and reaching its best development on the foot-hills of Tennessee and the Carolinas.

**PHYSICAL PROPERTIES.**—Wood moderately heavy and hard, strong, compact, with uniformly distributed small open ducts and very small medullary rays. It is of a reddish brown color with ample brownish white sap-wood. *Specific Gravity*, 0.7458; *Percentage of Ash*, 0.37; *Relative Approximate Fuel Value*, 0.7430; *Coefficient of Elasticity*, 88851; *Modulus of Rupture*, 728; *Resistance to Longitudinal Pressure*, 501; *Resistance to Indentation*, 201; *Weight of Cubic Foot in Pounds*, 46.48.

**USES.**—As logs of this wood are not often found of any considerable size or abundance, it being usually distributed throughout forests of other growth, no particular commercial value is placed on this wood. It is, however, used to some extent for tool handles and other small articles of wooden-ware. The Sorrel-tree is occasionally planted for ornamental purposes, though not as extensively as its merits would seem to justify. It proves hardy as far north as Massachusetts.

**MEDICINAL PROPERTIES.**—The leaves have a pleasant acid taste, and are used by hunters to allay thirst, and form in decoction a grateful refrigerant drink in fevers. Aside from that little is claimed for medicinal properties in this species\*.

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\* *U. S. Dispensatory*, 16th ed., p. 1707.

## GENUS RHODODENDRON, L.

*Leaves* clustered at the ends of the branchlets, persistent and coriaceous with revolute entire margins; midribs broad, petioles stout. *Flowers* in terminal corymbs or umbels from terminal scaly cone-like buds; calyx 5-lobed or parted, persistent; corolla campanulate with 5 nearly regular lobes; disk fleshy, lobed; stamens usually 10 and somewhat unequal, declined and spreading; filaments pilose at base and attached to the backs of the anthers; ovary 5-celled with slender exerted persistent style and many anatropous ovules in each cell attached to the axile plamenta. *Fruit* a woody capsule, 5-20-valved, septicidally dehiscent from the summit and containing many seeds with coat lacinated at the ends.

Small trees and shrubs with bitter astringent properties and showy flowers, of some over one hundred and fifty species of eastern and southern Asia and the adjacent islands and North America. They are largely grown for ornamental purposes and many garden varieties have been produced by hybridization and selection. Of the eight species found in the United States one is arborescent on the Atlantic coast region and another rarely on the Pacific slope. The name is from Greek words meaning *Rose-tree*.

## 284. RHODODENDRON MAXIMUM, L.

## ROSE BAY. GREAT LAUREL.

Ger., *Groszer Rosenlorbeer*; Fr., *Rhododendron grand*; Sp., *Rhododendron grande*.

**SPECIFIC CHARACTERS:**—*Leaves* oblong-lanceolate, oblanceolate or oblong, 4-12 in. long, acute at both ends, revolute in the bud, ferruginous tomentose at first but at maturity lustrous dark green above, paler beneath, thick and stiff. *Flowers* (June-July) in 16-24-flowered umbels 4-5 in. across, with slender pink viscid-pubescent pedicels springing from the axils of the scales of the inflorescence buds; calyx-lobes oblong, rounded; corolla campanulate, gibbous posteriorly, about 1 in. long, varying from rose-color or purplish to white, cleft to the middle, lobes rounded, the upper one yellow spotted inside. *Fruit* capsule oblong-ovoid,  $\frac{1}{2}$  in. long, glandular-hispid, opening and liberating its seeds in autumn and persisting during the following winter.

The Rose Bay, or Large Rhododendron, is very widely known as one of our most beautiful flowering shrubs, and in the minds of the majority of people is never thought of as a tree. Not so, however, in the enchanted heart of the Alleghanies of Tennessee and the Carolinas, where encouragement for tree-growth is extraordinary. There the Rose Bay is found as a tree 30 or 40 ft. (10 m.) in height and has a trunk 10 or 12 in. (0.23 m.) in diameter. The bark of trunk is of an ashen gray color, quite free from ridges and exfoliates in thin irregular scales.

**HABITAT.**—From Nova Scotia and Maine southward throughout the Appalachian system to Georgia. In the northern part of its range it is rare and local, being there confined to swamps and is shrubby in character. To the southward it is more general in dis-

tribution and becomes very abundant on the slopes of the Alleghanies, where it is scattered extensively as an undergrowth in the forests, or in places forms almost impenetrable and exclusive thickets.

PHYSICAL PROPERTIES.—The wood is rather heavy, hard, compact, of very fine grain, with many very small open ducts and fine medullary rays. It is of a pale brown color with abundant lighter sap-wood. *Specific Gravity*, 0.6303; *Percentage of Ash*, 0.36; *Relative Approximate Fuel Value*, 0.6280; *Coefficient of Elasticity*, 64578; *Modulus of Rupture*, 663; *Resistance to Longitudinal Pressure*, 439; *Resistance to Indentation*, 191; *Weight of a Cubic Foot in Pounds*, 39.28.

USES.—Little use is made of the wood of the Rhododendron, excepting occasionally in turnery for tool-handles and as a substitute for box-wood in engraving. The great point of usefulness in the species is its value for ornamental planting, for which it is probably the most popular of American shrubs.

MEDICINAL PROPERTIES.—The bark is sometimes used as a remedy for rheumatism and gout.

#### ORDER SYMPLOCACEÆ: SWEET-LEAF FAMILY.

*Leaves* simple, alternate, without stipules; buds scaly. *Flowers* regular, mostly perfect and yellow, in axillary or lateral clusters; calyx 5-lobed, campanulate, the tube adnate to the ovary; corolla deeply 5-lobed, with imbricated lobes; disk none; stamens numerous, more or less united at base into clusters, with long filiform filaments and small 2-celled anthers opening laterally; ovary 2-5-celled with simple style, terminal stigma and usually 2 anatropous ovules suspended in each cell. *Fruit* usually a dry drupe crowned with the persistent calyx-lobes, thin flesh and one bony stone; embryo straight in fleshy albumen.

A family of the following single genus of trees and shrubs.

#### GENUS SYMPLOCOS, L'HER.

For characters see description of the family, this being the only genus.

The genus *Symplocos* comprises about 180 species, so far as known, chiefly of the tropical regions of America, Asia, and Australia. One inhabits southeastern United States ranging as far north as southern Delaware. The name is from Greek roots referring to the fact that the stamens are united together in clusters.

### 285. SYMLOCOS TINCTORIA, L'HER.

#### SWEET-LEAF. HORSE-SUGAR.

Ger., *Zuckerblatt* Fr., *Feuille sucrée*; Sp., *Hoja dulce*.

SPECIFIC CHARACTERS:—*Leaves* oblong to obovate, mostly 4-6 in. long, cuneate at base, acute or acuminate, obscurely crenate, serrate or subentire, revolute in the bud, tomentose beneath at first but at maturity lustrous dark green above, paler and pubescent beneath, subcoriaceous and with arcuate veins; petioles short, stout.

*Flowers* in early spring, creamy white and fragrant, subsessile in several-flowered clusters from the axils of the leaves of the previous season; calyx cup-shaped, puberulous, with rounded lobes; corolla  $\frac{1}{4}$  in. long, oblong, obtuse, each lobe bearing a cluster of exerted stamens; ovary 3-celled with 5 nectiferous glands opposite the lobes of calyx. *Fruit* (August-September) an oblong nut-like pubescent drupe about  $\frac{1}{3}$  in. long.

The Sweet-leaf is a small tree, occasionally 35 ft. (10 m.) in height and 8 or 10 in. (0.30 m.) in thickness of trunk. The bark of trunk is quite smooth, being only very slightly fissured lengthwise with age. It is not commonly that trees of the above dimensions, or approximating them, are found, and it is often only a shrub in stature.

**HABITAT.**— From southern Delaware southward to Florida and westward through the Gulf States to western Louisiana and southern Arkansas. It is a peculiarly shade-loving tree, rarely ever being found except in the shade of forests of taller growth.

**PHYSICAL PROPERTIES.**— Wood light, soft, of very close fine grain, with many very small and quite uniformly distributed ducts and very fine medullary rays. It is of a creamy white color, the heart-wood of very old trees only showing a somewhat redder tint. *Specific Gravity*, 0.5325; *Percentage of Ash*, 0.68; *Relative Approximate Fuel Value*, 0.5289; *Coefficient of Elasticity*, 62202; *Modulus of Rupture*, 619; *Resistance to Longitudinal Pressure*, 384; *Resistance to Indentation*, 159; *Weight of a Cubic Foot in Pounds*, 33.19.

**USES.**— Too uncommon a wood of sufficient size to be of commercial importance, though possessed of qualities that would make it excellent for use in turnery, for small articles of wooden-ware, etc.

#### ORDER OLEACEÆ: OLIVE FAMILY.

*Leaves* mostly opposite, simple or compound and without stipules. *Flowers* perfect, dioecious or polygamous, regular and in panicles, cymes or fascicles; calyx inferior, 2-4-lobed or none; corolla of 2-4 petals or none; disk none; stamens 2-4 with short filaments and introrse 2-celled anthers, dehiscence usually by lateral longitudinal slits; ovary superior, 2-celled with 2 pendulous anatropous ovules in each cell; style simple. *Fruit* in the American arborescent representatives a samara or berry with pendulous seeds containing straight embryo and fleshy albumen.

Trees and shrubs widely distributed throughout tropical and temperate regions, particularly of the northern hemisphere, and some of great economic value. There are about 20 genera and 500 species. Five genera are indigenous to the United States and of these four have arborescent representatives.

#### GENUS FRAXINUS, L.

*Leaves* deciduous, odd-pinnately compound, petiolate; leaflets conduplicate in the bud and usually serrate. *Flowers* in early spring, from the axils of the leaves of the previous season, mostly dioecious or polygamous (occasionally perfect) in fasciculate panicles; calyx small, campanulate or none; corolla 2-4-parted or none; stamens usually 2 with short terate filaments and large oblong anthers

opening by lateral slits; ovary mostly 2-celled with single style and 2-lobed stigma. *Fruit* a samara, with terete or somewhat flattened and usually 1-seeded body and terminal wing; seed elongated, pendulous.

Trees and shrubs of about 40 species with tough wood, stout branchlets having large pith and obtuse or rounded scaly buds, the terminal one the largest. It is of wide distribution in north-temperate regions and within the tropics on the islands of Cuba and Jamaica. About 16 species are found within the United States, all arborescent though one is more commonly a shrub than a tree. (*Fraxinus* is the ancient Latin name of the *Ash-tree*.)

## 286. FRAXINUS CAROLINIANA, MILL.

### WATER ASH.

Ger., *Wasser-Esche*; Fr., *Frêne d'eau*; Sp., *Fresno de agua*.

SPECIFIC CHARACTERS:—*Leaves* 7-12 in. long with elongated petioles and 5-7 rather remote long-petiolulate ovate to ovate-lanceolate leaflets, usually cuneate or rounded at base and acute or acuminate at apex, closely serrate or entire, tomentose at first but finally dark green above, paler and glabrous or pubescent beneath; branchlets thick. *Flowers* (February and March) dioecious, with calyx nearly obsolete and 2 to 3 stamens; corolla none; pistillate flowers with cup-shaped laciniate-lobed persistent calyx. *Fruit* samara winged all around, obovate, spatulate or elliptical, nearly 2 in. long,  $\frac{1}{2}$ - $\frac{3}{4}$  in. broad, frequently 3-winged with persistent calyx at base, compressed body and wing pinnately veined.

The Water Ash is a small tree seldom over 40 ft. (12 m.) in height or 1 ft. (0.30 m.) in thickness of trunk. It has a rather narrow top of slender branches, and the bark of trunk is rather thin, of a dark gray color, slightly if at all ridged and exfoliating in thinnish irregular scales.

HABITAT.—The coast region from Virginia southward to southern Florida, and westward to the valley of the Sabine River in Texas, occupying deep swamps and the banks of streams inundated during a considerable portion of the year. It associates in these localities with the Ball Cypress, Cotton Gum, Over-cup, Laurel and Water Oaks, the Red Maple, etc. Though generally much shaded by these taller trees it thrives even though not receiving what would seem to be its due allowance of sunlight.

PHYSICAL PROPERTIES.—Wood light, brittle, not strong, compact and of a pinkish brown color, with abundant sap-wood of lighter tint. *Specific Gravity*, 0.3541; *Percentage of Ash*, 0.73; *Relative Approximate Fuel Value*, 0.3515; *Coefficient of Elasticity*, 47637; *Modulus of Rupture*, 536; *Resistance to Longitudinal Pressure*, 251; *Resistance to Indentation*, 138; *Weight of a Cubic Foot in Pounds*, 22.07.

USES.—Little if any use is made of this wood, its trunk being too small and the wood too inferior to give it any special commercial value.



## 287. FRAXINUS BILTMORIANA, BEADLE.

## BALTIMORE ASH.

Ger., *Biltmore Esche*; Fr., *Frêne de Biltmore*; Sp., *Fresno de Biltmore*.

SPECIFIC CHARACTERS:—*Leaves* 10-15 in. long, with 7-9 ovate or ovate-oblong to lanceolate somewhat falcate long-petiolulate leaflets, 3-7 in. long, obtuse or rounded at base, acuminate, with entire or obscurely denticulate margins and at maturity firm dark green above, paler and pubescent especially on the veins beneath; branchlets velvety pubescent. *Flowers* early in May, in rather compact pubescent panicles. *Fruit* samaras  $1\frac{1}{4}$ - $1\frac{3}{4}$  in. long, linear or linear-spatulate with wing 2 or 3 times as long and very slightly decurrent upon the nearly terete narrowly elliptic seed-bearing portion.

The Biltmore Ash is a tree of medium size, attaining a height of 50 to 60 ft. (15 to 18 m.) and a trunk diameter of 12 to 15 in. (0.30 to 0.35 m.). The habit of growth of the tree is much like that of the White Ash, to which it is closely related, and like that tree its bark of trunk is of an ashen gray color and characterized by many prominent narrow and more or less reticulated ridges.

HABITAT.—From southern Pennsylvania southward throughout the Alleghany region to northern Georgia and Alabama, growing in moist but well-drained soil and is particularly common in the vicinity of Biltmore, North Carolina. It was there that it was first separated from the White Ash, by Mr. C. D. Beadle, botanist of the Biltmore Forest estate of Mr. George W. Vanderbilt, located there.

PHYSICAL PROPERTIES.—Wood heavy, hard, strong, tough, and of a pinkish brown color with abundant lighter sap-wood, very similar in properties to those of the White Ash.

USES.—The wood of the Biltmore Ash, as such, is not known in commerce, though its properties are so similar to those of the White Ash that it would doubtless be equally applicable to the same uses, viz., in the manufacture of agricultural implements, wheels, axles, frames for carriages and cutters, etc., where strength and stiffness are required.

NOTE.—The wood from which the accompanying sections were made was received from Mr. C. D. Beadle, of Biltmore, N. C.

## ORDER SCOPHULARIACEÆ: FIGWORT FAMILY.

*Leaves* various, without stipules. *Flowers* mostly perfect, complete and irregular; calyx inferior, variously cleft or divided, persistent; corolla gamopetalous,

irregular, with imbricated lobes; stamens 2-5, didynamous or nearly equal and inserted on the corolla alternate with its lobes; anthers 2 or 1-celled; pistil solitary with slender style, entire or 2-lobed stigma and mostly 2-celled ovary containing anatropous or amphitropous ovules on axile placenta. *Fruit* a capsule usually containing numerous seeds with small embryo in copious albumen.

This family consists chiefly of herbs, but some shrubs and trees, and is of very wide distribution. About 2,500 species are known, grouped in 165 genera.

GENUS PAULOWNIA, SIEB. & ZUCC.

*Leaves* opposite, long-petioled, mostly 5-8 in. long larger on vigorous shoots, broad-ovate, cordate, acute or short acuminate, entire or with a single short-pointed lobe on each side, velvety pubescent especially at first; long-petioled, branchlets with segmented pith. *Flowers* before or with the leaves, fragrant, in large erect rusty tomentose terminal panicles from buds formed the previous summer and remaining naked during the winter; calyx with 5 thick lobes; corolla  $1\frac{1}{2}$ -2 in. long, pale violet or blue, somewhat irregular, with 5 spreading lobes, puberulent outside; stamens 4, didynamous, included, with divaricate anther-sacs. *Fruit* broad-ovoid woody abruptly pointed 2-celled capsule, about  $1\frac{1}{2}$  in. long, loculicidally dehiscent and containing many small membranous-winged seeds.

This is a genus composed of possibly two or three species of Asiatic trees but is generally known only by the single species *P. imperialis* S. & Z., now naturalized in America. (The genus is named after Princess Anna Paulowna, daughter of Czar Paul I.)

288. PAULOWNIA TOMENTOSA, BAILEY.

PAULOWNIA. PRINCESS-TREE.

Ger., *Princessinn-Baum*; Fr., *Arbre de princesse*; Sp., *Arbol de princesa*.

SPECIFIC CHARACTERS:—See the ordinal and generic characters above, this being the only well known species.

The interesting Paulownia is a naturalized species in this country and we can not yet tell how large the trees may grow here, but it is occasionally seen with trunk 2 or 3 ft. (0.75 m.) in diameter. Its habit of growth, however, is to develop a wide-spreading open top of few large branches, and a tree with a trunk of the above dimensions may not have a greater height than 30 or 40 ft. (12 m.). The bark of trunk is very characteristic. It is quite smooth and of a brownish gray color streaked irregularly lengthwise with paler color, where it separates a little on the surface in process of growth, and it becomes slightly roughened.

HABITAT.—The native land of the Paulownia is China and Japan whence it has been introduced into this country for ornamental purposes and it has been naturalized from about the latitude of New York to Florida and Texas.

**PHYSICAL PROPERTIES.**—The wood is light, soft, not strong, easily worked, and yields a beautiful satiny surface. Its wide annual rings are marked by many bands of rather small open ducts, and medullary rays are very inconspicuous. It is of a mottled purple-brown color with very thin sap-wood of only one or two rings of growth. *Specific Gravity*, 0.25.

**USES.**—As yet no particular use is made of this beautiful wood in this country, but it would seem to be very suitable for handsome interior furnishings and cabinet-ware.

The tree is deservedly popular for ornamental planting, as it produces an annual display of very beautiful and fragrant flowers and attractive umbrageous foliage, in regions south of the latitude of New York. North of that latitude the climate seems too severe for it to produce its flowers and fruit and it generally winter-kills to the ground annually. Each spring it then sends up vigorous shoots with very large leaves, giving an effect very different from that of the tree in more congenial climate farther south.

#### ORDER ULMACEÆ: ELM FAMILY.

*Leaves* deciduous, simple, petiolate, alternate, in two ranks, serrate, pinnately veined, unequal at base, conduplicate in the bud and with usually fugacious stipules; buds with several scales. *Flowers* small, perfect, monoecious or polygamous, clustered, or the pistillate solitary; calyx regular, 4-9 parted or lobed; petals none; stamens as many as the lobes of the calyx and opposite them, with straight exerted filaments and introrse 2-celled anthers opening longitudinally; ovary 1-celled with solitary, anatropous or amphitropous ovule suspended from apex of the cell; styles two. *Fruit* a samara, drupe or nut; seed with little or no albumen, straight or curved embryo, and usually flat cotyledons.

Trees and shrubs with tough wood and of about one hundred and forty species grouped in thirteen genera and widely distributed throughout the temperate regions of the northern hemisphere. Five genera are represented in the United States, and three of these by trees of the eastern and southern states.

#### GENUS ULMUS, L.

*Leaves* inquilateral, straight-veined and simply or doubly serrate; stipules scarios caducous; buds with several closely imbricated scales in 2 ranks. *Flowers* from axillary buds on twigs of the previous season's growth and usually expanding before the leaves (or in autumn from the axils of the leaves of the season), mostly perfect and in fascicles or racemes, with bibracteolate pedicels; calyx campanulate, membranaceous persistent with 4-9 imbricated lobes; stamens 5-6, exerted with slender filaments and oblong anthers; ovary sessile or stalked, compressed with 2 divergent styles stigmatic on inner faces, 1-celled and containing a single amphitropous ovule. *Fruit* a flat orbicular or oblong membranaceous 1-seeded samara winged all around (or excepting apex), subtended by the withered calyx and sometimes tipped with the remnants of the styles; seed compressed with straight embryo and no albumen.

*Ulmus* is the ancient Latin name of the *Elm*.

Trees or rarely shrubs with scaly ridged bark, heavy tough wood and somewhat zigzag branchlets, and of about eighteen species, of which six or seven are found in eastern United States and four of these in the northeastern states. None are found in the Pacific states.

## 289. ULMUS ALATA, MICHX.

## WINGED ELM.

Ger., *Befluggelte Ulme*; Fr., *Orme ailé*; Sp., *Olmo alado*.

SPECIFIC CHARACTERS:—*Leaves* ovate-oblong, from abruptly wedge-shaped to subcordate at base and somewhat inequilateral, acute or acuminate, doubly serrate, at maturity firm, smooth, dark green above, pale pubescent beneath. *Flowers* appearing in early spring before the leaves, in short few-flowered fascicles; calyx glabrous with 5 obovate lobes. *Fruit* ripening usually before the unfolding of the leaves, samara from  $\frac{1}{4}$ - $\frac{1}{3}$  in. in length, long-stipitate, white-hairy especially on the thickened margin; wings narrow and with protruded points incurved at apex.

The Winged Elm is very different in stature from the favorite majestic elms of the northern states, as its extreme height is in the vicinity of only 60 ft. (18 m.) and the thickness of trunk is rarely greater than 2 ft. (0.60 m.). It forms a rather narrow oblong top of shorter and less spreading branches than those of the White Elm, and the bark of trunk is rather thin and fissured into narrow firm scaly ridges. A striking feature of the tree is its widely winged branchlets. The "wings" consist of excessive growths of the corky layer of the bark appearing on opposite sides of the branchlets during the first or second year of its growth, and becoming most pronounced in from four to six years, when each wing may be a half-inch or so in width. This peculiar growth is not common to all of the branchlets, but to a large portion of them, especially of the lower branches.

HABITAT.—Southern Virginia and westward, throughout Indiana and Illinois to Kansas, and southward to northern Florida and the Gulf Coast region to eastern Texas, seeming to prefer the rather dry gravelly uplands and slopes, though not uncommon in well-drained alluvial bottom-lands.

PHYSICAL PROPERTIES.—The wood is heavy, hard, moderately strong, close-grained, compact, and difficult to split. It is of a purplish brown color with abundant buff-white sap-wood. *Specific Gravity*, 0.7491; *Percentage of Ash*, 0.99; *Relative Approximate Fuel Value*, 0.7417; *Coefficient of Elasticity*, 52323; *Modulus of Rupture*, 724; *Resistance to Longitudinal Pressure*, 449; *Resistance to Indentation*, 255; *Weight of a Cubic Foot in Pounds*, 46.68.

USES.—Like the wood of the White Elm, this is used in the manufacture of agricultural implements, wheel-hubs, tool-handles, etc.

## ORDER MORACEÆ: MULBERRY FAMILY.

*Leaves* conduplicate or involute in the bud, petiolate, alternate, deciduous, with caducous stipules inclosing the leaf in the bud. *Flowers* monœcious or diœcious, small, in ament-like spikes or heads, from the axils of caducous bud-scales or of the lower leaves of the shoots of the season; calyx 3-5-lobed or parted; corolla none; stamens 1 to 4, inserted on the bases of the calyx-lobes; ovary superior, 1-2 celled; styles 1-2; ovules solitary, anatropous and pendulous. *Fruit* an aggregation of drupelets, each inclosed in the thick fleshy calyx.

Trees, shrubs and herbs of over nine hundred species, generally with milky juice and natives of temperate and tropical regions. They are grouped in fifty-four genera of which four are represented in North American trees, three being indigenous and the fourth a naturalized species.

## GENUS MORUS, L.

*Leaves* serrate-dentate and sometimes 3-5-lobed or mitten-shaped, all forms often on the same tree, 3-nerved at base. *Flowers* small, appearing with the unfolding of the leaves or soon after; the staminate in cylindrical, pedunculate ament-like spikes; calyx deeply 4-lobed; stamens 4, opposite the calyx lobes, inflexed in the bud, straightening out elastically (thereby scattering the pollen) and becoming exerted; anthers 2-celled, introrse, longitudinally dehiscent; pistillate flowers sessile, in shorter compact spikes; calyx 4-parted, with spreading stigmas. *Fruit* a blackberry-like aggregation of drupelets (*sincarp*), each tipped with the remnants of the styles and formed by the nutlet enveloped by the succulent enlarged and colored calyx; seed pendulous with curved embryo and scanty albumen.

Trees of eight or ten species, with milky juice and mostly of the tropical and north temperate regions of both hemispheres. Two are indigenous to the United States, one being found along the Mexican frontier and the other in most of the Atlantic states. A third is a species introduced from Japan and eastern Asia and extensively naturalized in eastern United States. (*Morus* is the ancient Latin name of the *Mulberry-tree*.)

## 290. MORUS ALBA, L.

## WHITE MULBERRY.

Ger., *Weisse Maulbeerbaum*; Fr., *Mûrier blanc*; Sp., *Moral blanco*.

**SPECIFIC CHARACTERS.**—Leaves mostly ovate, 3-7 in. long, serrate, and on vigorous shoots often with from 1-5 wide lobes, cordate or truncate at base, mostly acute at apex, thin, shining dark green above, duller beneath. *Fruit* maturing in June or July,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, sweet and succulent, usually white or pinkish tinted. Several varieties have originated in cultivation, one with nearly black fruit.

The White Mulberry, as we see it in this country, is seldom more than 30 or 40 ft. (8 m.) in height. It is of rather wide-spreading habit of growth and its trunk may be 3 or 3 $\frac{1}{2}$  ft. (1 m.) in diameter. The bark of trunk is of a yellowish brown color, rough with firm thick-scaled ridges.

**HABITAT.**—The native home of the White Mulberry is northern China and Japan; whence it has been extensively introduced into all countries where climatic conditions are favorable, owing to the value of its foliage as food for the silk worm. In this country it was very extensively planted in early days, commencing as far back as the

seventeenth century and for a long time previous to the war of the Revolution under encouragement by the British government. It is now found naturalized in localities throughout the eastern United States generally.

PHYSICAL PROPERTIES.—The wood of the White Mulberry is quite hard, heavy and durable, with annual rings of growth marked with many rather small open ducts, and it is of a yellowish brown or markedly yellow color with scant nearly white sap-wood. *Specific Gravity*, 0.71.

USES.—Little use is made of the wood of this species in this country, though it is said to be used in India for boat-building, furniture and agricultural implements — uses for which other woods in this country are considered more suitable.

The chief value of the tree lies in its leaves, upon which the silk worm mainly feeds and, hence, upon it the vast silk industry mainly depends. The price of the necessary hand labor in silk production, however, will doubtless always prevent its being an extensive industry in America.

MEDICINAL PROPERTIES.—Mulberries are refreshing and laxative, and serve to prepare a grateful drink well adapted to febrile cases. A syrup is made from their juice and used as an agreeable addition to gargles in inflammation of the throat. The fruit of this species, however, is sweeter and less grateful than the fruit of the *M. nigra* and our native *M. rubra*.\*

#### GENUS TOXYLON, RAFINESQUE.

*Leaves* involute in the bud, broad-ovate to oblong and oblong-lanceolate, rounded, obtuse or subcordate at base, acuminate, entire, pinnately veined, the veins arcuate and united near the margin, whitish tomentose at first but finally lustrous dark green above, duller and conspicuously reticulate-veined beneath, turning bright yellow in autumn; petioles rather long, terete; stipules triangular, small, caducous; branchlets armed with sharp axillary spines. *Flowers* in late spring after the unfolding of the leaves, diœcious, light green; the staminate in long-pedunculate subglobose heads from the axils of crowded leaves on short lateral spurs; pedicels slender; calyx 4-lobed to the middle, stamens 4, opposite the calyx lobes, incurved in the bud and elastically straightening and becoming exerted; anthers 2-celled; pistillate flowers in dense globose heads, sessile or with short peduncles in the axils of the leaves on the shoots of the year; calyx divided to the base with thick concave persistent lobes closely investing the ovary, the two outer lobes the largest; ovary ovoid, compressed, tipped with a long filiform style and containing a single anatropous suspended ovule. *Fruit* a globose yellowish green aggregation of elongated drupelets, each consisting of a nutlet enveloped by the enlarged fleshy calyx, the tips of the lobes of which form the roughened surface of the fruit.

A genus of a single American species. A tree with deeply furrowed orange-brown bark and slightly acrid milky juice.

The name is from Greek words meaning *bow* and *wood*.

\* *U. S. Dispensatory*, 16th ed., p. 986.

## 291. TOXYLON POMIFERUM, RAF.

OSAGE ORANGE. BOW-WOOD.

Ger., *Bogen-Holz*; Fr., *Bois d'Arc*; Sp., *Madera de arco*.

SPECIFIC CHARACTERS:— See the above generic description, this being the only species.

The Osage Orange in its native southern forests attains the height of 50 or 60 ft. (18 m.) with a trunk perhaps 3 ft. (0.90 m.) in diameter, but in the open rarely if ever attains as great a height. It is there characterized by a short, thick trunk covered with an orange-brown bark, rough with prominent, firm and more or less reticular fibrous ridges. The trunk divides into a few large limbs and these into many curved branches forming a rounded or dome-shaped top with lowermost branches drooping nearly to the ground. Its curved branches, strikingly suggestive of so many drawn bows, and its glossy dark green foliage are prominent features.

HABITAT.— The native home of the Osage Orange is limited to the rich bottom-lands of southern Arkansas, Indian territory and eastern Texas, but its popularity for hedges and ornamental planting has caused its quite general distribution over the middle and eastern states and it is now quite common and naturalized in various localities far outside of its native range.

PHYSICAL PROPERTIES. — Wood heavy, very hard and strong, flexible, compact, very durable in contact with the soil, and of a clear rich yellow color or tinted with brown in places, and with a scanty white sap-wood. *Specific Gravity*, 0.7736; *Percentage of Ash*, 0.68; *Relative Approximate Fuel Value*, 0.7683; *Coefficient of Elasticity*, 94373; *Modulus of Rupture*, 1131; *Resistance to Longitudinal Pressure*, 809; *Resistance to Indentation*, 363; *Weight of a Cubic Foot in Pounds*, 48.21.

USES.— A valuable wood for fence-posts, railway-ties, paving blocks, the hubs of wheels, etc. Formerly it was the favorite wood of the American Indians of the middle west for their bows — a fact which is commemorated in the name, *Bow-wood*, or the French *Bois d'Arc*, by which the tree is known in the region in which it grows.

The bark of the roots yields a yellow dye and the tree is of value for ornamental planting.

## ORDER JUGLANDACEÆ: WALNUT FAMILY.

A family of six genera and about thirty-five species of important trees with aromatic bark and watery juice, mostly of the warmer parts of the north temperate zone. Two genera are represented in the United States.

*Leaves* alternate, deciduous, odd-pinnate, with long grooved petioles exstipulate, the leaflets sessile or nearly so excepting the terminal one which is usually long-stalked. *Flowers* monœcious, opening after the unfolding of the leaves; the staminate in long drooping lateral aments on the growth of the previous season; calyx 3 to 6-lobed, each in the axil of and adnate to a bract; stamens several with short distinct filaments and longitudinally dehiscent anthers; pistillate in spikes or solitary terminating the new growth, bracteate and usually two-bracteolate; calyx 3-5-lobed; ovary inferior and 1-celled or incompletely 3-4-celled and containing a solitary erect orthotropous ovule; style short with 2 plumose stigmas. *Fruit* a bony incompletely 2-4-celled nut inclosed in an indehiscent or 4-valved exocarp; seed without albumen, large, solitary, 2-lobed, fleshy and very oily; cotyledons 2-lobed, corrugated or sinuose; radicle minute, superior, at apex of nut.

## GENUS HICORIA, RAF.

*Leaves* with thick and firm ovate to obovate leaflets, increasing in size from below upwards, often glandular-dotted, usually unequal at base, and acuminate at apex, serrate, veins commonly forking near the margins. *Flowers*: staminate aments slender, drooping and usually in threes with common peduncle from the axils of leaf-scars at the base of the shoots of the season or in clusters from buds in the axils of leaf-scars near the summit of the growth of the previous season, the lateral branches from the axils of persistent bracts; calyx 2-3-lobed, adnate to the bracts; stamens 3-10 with ovate-oblong hairy anthers; pistillate flowers sessile, in mostly 2-10-flowered terminal spikes; calyx unequally 4-lobed; stigmas short-papillose. *Fruit* subglobose, oblong, ovoid or pyriform, with husk (epicarp) woody at maturity and separating more or less completely into 4 valves, the sutures alternate with those of the nut and falling away at maturity; nut with bony crustaceous shell (endocarp), 4-celled at base, 2-celled at apex; seed lobed and variously grooved, oily and usually edible, sometimes bitter.

The Hickories are confined to the temperate regions of eastern North America ranging from the valley of the St. Lawrence River to the highlands of Mexico. There are about a dozen species, all being found within the United States excepting one. Their wood is very strong, flexible and more valuable than any other woods for certain uses. They have smooth gray bark when young, but with age become fissured into hard plates and scales. The branches are tough and flexible and the pith solid. (The name is from the popular name which is of American Indian origin.)

## 292. HICORIA VILLOSA, ASHE.

## PALE-LEAF HICKORY.

Ger., *Zottige Hickory*; Fr., *Noyer villeaux*; Sp., *Nogal velludo*.

SPECIFIC CHARACTERS:—*Leaves* 6-10 in. long, with slender pubescent petioles and usually 7 (sometimes 5 or 9) leaflets which vary from lanceolate to lance-obovate, serrate, acuminate, and when young pubescent and covered beneath with silvery peltate scales and resin-globules, but at maturity glabrous dark green above and yellowish beneath; winter buds small with 6-8 imbricated scales, the outer dotted with resin-globules. *Flowers* staminate in scurvy pubescent catkins, 5-7 in. long; central calyx-lobe much longer than the lateral ones. *Fruit* subglobose to pyriform, 1-1¾ in. long, compressed with thin husk splitting nearly to the base; nut slightly angled, pale brown with thick shell and small sweet seed.



The Pale-leaf Hickory is a tree of medium stature, compared with the other hickories. In the forest it does not usually surpass 50 or 60 ft. (18 m.) in height or 18 or 20 in. (0.50 m.) in diameter of trunk. In the open it develops a rather narrow oblong top with upright branches and pendulous lower branches. The bark of trunk is of a grayish brown color very rough with prominent reticulated scaly ridges.

HABITAT.— From New Jersey to northern Florida and westward to eastern Texas. In the Mississippi valley it ranges northward into Missouri. It occupies well-drained slopes, sandy plains and rocky ridges, and is particularly abundant in the foot-hill region of the southern Alleghanies.

PHYSICAL PROPERTIES.— Wood heavy, very hard, strong, tough, with very inconspicuous medullary rays and large open ducts chiefly in the spring growth, but also scattered somewhat through the summer growth. It is of a yellowish brown color with light brownish white sap-wood.

USES.— The wood of this hickory, like that of most of the hickories is excellent for tool-handles, agricultural implements, etc., where great strength and toughness are required. It also makes an excellent fuel.

#### ORDER CUPULIFERÆ: OAK FAMILY.

*Leaves* alternate, simple, straight veined; the stipules, forming the bud-scales, deciduous. *Flowers* monœcious, apetalous. *Sterile flowers* in clustered or racemed catkins (or in simple clusters in the Beech); calyx regular or scale-like; stamens 5-20. *Fertile flowers* solitary, clustered or spiked and furnished with an involucre which forms a cup or covering to the nut; calyx-tube adherent to the ovary, its teeth minute and crowning the summit; ovary 2-7-celled with 1-2 pendulous ovules in each cell, but all of the cells and ovules, except one, disappearing before maturity; stigmas sessile. *Fruit* a 1-celled, 1-seeded nut, solitary or several together and partly or wholly covered by the scaly (in some cases echinate) involucre cup or covering; seed albumenless, with an anatropous, often edible, embryo; cotyledons thick and fleshy.

Order is represented by trees and shrubs of wide geographic distribution.

#### GENUS QUERCUS, LINNÆUS.

*Flowers* greenish or yellowish. *Sterile flowers* in loose, slender, naked catkins, which spring singly or several together from axillary buds; calyx 2-8-parted or cleft; stamens 3-12; anthers 2-celled. *Fertile flowers* with ovary nearly 3-celled and 6-ovuled, two of the cells and 5 of the ovules being abortive; stigma 3-lobed; involucre developing into a hard, scaly cup around the base of the nut or acorn, which is 1-celled, 1-seeded.

(*Quercus* is the ancient Latin name for the Oak, supposed to be from the Celtic *quer*, *fine*, and *cuez*, *tree*.)

## 293. QUERCUS LYRATA, WALT.

## OVER-CUP OAK.

Ger., *Überkelch-Eiche*; Fr., *Chêne lyré*; Sp., *Roble de pantano*.

SPECIFIC CHARACTERS:—*Leaves* obovate-oblong, wedge-shaped at base, lyrate-pinnated or lobed to beyond the middle, with 5-9 entire or sparingly-toothed triangular oblique lobes the upper pair usually the larger and more divergent, shining dark green above, white tomentose beneath. *Flowers* staminate aments 3-6 in. long; calyx with 5 acute lobes. *Fruit* sessile or with short peduncles; nut mostly depressed globose and nearly or quite enveloped by the cup which is rather thin, hoary tomentose, with thick rugged united scales at the base but gradually thinner towards the margin, which often splits irregularly.

The Over-cup Oak occasionally attains the height of nearly 100 ft. (30 m.) with a trunk 3 or 4 ft. (1 m.) in thickness, but usually it is of considerably smaller dimensions. The bark of trunk is of a light brownish gray color rough with narrow scaly ridges.

HABITAT.—Swamps and bottom-lands that are more or less inundated during the greater part of the year, from eastern Virginia and southern Missouri to the Gulf Coast. In such localities are also found the Water and Laurel Oaks, Cotton Gum, Water Ash, River Birch, Bald Cypress, etc.

PHYSICAL PROPERTIES.—Wood heavy, hard, strong, tough, durable in contact with the soil, and of a grayish brown color with buff-white sap-wood. *Specific Gravity*, 0.8313; *Percentage of Ash*, 0.65; *Relative Approximate Fuel Value*, 0.8259; *Coefficient of Elasticity*, 133438; *Modulus of Rupture*, 1025; *Resistance to Longitudinal Pressure*, 492; *Resistance to Indentation*, 252; *Weight of a Cubic Foot in Pounds*, 51.81.

USES.—A valuable wood for use in the manufacture of agricultural implements, boat-building, cooperage, baskets, railway-ties, cabinet-making, furniture, interior finishing, etc. It is little if any inferior to the wood of the White Oak in the qualities which make that wood superior.

## 294. QUERCUS TEXANA, BUCKL.

## SOUTHERN RED OAK. SCHNECK'S OAK.

Ger., *Südlliche Rothe Eiche*; Fr., *Chêne rouge du sud*; Sp., *Roble rojo meridional*.

SPECIFIC CHARACTERS:—*Leaves* ovate to broad oval,  $3\frac{1}{2}$ -8 in. long, truncate or broad wedge-shaped at base, deeply pinnated with broad rounded sinuses and 5-9 spreading lobes narrow below and spreading and dentate at apex with bristle-

pointed teeth, at maturity thin, firm and shining dark green above paler and with tufts of whitish hairs in axils beneath. *Flowers* staminate in slender pubescent aments; calyx 4-5 with laciniately cut lobes; pistillate with short tomentose peduncles, stigmas red. *Fruit* usually solitary, sessile or with short stalks, ovoid, puberulous light brown acorn,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, sometimes striated, 2-3 times as high as the shallow or somewhat turbinate cup with thin closely appressed light brown tomentose scales.

In the luxuriant primeval forests which clothed the rich bottom-lands of southern Indiana and Illinois this Oak is said to have been found attaining the height of nearly 200 ft. (60 m.) with great buttressed trunks sometimes 6 or 8 ft. (2 m.) in thickness — dimensions which rank this as one of our largest oaks. All of the trees of such size have doubtless long since been felled, but fairly large individuals may still be seen in localities. The habit of growth is similar to that of the Red Oak of the northern states, and like it it has a dark gray bark rough with firm close ridges.

**HABITAT.**— From northeastern Iowa and central Illinois southward to the Gulf, eastward to North Carolina and westward to western Texas, thriving best on well-drained bottom-lands and particularly abundant in the Mississippi valley.

**PHYSICAL PROPERTIES.**— Wood heavy, hard, strong, rather coarse-grained and of a light or reddish brown color with whitish sap-wood. *Specific Gravity*, 0.9080; *Percentage of Ash*, 0.85; *Relative Approximate Fuel Value*, 0.9003; *Coefficient of Elasticity*, 103343; *Modulus of Rupture*, 1024; *Resistance to Longitudinal Pressure*, 582; *Resistance to Indentation*, 291; *Weight of a Cubic Foot in Pounds*, 56.59.

**USES.**— The wood of the Southern Red Oak is used in cooperage, for interior finishing and for furniture, and in quality is similar to that of the northern Red Oak, *Q. rubra*.

## 295. QUERCUS LAURIFOLIA, MICHX.

### LAUREL OAK.

Ger., *Lorbeer-Eiche*; Fr., *Chêne de laurier*; Sp., *Roble de laurel*.

**SPECIFIC CHARACTERS:**— *Leaves* narrow-oblong to oblong-obovate, sometimes falcate, 2-4 in. long, cuneate at base, rounded or acute at apex, entire or on vigorous branches unequally lobed, at maturity lustrous dark green above, paler beneath; petioles short and stout. *Flowers*: staminate in reddish hairy aments 2-3 in. long; pistillate with short stout glabrous peduncles. *Fruit* sessile or nearly so, usually solitary with short ovoid to hemispherical nut, puberulous at apex about one-fourth inclosed in a thin flat saucer-shaped cup with thin pale-pubescent closely imbricated scales.

The Laurel Oak attains the height of 100 ft. (30 m.) in forest growth in favorable localities, and a thickness of trunk of 3 or 4 ft. (1 m.). When isolated from other trees it forms a rather wide rounded top. The bark of trunk is rather thin, of a brownish gray color and quite smooth, as compared with that of other oaks. With age it becomes somewhat fissured into low flat plates and ridges.

HABITAT.—The Atlantic coast region from the Dismal Swamp of eastern Virginia southward to Mosquito Inlet and Cape Romano, Florida, and westerward along the Gulf coast region to Louisiana. It is confined mostly to the banks of streams, swamps and moist bottom-lands, for which reason it is often called the Water Oak. It is not a very common oak generally and its region of greatest abundance is along the south Atlantic coast and in Florida.

PHYSICAL PROPERTIES.—Wood heavy, hard, strong, coarse-grained and of a reddish brown color with whitish sap-wood. *Specific Gravity*, 0.7673; *Percentage of Ash*, 0.82; *Relative Approximate Fuel Value*, 0.7610; *Coefficient of Elasticity*, 125916; *Modulus of Rupture*, 1181; *Resistance to Longitudinal Pressure*, 526; *Resistance to Indentation*, 253; *Weight of a Cubic Foot in Pounds*, 47.82.

USES.—Heretofore not extensively used except for fuel, but suitable for lumber for interior finishing, furniture, etc., and with the growing scarcity of other more popular oaks this will doubtless be more extensively used.

The tree is popular for street-planting in southern villages where it usually goes by the name of Water Oak.

#### ORDER SALICACEÆ: WILLOW FAMILY.

*Leaves* deciduous, simple, alternate and with stipules (sometimes minute and caducous). *Flowers* dioecious, appearing in early spring before the leaves, in aments, from axillary buds, a single small flower appearing in the axil of each scale of the ament, perianth wanting; stamens 2—many, subtended by a disk and with introrse 2-celled anthers longitudinally dehiscent; pistil with short style, 2-4 lobed stigma and 1-celled ovary having 2-4 parietal placentæ and numerous anatropous ovules. *Fruit* a 1-celled 2-4 valved ovoid capsule, bearing numerous minute seeds surrounded by long silky white hairs and containing short radicle, flat cotyledons and no albumen.

Trees and shrubs with soft light wool, brittle twigs, bitter bark and of wide distribution, chiefly of the northern hemisphere. They are grouped in two genera.

#### GENUS SALIX, L.

*Leaves* commonly lanceolate but ranging from obovate to linear; petioles short, sometimes glandular at apex and more or less covering the bud; stipules oblique, serrate, large and persistent (especially so on young shoots) or small and deciduous; winter buds covered with a single scale of two coats, the inner thin and membranous. *Flowers* in aments with entire or glandular dentate bracts and

disk gland-like, minute and nectiferous; stamens 2-12 (mostly 2) inserted at the base of the scale, with slender and mostly free filaments and small oblong anthers; pistillate aments usually erect or spreading; ovary sessile or short stipitate with short style, 2 short more or less recurved 2-cleft stigmas and containing 4-8 ovules on each of the 2 placentas. *Fruit* an acuminate capsule dehiscent by 2 recurved valves; seeds minute, dark brown.

Trees and shrubs of 160 or 170 species of wide distribution throughout the northern and a few in the southern hemisphere. They grow generally along the banks of streams and in low moist soil from the Arctic regions to the tropics. Numerous natural hybrids also occur. About 70 species are found in North America and of these 21 are recognized as trees of which 9 or 10 species are found in the northeastern states. Besides these we have two or three naturalized arborescent species. The name is the ancient Latin name of the genus.

### 296. SALIX LONGIPES, ANDERS.

LONG-STALK WILLOW. WARD WILLOW.

Ger., *Langstengel-Weide*; Fr., *Saule à tige long*; Sp., *Sauce de tallo largo*.

**SPECIFIC CHARACTERS:**—*Leaves* involute in the bud, 4-7 in. long, lanceolate to ovate-lanceolate, cuneate or rounded and the largest leaves sometimes cordate at base, long-pointed, finely and unequally serrate, glabrous bright green above, somewhat pubescent and whitish beneath; the foliaceous stipules reniform, often  $\frac{1}{2}$  in. long; petioles short, without glands; winter buds small, brown, lustrous, branchlets hoary pubescent. *Flowers* aments terminal on leafy branchlets, 3-4 in. long; scales ovate, yellow, obtuse, villous; stamens 3-7 with filaments hairy at base and yellow anthers; ovary long-stalked with nearly sessile stigmatic lobes. *Fruit* capsules about  $\frac{1}{4}$  in. long, globose conical.

The Long-stalk Willow is a small tree, only occasionally attaining the height of 30 ft. (9 m.) and a trunk diameter of 8 or 10 in. (0.25 m.), and it is often found fruiting as a shrub. The bark of trunk is of an ashen gray color and coarsely ridged with longitudinal and connecting scaly ridges.

**HABITAT.**—The gravelly banks of streams from about the latitude of Washington, D. C., and central Illinois, southward to southern Florida and southern Texas. It is quite abundant in southwestern Missouri and western Arkansas and ranges westward through New Mexico.

**PHYSICAL PROPERTIES.**—The wood of the Long Stalk Willow is very light, soft, not strong, with numerous very obscure medullary rays and quite uniformly distributed small open ducts. It is of a rich reddish brown color with creamy white sap-wood. *Specific Gravity*, 0.4456; *Percentage of Ash*, 0.70.

**USES.**—No particular use is made of the wood of this willow save occasionally for fuel, charcoal, etc.

MEDICINAL PROPERTIES are not mentioned in the pharmacopœa specifically of this willow, but doubtless those common to the willows generally, and mentioned in our account of the *S. nigra* (Part II, p. 37), are found in this species.

### 297. SALIX MISSOURIENSIS, MUEHL.

#### MISSOURI WILLOW.

Ger., *Missouri Weide*; Fr., *Saule de Missouri*; Sp., *Sauce de Missouri*.

SPECIFIC CHARACTERS:—*Leaves* involute in the bud, lanceolate to oblanceolate and occasionally ovate-lanceolate, 3-5 in. long, narrowed and wedge-shaped or rounded at base, acuminate, finely serrate with small gland-tipped teeth, pubescent at first but finally nearly glabrous, dark green above, paler and often glaucous beneath; petioles pubescent; the persistent stipules semicordate, often  $\frac{1}{2}$  in. long; winter buds large and hoary-tomentose; branchlets pubescent the first season. *Flowers* unfold very early (February-March) on short branchlets bearing small scale-like leaves; staminate about  $1\frac{1}{2}$  in. long; scales light green, hairy outside; stamens 2 with long glabrous free filaments; ovary glabrous, beaked, with very short style and emarginate stigmas. *Fruit* a narrow cylindrical ovoid long-pointed capsule with slender stalk about as long as the scale.

The Missouri Willow is a small tree, occasionally attaining the height of 50 or 60 ft. (18 m.) and a thickness of trunk of 12 to 18 in. (0.40 m.). It develops a rather narrow rounded top of upright slender branches and pubescent branchlets. The bark of trunk is gray in color and quite thin and smooth, only becoming moderately roughened with age with shallow scaly longitudinal ridges. The smoothness of bark is particularly pronounced on the larger branches.

HABITAT. — The rich alluvial bottom-lands of the lower Missouri river from western Iowa and eastern Nebraska to its mouth, and of the Mississippi river from eastern Iowa to southeastern Missouri. The principal area of distribution is within the state of Missouri, from which fact it receives its name.

PHYSICAL PROPERTIES. — Wood soft, light, not strong, with numerous obscure medullary rays and quite uniformly distributed fine open ducts. It is of a reddish brown color with thin whitish sap-wood. It is quite durable in contact with the soil. *Specific Gravity*, 0.6069; *Percentage of Ash*, 0.59; *Relative Approximate Fuel Value*, 0.6033; *Weight of a Cubic Foot in Pounds*, 37.82.

USES. — The principal use of the Missouri Willow is for fence-posts and stakes, due to its exceptional durability in contact with the soil.

## GYMNOSPERMÆ.

Flowering, exogenous plants with *leaves* chiefly parallel-veined and cotyledons frequently more than two. *Flowers* declinuous and very incomplete; pistil represented by an open scale or leaf, or altogether wanting, with ovules naked, fertilized by direct contact with the pollen, and seeds at maturity naked — without a true pericarp.

## ORDER CONIFERÆ: PINE FAMILY.

*Leaves* narrow or scale-like, clustered or alternate, parallel-veined and generally persistent; buds scaly. *Flowers* in catkins or solitary with an involucre of enlarged bud-scales, unsexual and monœcious (diœcious in *Juniperus*) destitute of calyx and corolla; anthers 2-celled; pistillate flowers bearing on the inner face of each scale 2 or more ovules and becoming in *Fruit* a woody cone or rarely a berry or drupe; seeds often winged, with coat of two layers; embryo axile in copious albumen; cotyledons 2 or several.

A family of trees and few shrubs with resinous juice and cell-walls of wood marked with circular discs. It is of greatest economic value and world-wide distribution, but chiefly in north temperate regions. Among its representatives are trees, notably the Sequoias, which are considered to be of the greatest longevity of all living organisms. It consists of thirty-one genera of which thirteen are represented in the United States.

## GENUS PINUS, L.

*Leaves* evergreen, needle-shaped, from slender buds, in clusters of 2-5 together (solitary in one species), from the axils of scale-like primary leaves each cluster invested at its base with a sheath of thin, membranous scales. *Flowers* appearing in spring, monœcious. *Sterile flowers* in catkins, clustered at the base of the shoots of the season; stamens numerous with very short filaments and a scale-like connective; anther-cells, 2, opening lengthwise; pollen imbricated, carpellary scales, each in the axil of a persistent bract and bearing at its base within a pair of inverted ovules. *Fruit* maturing in the autumn of the second year, a cone formed of the imbricated carpellary scales, which are woody, often thickened or awned at the apex, persistent, when ripe dry and spreading to liberate the two nut-like and usually winged seeds; cotyledons 3-12 linear.

The Pines are trees and a few shrubs of the northern hemisphere and chiefly of temperate regions. Many of its representatives are of greatest economic value. About eighty species are recognized of which thirty-four are natives of the United States. (The name is a Latin word from Celtic *pin* or *pen*, a *erag*.)

## 298. PINUS PUNGENS, MICHX.

## TABLE-MOUNTAIN PINE.

Ger., *Tafelberg Fichte*; Fr., *Pin de plateau*; Sp., *Pino de mesa*.

SPECIFIC CHARACTERS:—*Leaves* in crowded clusters of 2-2.4 in. long with short persistent sheaths, stout, stiff, more or less twisted, with 2 fibro-vascular bundles and resin-ducts in parenchyma; branchlets short, dark brown and rough. *Flowers* staminate yellow, in loose clusters; the pistillate long-stalked, lateral and generally in whorls of 2 to 5 or more. *Cones* short-ovoid, 3-4 in. long, lateral and in whorls upon the branchlet, oblique at base, sessile and with scales, especially those of the

outer side near base, much thickened, with prominent transverse ridge and armed with a strong flat curved prickle; seeds rounded triangular, nearly  $\frac{1}{4}$  in. long, and with wings broadest near the center.

The Table-mountain Pine in forest growth occasionally attains the height of 60 ft. (18 m.) with a trunk diameter rarely more than 2 or 3 ft. (0.90 m.). When growing in the open it does not often surpass 30 or 40 ft. in height, and it there develops a rather flat or round-topped head. It is found in localities producing its cones when only a few feet in height. The bark of trunk is of a dark reddish brown color with large irregular scaly plates and ridges.

HABITAT. — In its natural distribution this pine is confined to the dry gravelly slopes and ridges of the Alleghany mountains, with a few out-lying stations, from Pennsylvania to North Carolina. It is uncommon and local northward, but is quite abundant in the southern part of its range, where in places it forms nearly exclusive forests of considerable extent. It thrives well when planted far outside of its natural range.

PHYSICAL PROPERTIES. — Wood light, soft, not strong, compact, with numerous resin-ducts and of a pinkish brown color with abundant lighter sap-wood. *Specific Gravity*, 0.4935; *Percentage of Ash*, 0.27; *Relative Approximate Fuel Value*, 0.4922; *Coefficient of Elasticity*, 80330; *Modulus of Rupture*, 726; *Resistance to Longitudinal Pressure*, 354; *Resistance to Indentation*, 115; *Weight of a Cubic Foot in Pounds*, 30.75.

USES. — The principal use of the Table-mountain Pine is for fuel and charcoal, though it is used to some extent for lumber for general construction purposes.

#### GENUS TSUGA, CARR.

*Leaves* linear, short-petiolate and articulated to persistent bases, flat in most species, mostly appearing 2-ranked by a twist in the base of the leaf and white stomatose beneath (but not 2-ranked and stomatose both above and below in one species) with a single dorsal resin-duct, evergreen. *Flowers* in middle spring, monœcious; the sterile subglobose clusters of stamens from the axils of the leaves of the previous year; the stipes surrounded by numerous bud-scales; anthers tipped with a short spur or knob and cells opening transversely; pistillate aments terminal on the branchlets of the previous year, erect; bracts somewhat shorter than the scales.

Tall somewhat pyramidal trees of the temperate regions of North America, Japan, China and the Himalaya Mountains, with horizontal and drooping branches, slender twigs and graceful flat sprays of foliage. Seven species are known of which four are inhabitants of North America, two of the Atlantic and two of the Pacific states. (*Tsuga* is the Japanese name of the *Hemlock-tree*.)



## 299. TSUGA CAROLINIANA, ENGELM.

## CAROLINA HEMLOCK.

Ger., *Carolina Tanne*; Fr., *Pruche de Caroline*; Sp., *Abeto de Carolina*.

**SPECIFIC CHARACTERS:**—*Leaves* flat, linear,  $\frac{1}{3}$ - $\frac{3}{4}$  in. long, petiolate, obtuse and often retuse at apex, lustrous dark green and with conspicuous central groove above, marked with white bands of 7 or 8 rows of stomata on each side of the midrib beneath and forming a flattish spray but not as flat as that of the *T. canadensis*. *Flowers* staminate purplish; pistillate purple with broad ovate bracts about as long as the scales. *Cones* oblong, 1-1½ in. long with short stalks and oblong obtuse fine but scarcely woody puberulous scales widely spreading at maturity and ample bracts about half as long as scales; seeds about one-sixth in. long with large wing broadest near the base.

The Carolina Hemlock is an interesting and rare or local tree which occasionally attains the height of 60 or 70 ft. (20 m.) with an oblong-pyramidal head and a trunk rarely exceeding 2 or 3 ft. (0.90 m.) in thickness. The bark of trunk is of a reddish or purplish brown color and rough with prominent scaly ridges.

**HABITAT.** — The slopes and benches of the Blue Ridge mountains from Virginia to northern Georgia, mostly between the altitudes of 2,000 and 3,500 ft. It is generally found scattered sparingly in forests of the commonly Hemlock, various oaks, Sugar Maple, Silver-bell Tree, Sour-wood, etc., but occasionally forms quite exclusive groves of small extent. It is so often found on rocky crags and ridges that it is called locally the *Crag Hemlock*.

**PHYSICAL PROPERTIES.** — Wood soft, light, not strong, brittle and of a light orange-brown color with little distinction in tint between the heart and sap-woods. *Specific Gravity*, 0.4275; *Percentage of Ash*, 0.40; *Relative Approximate Fuel Value*, 0.4258; *Coefficient of Elasticity*, 71282; *Modulus of Rupture*, 461; *Resistance to Longitudinal Pressure*, 403; *Resistance to Indentation*, 125; *Weight of a Cubic Foot in Pounds*, 26.64.

**USES.** — A too local, uncommon and inaccessible tree to figure in commerce, but with properties so similar to those of the common Hemlock that it is suitable for the same uses; that is as a coarse lumber for general construction purposes, joists, rafters, planks and siding in house-building, plank-walks, etc.

## GENUS ABIES, LINK.

*Leaves* sessile, those of young trees and sterile branches usually flat (four-sided in *Abies magnifica*) rounded or emarginate at apex, centrally grooved above,

spirally arranged, but generally appearing 2-ranked by a twist in their bases and stomatiferous only below; leaves of leading shoots and fertile branches crowded, incurved and more or less quadrangular, obtuse or acute at apex, and sometimes stomatiferous above, persistent for eight or ten years and when falling away leaving a circular flat scar; resin-ducts 2; branch-buds usually resin coated. *Flowers* from the axils of the leaves of the previous year and confined to the upper branches; the staminate in abundance on the lower side of branchlets, oblong with stipe, surrounded at base with bud scales; anther-cells 2, extrorse, opening transversely and connective terminating in a knob; pistillate flowers erect on upper side of branchlet and usually only those of the topmost branches, globose or cylindrical-oblong; scales numerous, imbricated and shorter than their mucronate bracts. *Cones* erect, ovoid to cylindrical-oblong, maturing the first year, with numerous broad thin imbricated scales, each bearing 2 seeds and springing from the axil of a thin membranous bract which with the scale and seeds falls away at maturity from the straight persistent axis; seed furnished with resin vesicles and a large membranous oblique wing at apex; cotyledons 4-10, shorter than radicle.

Trees of generally strict pyramidal habit of growth with branches in whorls and bark of trunks when young containing numerous resin-vesicles. There are twenty-four known species, all natives of the northern hemisphere and chiefly of northern regions. Ten are found in North America north of Mexico, eight in the Pacific coast and Rocky Mountain regions and two in the Atlantic states. (*Abies* is the ancient Latin name of the *Fir-tree*.)

### 300. ABIES FRASERI, LINDL.

#### FRASER FIR.

Ger., *Fraser Tanne*; Fr., *Sapin de Fraser*; Sp., *Abeto de Fraser*.

SPECIFIC CHARACTERS:—*Leaves* flat,  $\frac{1}{2}$ -1 in. long, those of the sterile branches emarginate and those of the fertile acute at apex, dark green and centrally grooved above, silvery white beneath with 8-12 rows of stomata. *Flowers* in May; staminate reddish yellow; pistillate with scales much broader than long and shorter than the exerted pale yellow-green bracts. *Cones* mature in September, ovoid-oblong, 2-2 $\frac{1}{2}$  in. long, dark purple with scales wider than long and with long exerted pale yellow-green reflexed bracts, aristate at apex; seeds about  $\frac{1}{8}$  in. long with very wide wing oblique at apex.

The Fraser Fir is a tree sometimes 70 ft. (21 m.) in height, though usually not surpassing 50 ft. (15 m.) and with a trunk sometimes 21 $\frac{1}{2}$  ft. (0.75 m.) in thickness. It develops a distinct and compact pyramidal top, with whorls of long horizontal or drooping lower branches and those above successively shorter to the pointed apex. The bark of the younger trunks is quite copiously supplied with resin-blisters, but that of the older trunks much less, and it becomes with age covered with thin yellowish gray papery scales giving an appearance very different from the bark of the common Balsam Fir of the northern states and Canada.

HABITAT. — One of the most restricted trees of the Atlantic states, the Fraser Fir is found only in altitudes of from 4,000 to 6,000 ft.

on the peaks and ridges of the Alleghany Mountains from Virginia nearly to Georgia. The extreme opposite of the northern species, whose presence is generally indicative wet swampy low-lands, this tree seems to love and thrive on the dry soil of the mountain top.

PHYSICAL PROPERTIES. — Wood light, soft, not strong, compact, free from resin and of a clear satiny cream-white color with little distinction between heart and sap-woods. *Specific Gravity*, 0.3565; *Percentage of Ash*, 0.54; *Relative Approximate Fuel Value*, 0.3546; *Coefficient of Elasticity*, 97170; *Modulus of Rupture*, 639; *Resistance to Longitudinal Pressure*, 347; *Resistance to Indentation*, 65; *Weight of a Cubic Foot in Pounds*, 22.22.

USES. — Such is the remoteness and inaccessibility of the home of these interesting trees that very few of them have been felled by the woodsman's axe, though in quality the wood is similar to that of the northern Balsam and suitable for the same uses.

Its fragrant boughs yield many a balsam pillow to those who climb to its lofty home and would carry away with them a delightful memento of the interesting trip.



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TO COMMON NAMES.

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# GENERAL INDEX

## TO BOTANICAL NAMES.

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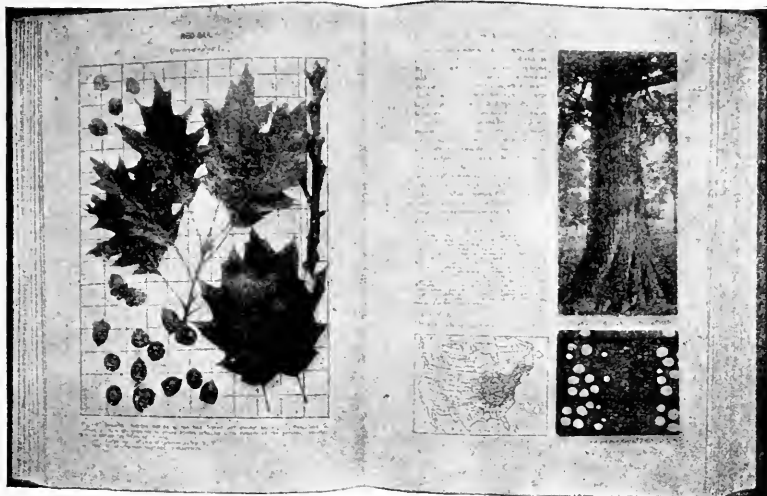
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HANDBOOK OF THE TREES  
OF THE NORTHERN STATES AND CANADA, EAST OF THE ROCKY MOUNTAINS.  
PHOTO-DESCRIPTIVE.  
ROMEYN BECK HOUGH, AUTHOR AND PUBLISHER



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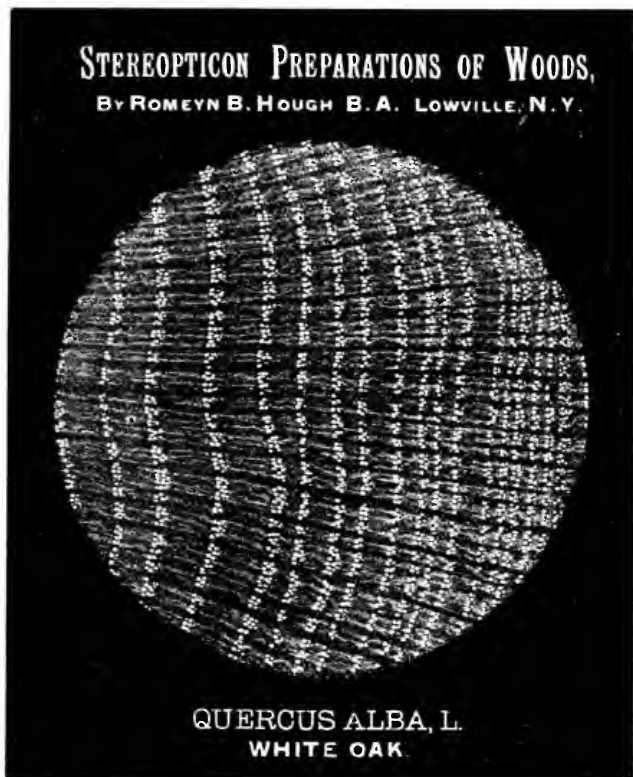
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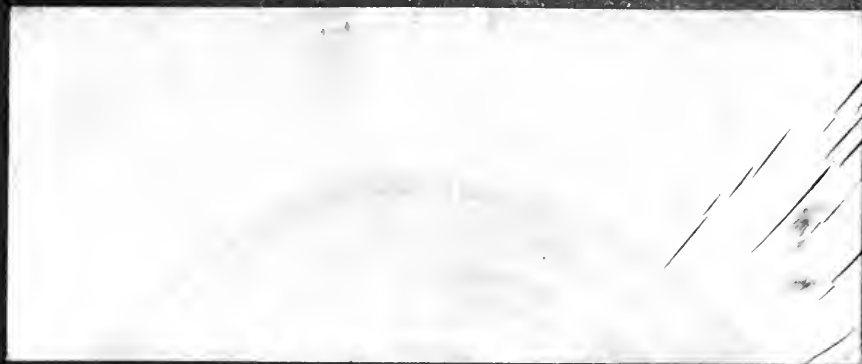






276. ILEX CASSINE L.

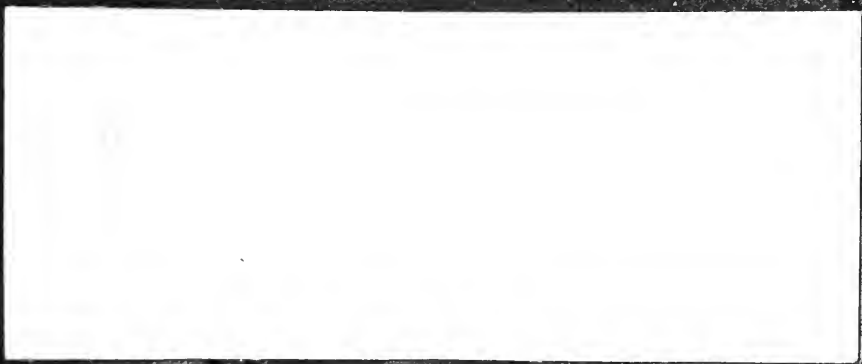
Cassia Holly, Dahoon, Henderson-wood.



TRANSVERSE SECTION



RADIAL SECTION



TANGENTIAL SECTION

— Cassina Stempaline.

— Houx de Cassena.

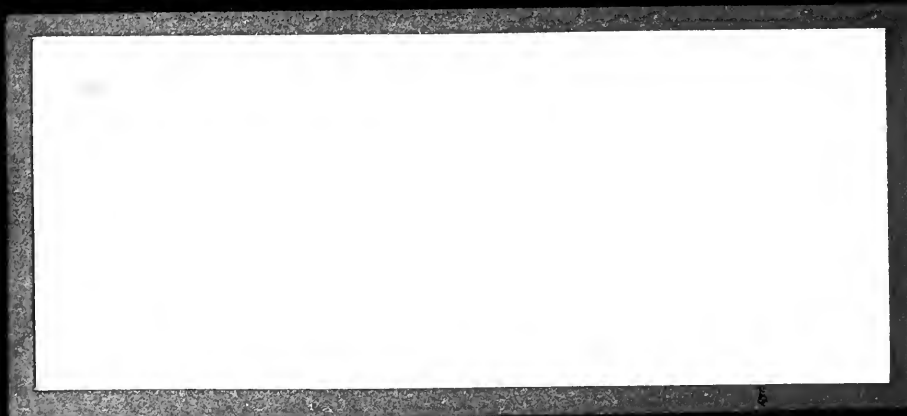
— Acebo de Cassena.

276. ILEX CASSINE L.

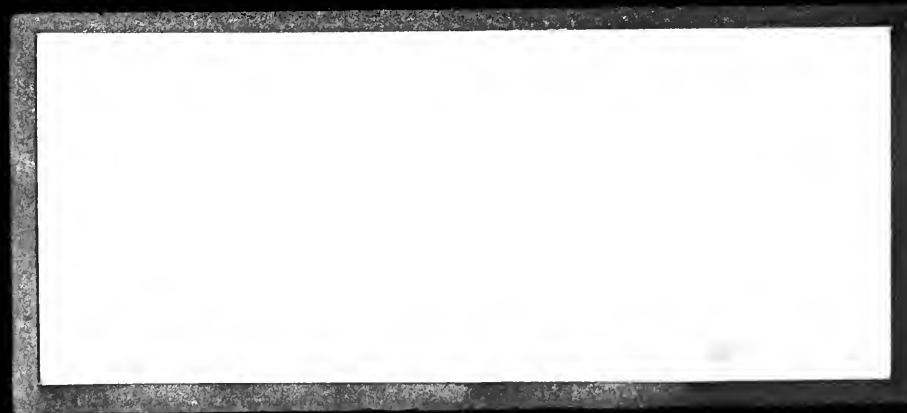
Cassena Holly. Dahoon. Henderson-wood.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Cassena Stechpalme.

Fr. Houx de Cassena.

Sp. Acebo de Cassena.

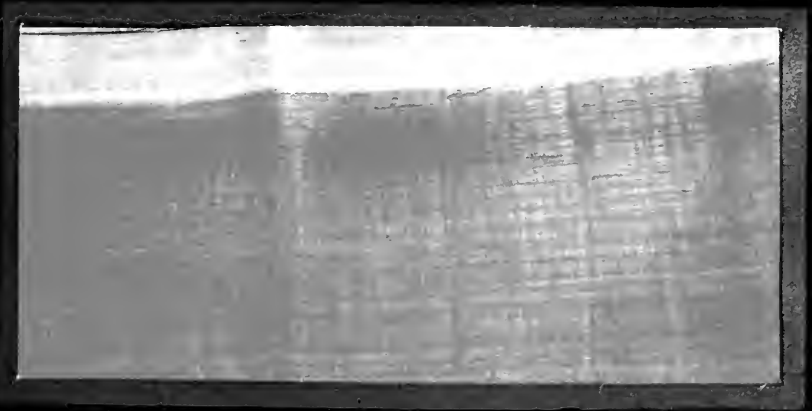


STIRHAMNUS CATHARTICA L.

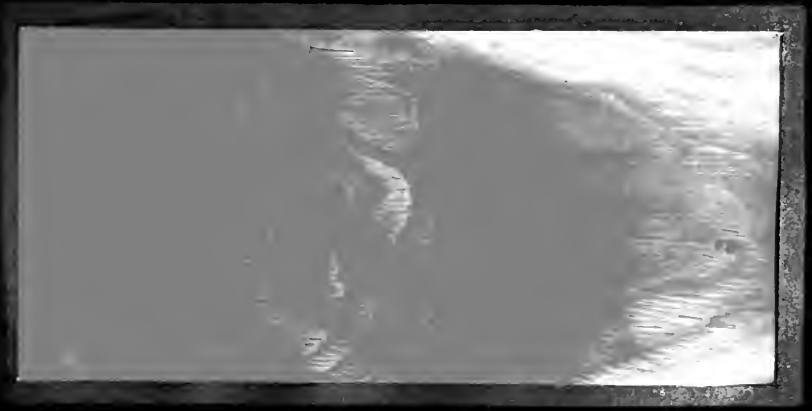
Stirhamnus Cathartica Linn. Buchholz. Weyher.



LONGITUDINAL SECTION



RADIAL SECTION



TANGENTIAL SECTION

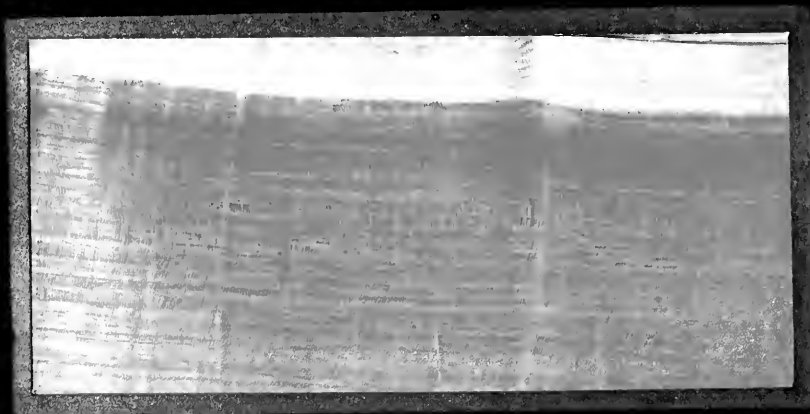
Stirhamnus Cathartica L. Nerprun.  
Stirhamnus Cathartica L.

277. RHAMNUS CATHARTICA L.

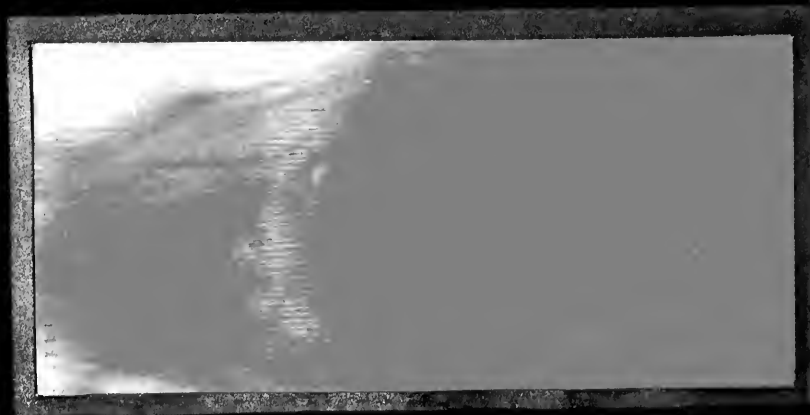
Common or European Buckthorn. Waythorn.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Stechdorn. Fr. Nerprun.

Sp. Ramno cathartico.

278 AESCULUS OCTANDRA MARSH.

Yellow Buckeye. Sweet Buckeye.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

*Fr.* Gelbe Rosskastanie.

*Fr.* Marronnier jaune.

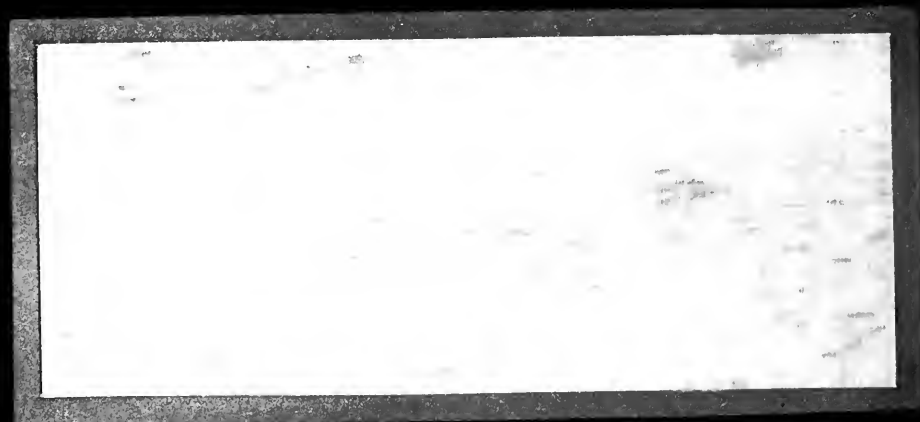
*Sp.* Castaño de caballo amarillo.

278. AESCULUS OCTANDRA MARSH.

Yellow Buckeye. Sweet Buckeye.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

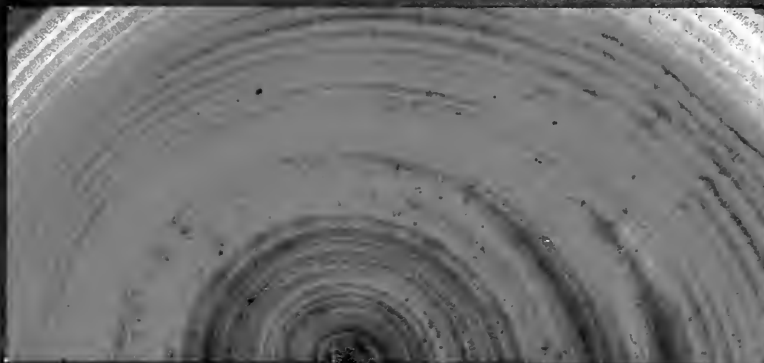
*Ger.* Gelbe Rosskastanie.

*Fr.* Marronnier d'Inde.

*Sp.* Castano de caballo amarillo.

279. RHUS COPALLINA L.

Zweig Stamm.



TRANSVERSE SECTION.



RADIAL SECTION



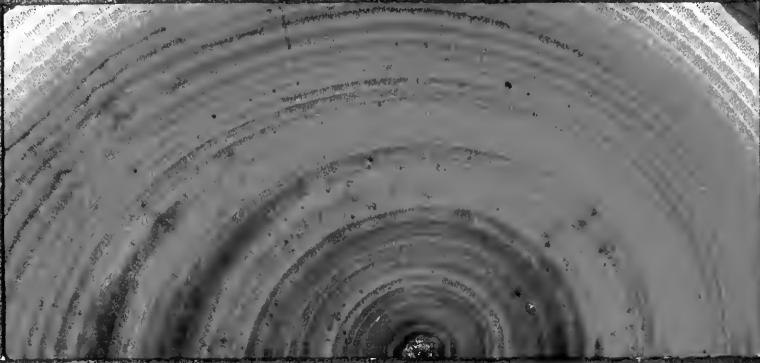
TANGENTIAL SECTION

von Zweig Stamm. Ex Stamm rind.

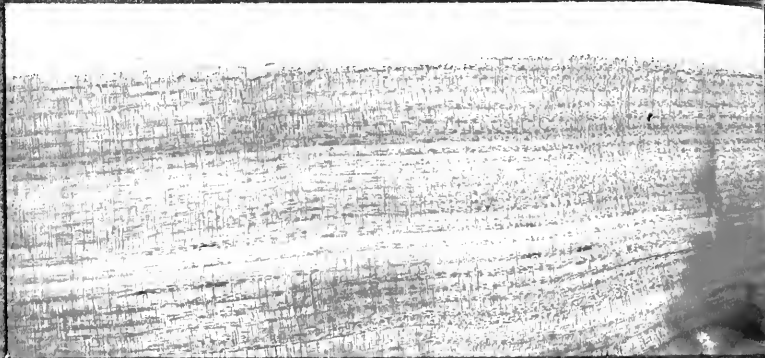
in Zweig rind.

279. RHUS COPALLINA L.

Dwarf Sumach.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

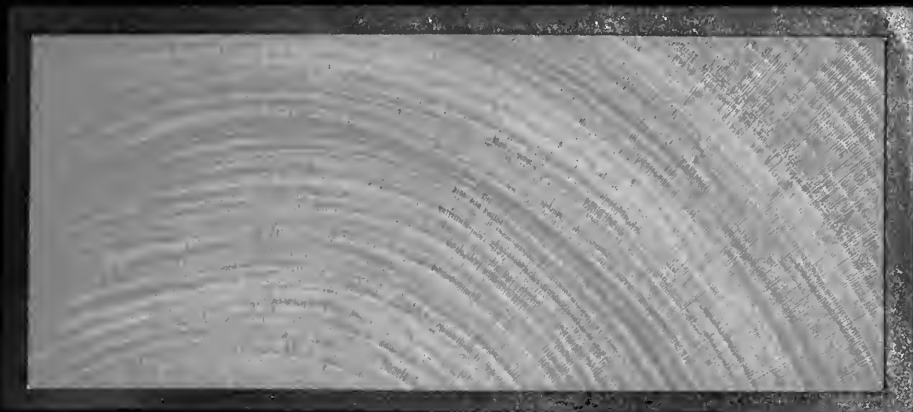
Det. Zwerg-Sumach.

Fr. Sumach rubra.

Sp. Zuniague enano.

280. GLADRASTIS LUTEA KOCH.

Yellow-wood. Gopher-wood. Virgilia.



TRANSVERSE SECTION



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Gelbholz.

Fr. Bois jaune.

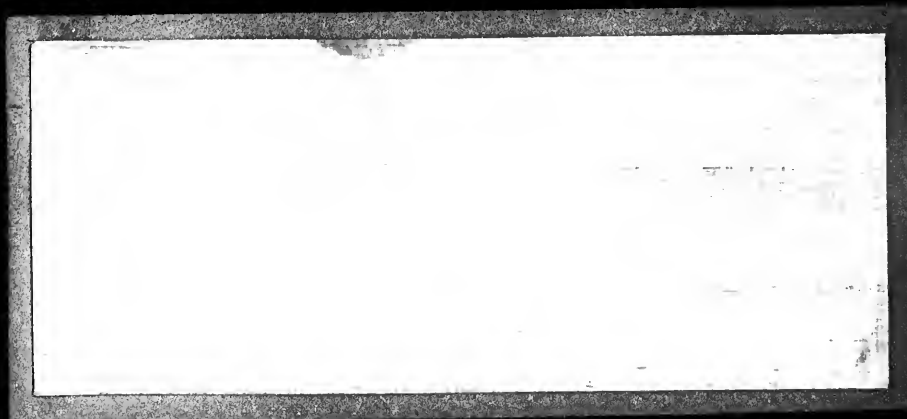
Sp. Madera amarilla.

280. OLADRASTIS LUTEA KOCH.

Yellow-wood. Gopher-wood. Virginia.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Gelb-holz.

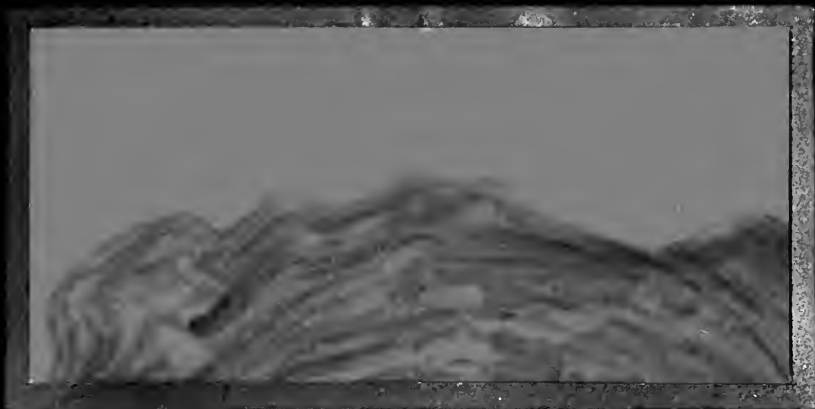
Fr. Bois jaune.

Sp. Madera amarilla.

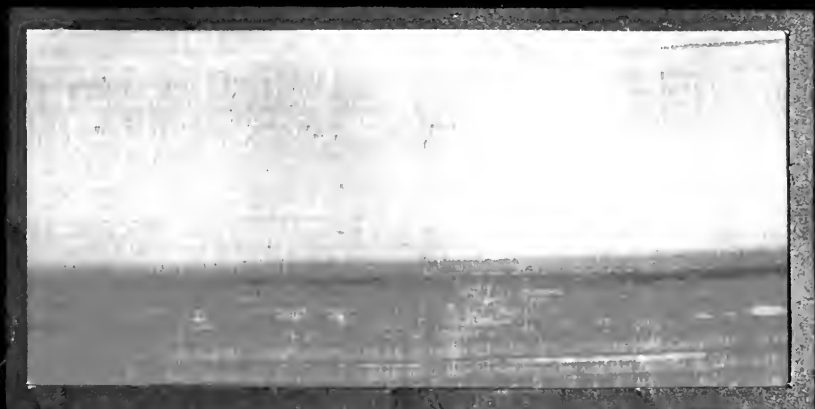


451 HAMAMELIS VIRGINIANA L.

Wüchshagen.



TRANSVERSE SECTION.



RADIAL SECTION



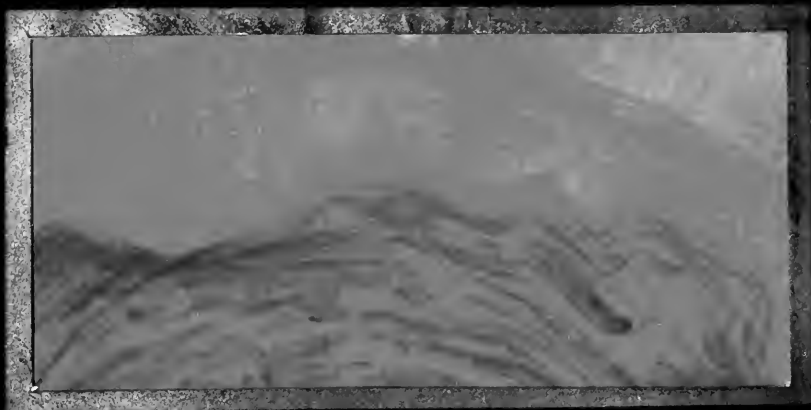
TANGENTIAL SECTION

*Ger. Zauberstrauch. Fr. Noisetier des sorcieres*

*Sp. Bruxa-avellano.*

281. HAMAMELIS VIRGINIANA L.

Witch-hazel.



TRANSVERSE SECTION



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Zauberstrauch. Fr. Noisetier des sorcieres

Sp. Bruxa-avellano.

2012 NYSSA AQUATICA MARSH

Common Name: Tupelo (Grand, Large Tupelo)



TRANSVERSE SECTION



RADIAL SECTION



TANGENTIAL SECTION

1954 Grutzer (Gum) (Grand) Fr. Gommier grand.

1954 Tupelo (Grand)

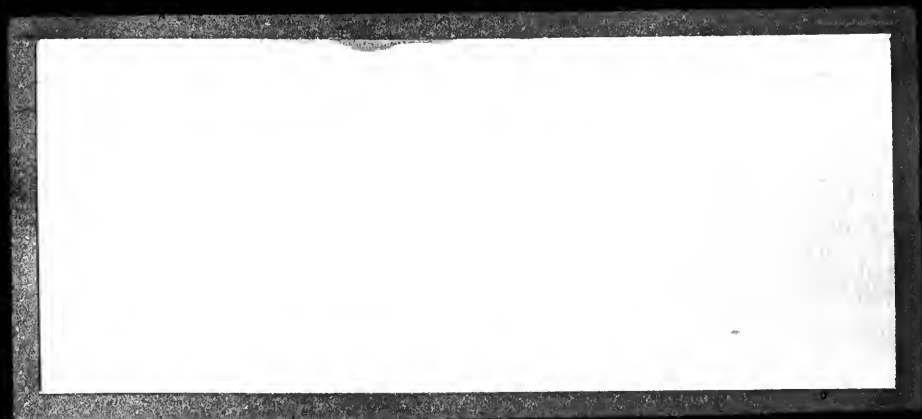
400

282. NYSSA AQUATICA MARSH

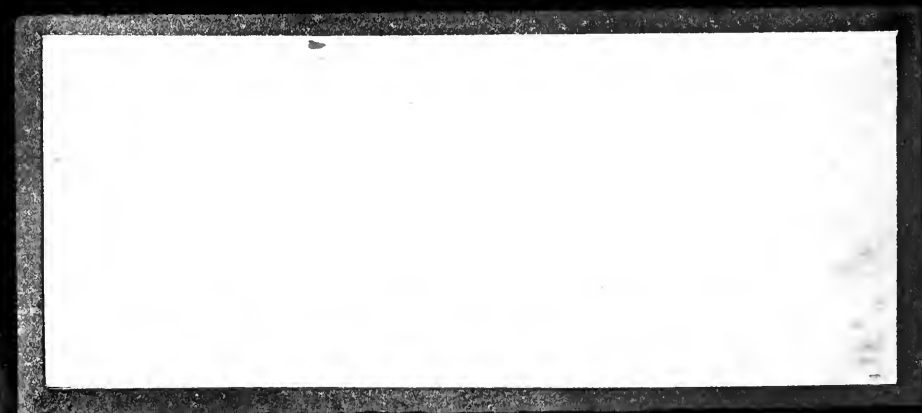
Cotton Gum. Tupelo Gum. Large Tupelo.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

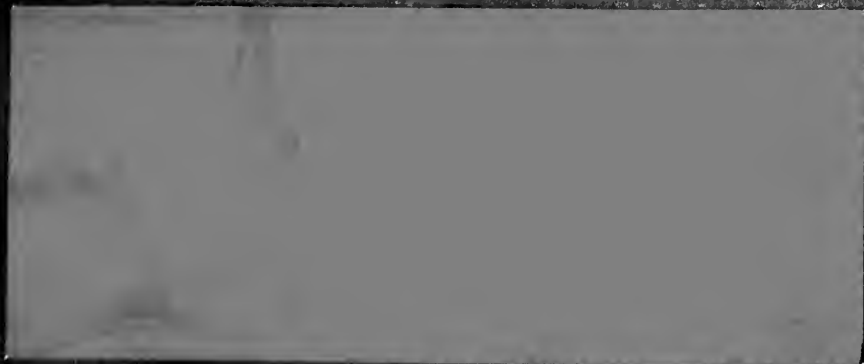
Gen. Groszer Gummibaum.

Fr. Gummies gelind.

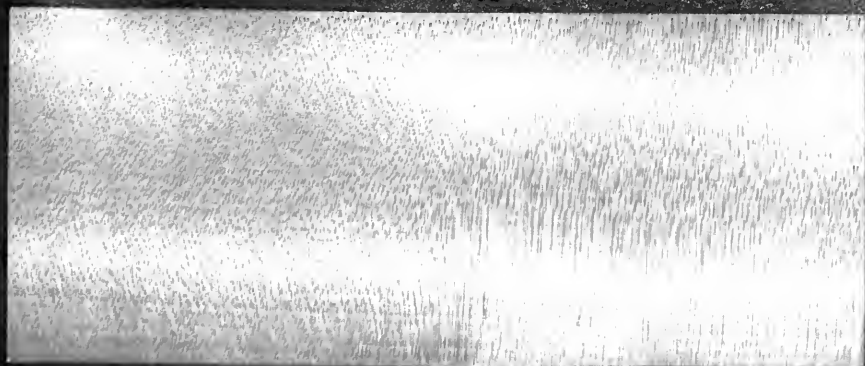
Ny. Tupelo grande.

18. *WYDENDRUM ARBOREUM* DC.

Sorrel-Tree. Sour-Wood.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Fr. Sauerampterbaum.

Fr. Arbre d'oseille.

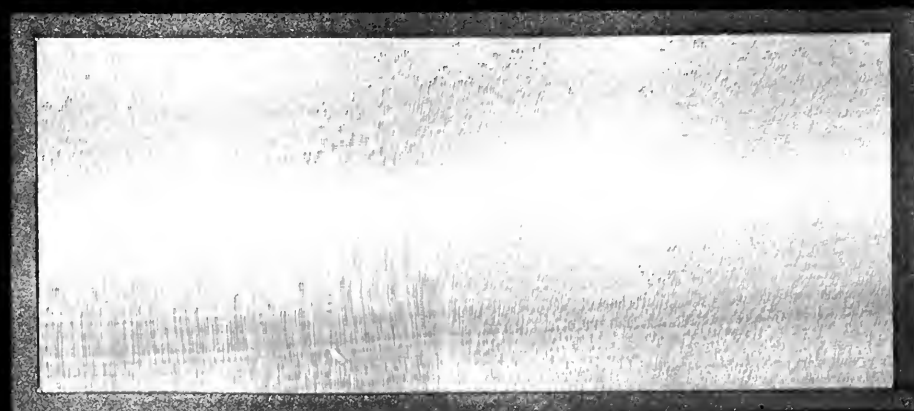
Sp. Arbol de acedera.

283. OXYDENDRUM ARBOREUM DC

Sorrel-Tree. Sour-Wood.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

*Ger.* Sauerampferbaum.

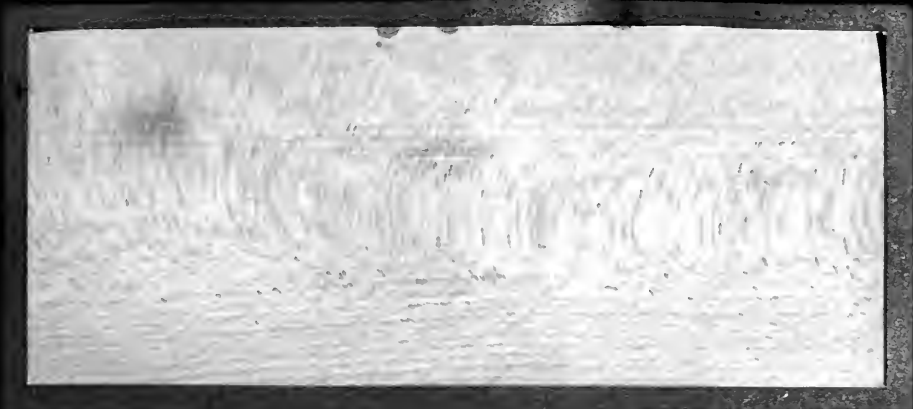
*Fr.* Arbre d'aigle.

*Sp.* Arbol de acedera.

Plate 671. Great Laurel.



TRANSVERSE SECTION.



RADIAL SECTION



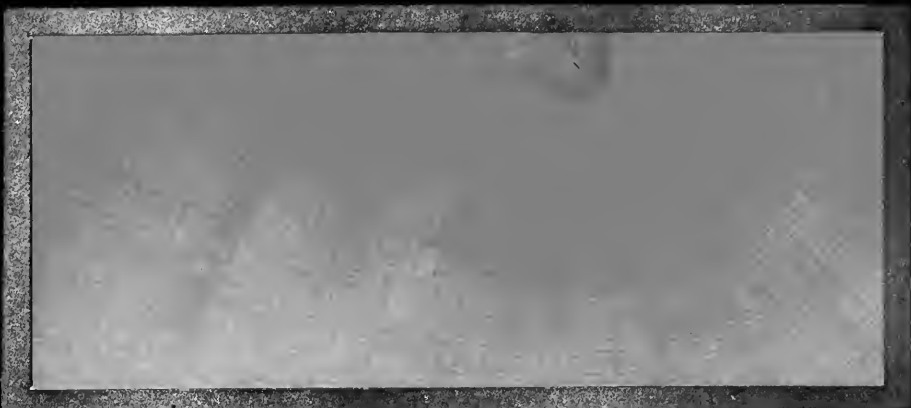
TANGENTIAL SECTION

*Rhododendron maximum* L. *Rhododendron grand.*

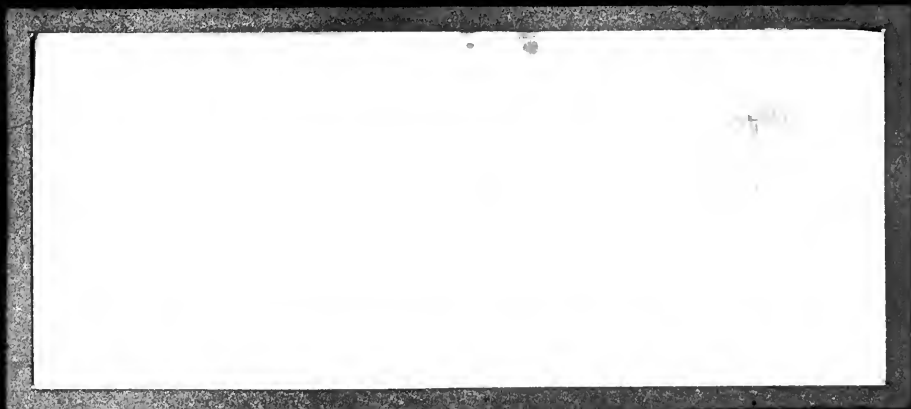
*Rhododendron grande.*

284. RHODODENDRON MAXIMUM L.

Rose Bay, Great Laurel.



TRANSVERSE SECTION



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Groszer Rosenlorbeer. Fr. Rhododendron grand.

sp. Rhododendron grande.

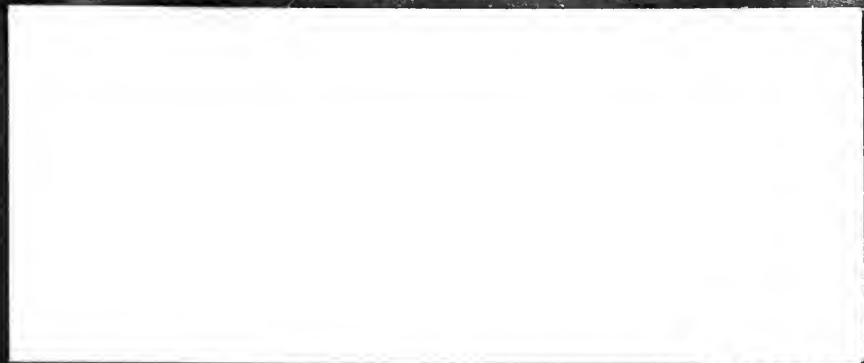


PHYLLOCOSSA TINCTORIA L'HER

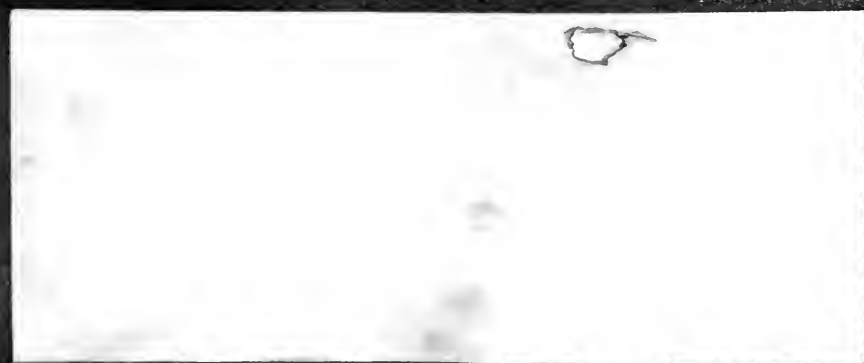
Common name: Hoop Sugar.



LONGITUDINAL SECTION



RADIAL SECTION



TANGENTIAL SECTION

Common name: Hoop Sugar. Fr. Feuille sucrée.

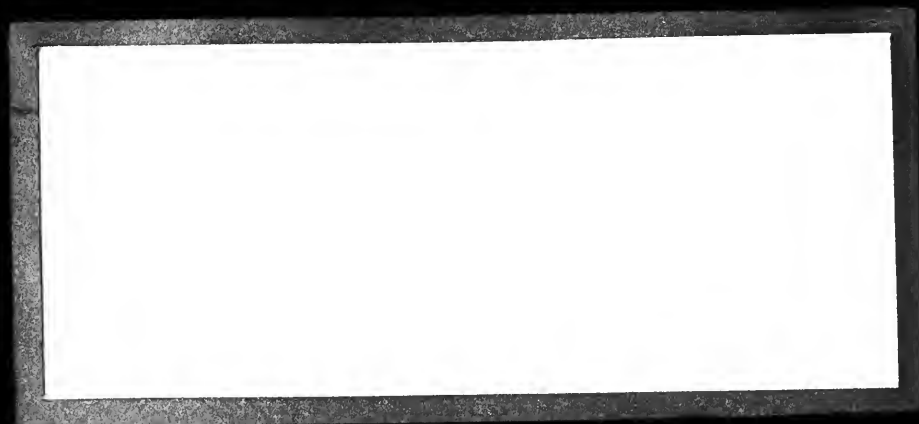
W. Hoop Sugar.

285. SYMPLOCOS, TINCTORIA L. HER

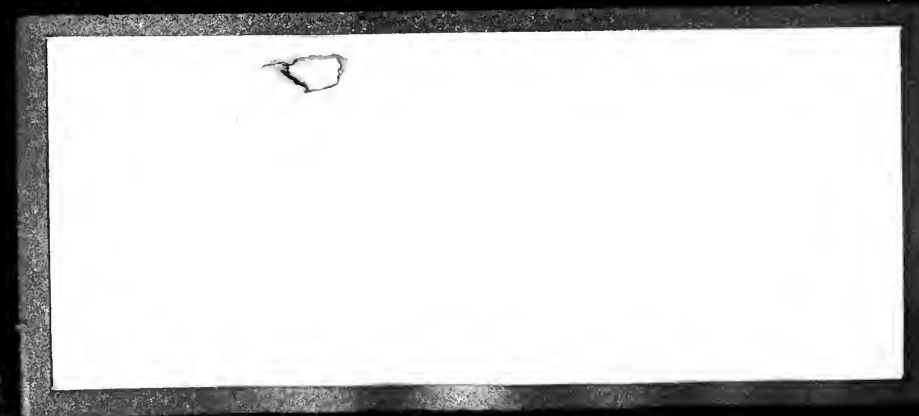
Sweet-leaf. Horse-Sugar



TRANSVERSE SECTION.



RADIAL SECTION



TANGENTIAL SECTION

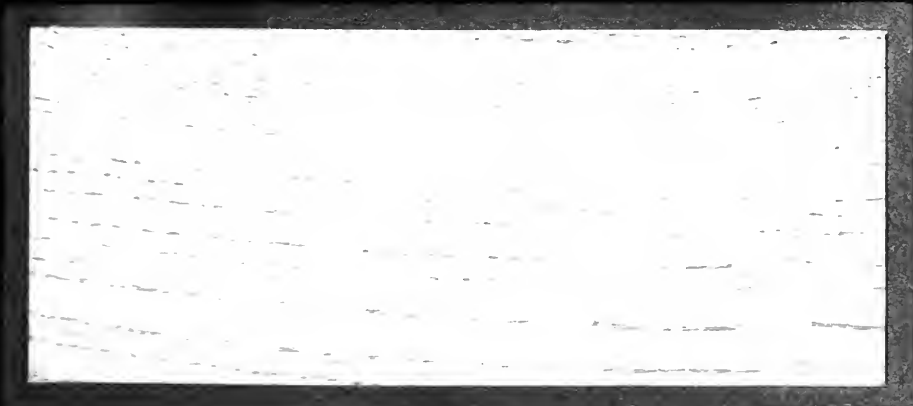
*Her.* Zuckerblatt, *Fr.* Feuille sucrée

*Mex.* Hoja dulce.

Water Ash.



TANGENTIAL SECTION



RADIAL SECTION



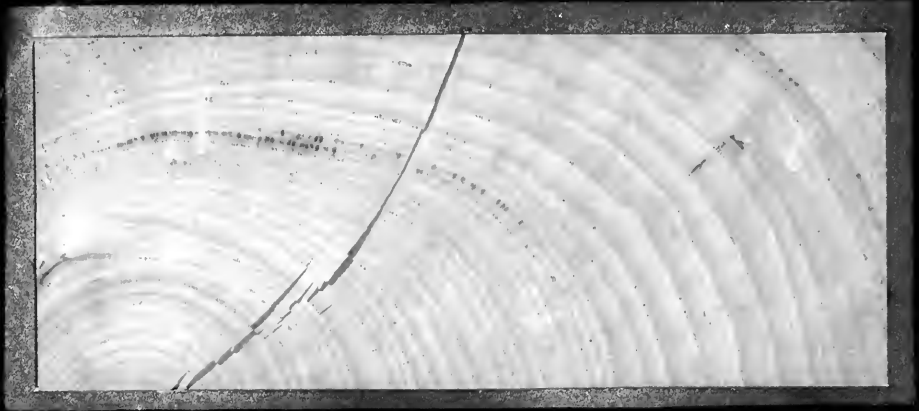
TANGENTIAL SECTION

Ver. Wasser-Bache. Fr. Frêne d'eau.

Fr. Frêne de agua.

286. FRAXINUS CAROLINIANA MILL

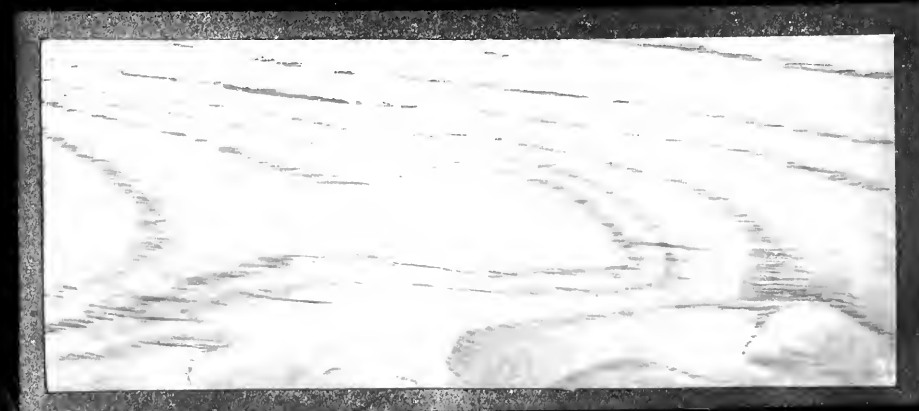
Water Ash.



TRANSVERSE SECTION



RADIAL SECTION



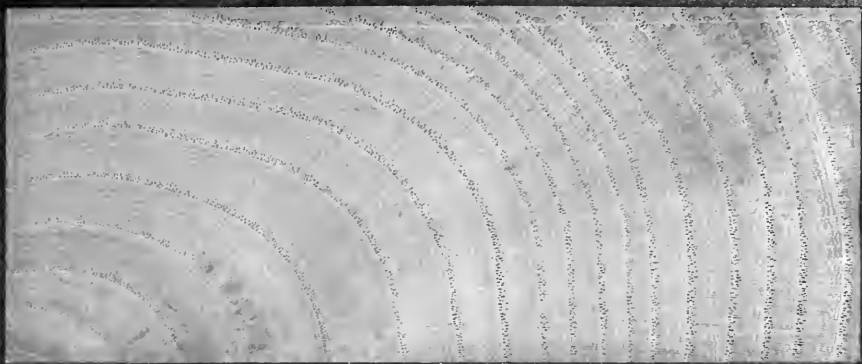
TANGENTIAL SECTION.

Ger. Wasser-Esche.

Fr. Frêne d'eau.

Sp. Fresno de agua.

Biltmore Ash.



TRANSVERSE SECTION



RADIAL SECTION



TANGENTIAL SECTION

See Catalogue of the U. S. Geol. Surv. for Frêne de Biltmore  
and Frêne de Biltmore.

Biltmore Ash.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Biltmore Esche.

Fr. Fresno de Biltmore.

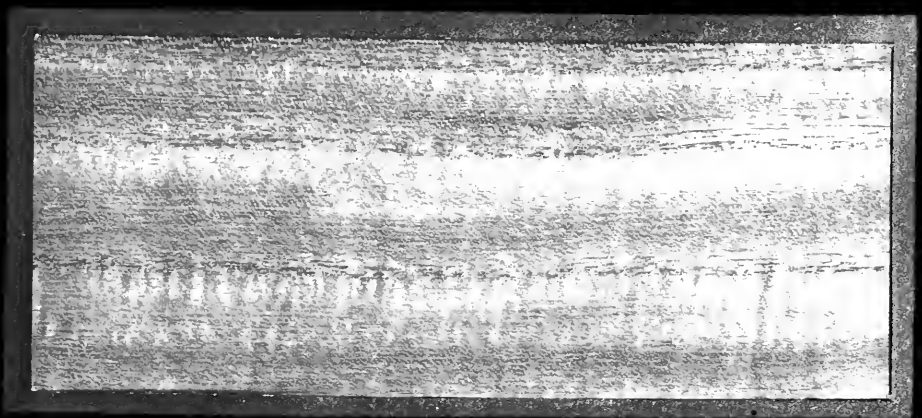
Mex. Fresno de Biltmore.

113 PAULOWNIA TOMENTOSA BAILEY.

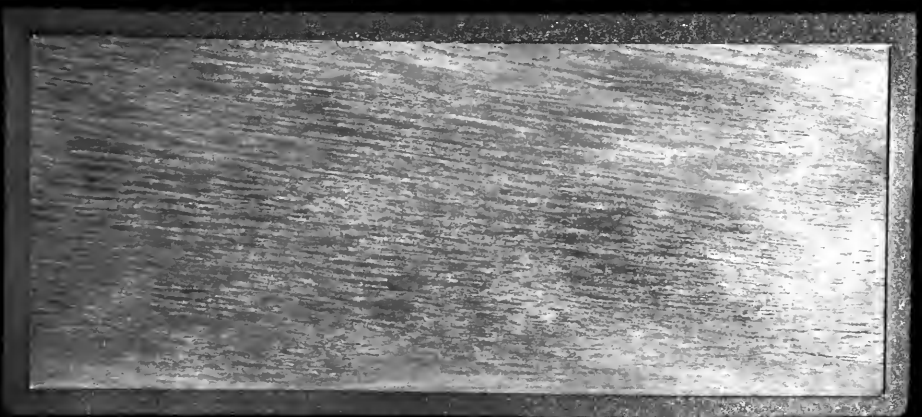
Paulownia, Princess-tree.



TRANSVERSE SECTION



RADIAL SECTION



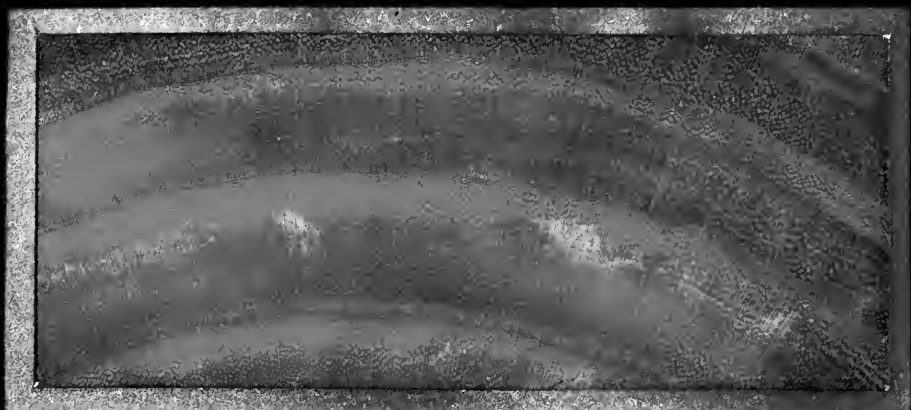
TANGENTIAL SECTION.

113. Princessinn-Baum. 114. Arbre de princesse.

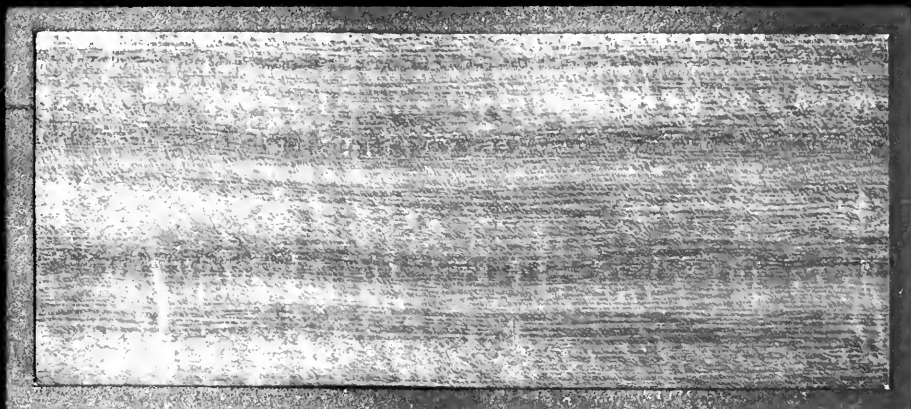
115. Arbol de princesa.

288. PAULOWNIA TOMENTOSA BAILEY

Paulownia Princess-tree.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Princessinn-Baum. Fr. Arbre de princesse.

Sp. Arbol de princesa.

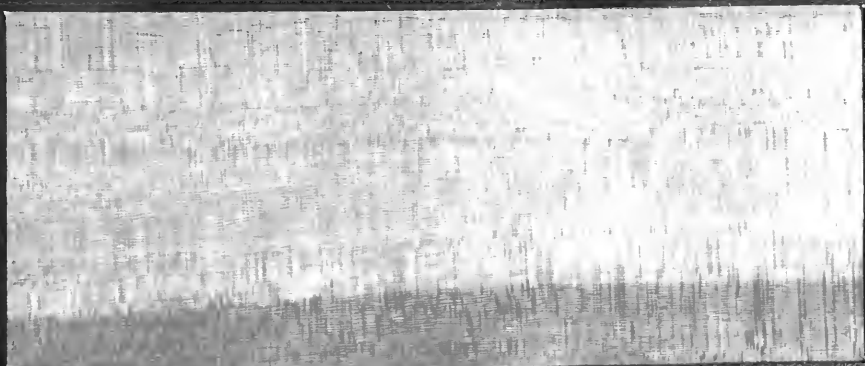


ORNI ULMUS ALATA MICHX.

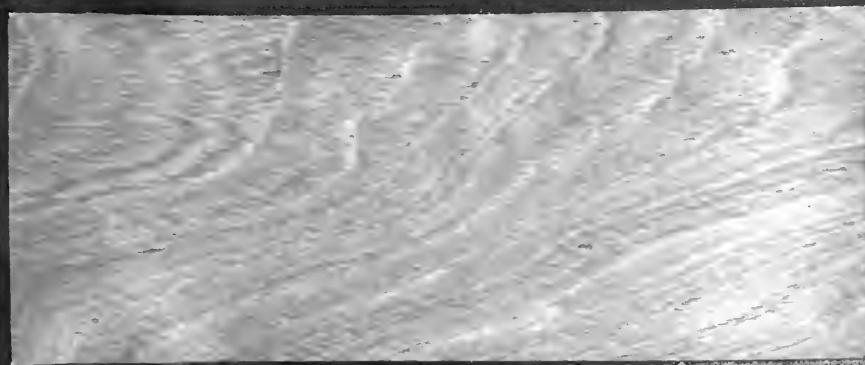
Winged Elm.



TRANSVERSE SECTION



RADIAL SECTION



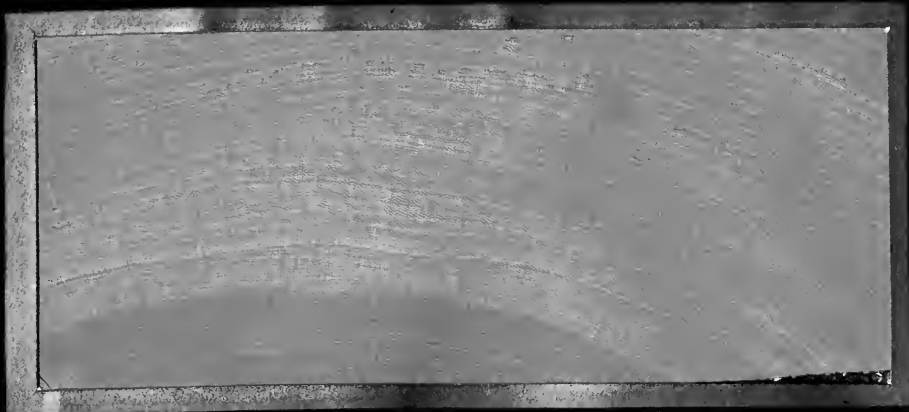
TANGENTIAL SECTION

near Bellugera Ulme. Fr. Ornithoecus.

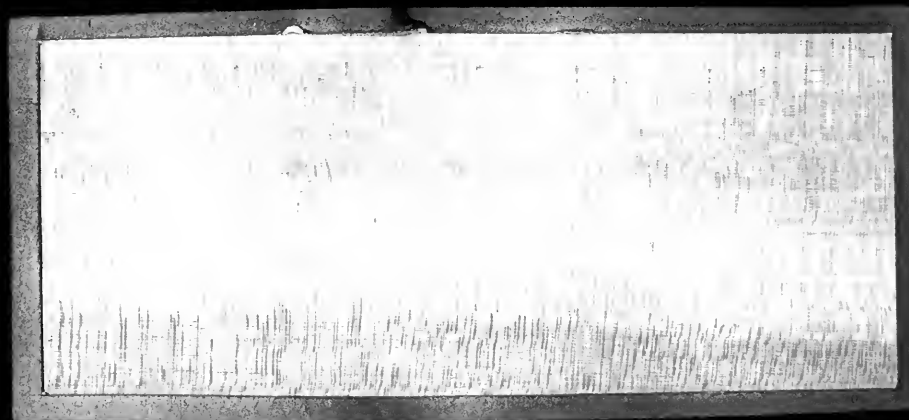
Ornithoecus alado.

289. ULMUS ALATA MICHX

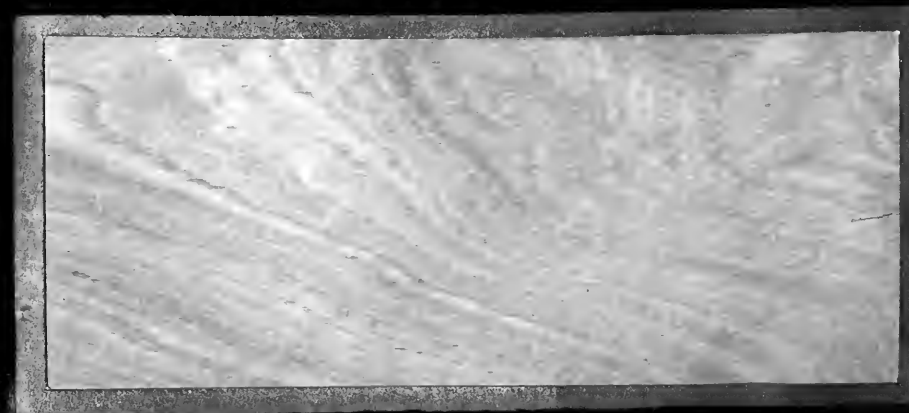
Winged Elm.



TRANSVERSE SECTION.



RADIAL SECTION



TANGENTIAL SECTION

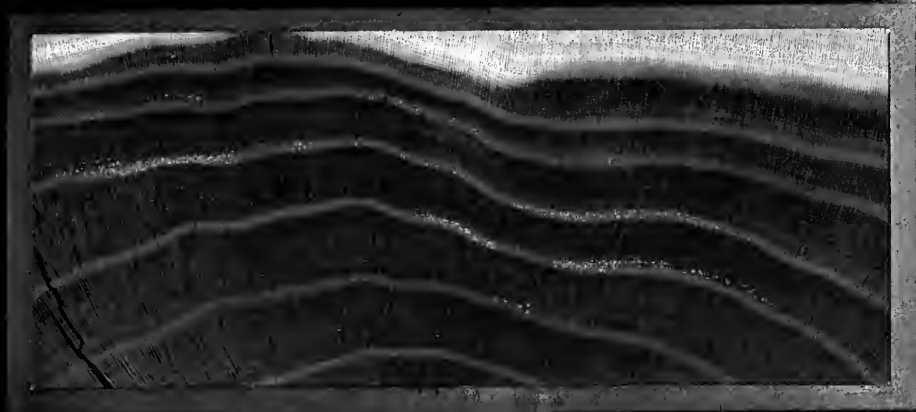
Ger. Beflügelte Ulme.

Fr. Orme alé.

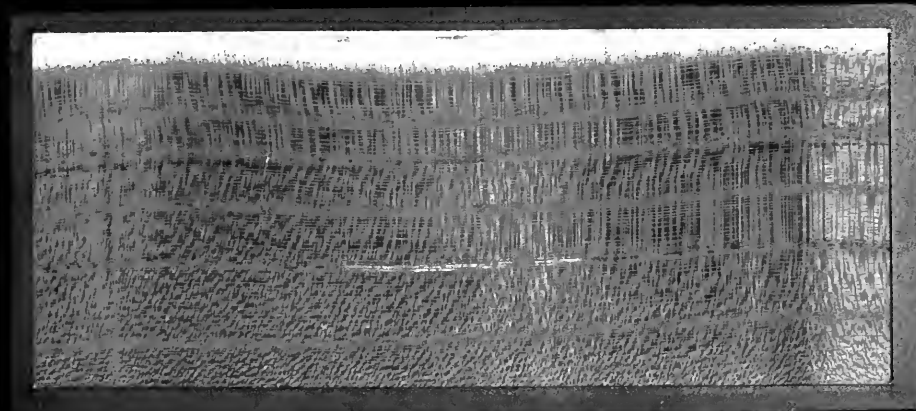
Sp. Olmo alado.

MORUS ALBA L.

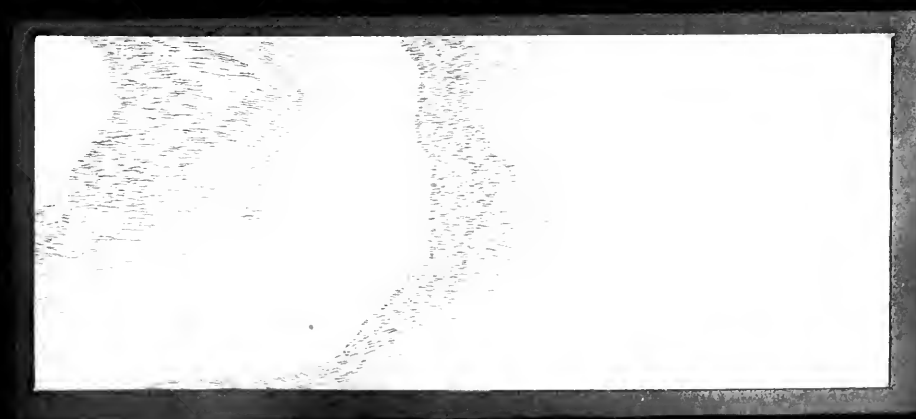
White Mulberry:



TRANSVERSE SECTION



RADIAL SECTION



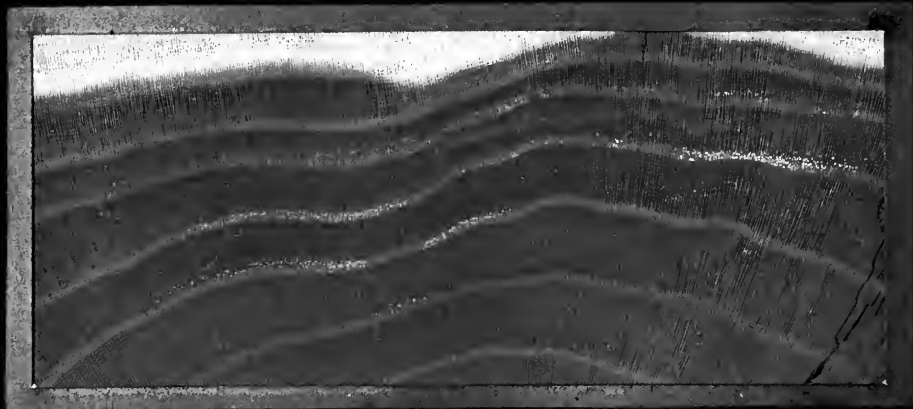
TANGENTIAL SECTION

Weisse Mulleerbaum, or Murier blanc.

Morus alba L.

290. MORUS ALBA L.

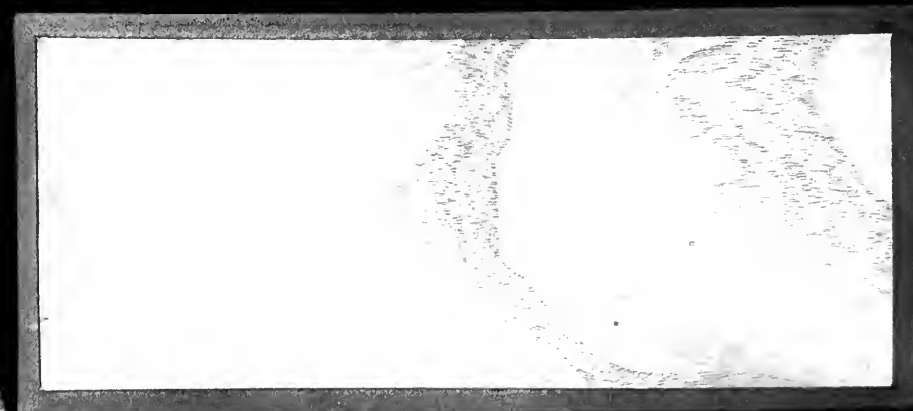
White Mulberry.



TRANSVERSE SECTION



RADIAL SECTION



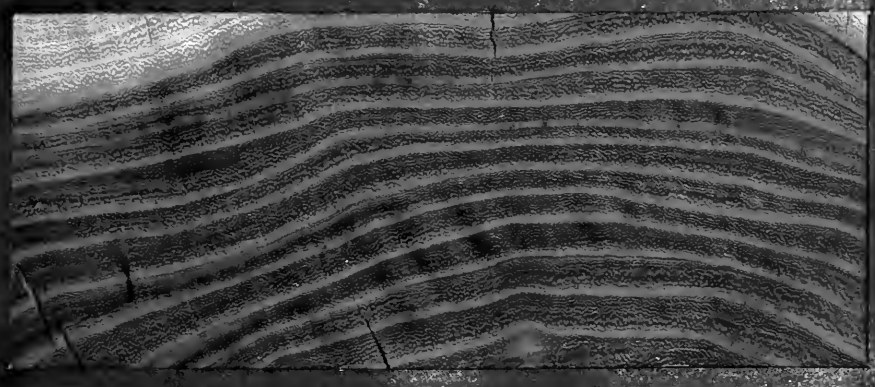
TANGENTIAL SECTION

Ger. Weisse Maulbeerbaum. Fr. Mûrier blanc.

Sp. Moris blanco.

1977 TOXYLON POMIFERUM Raf.

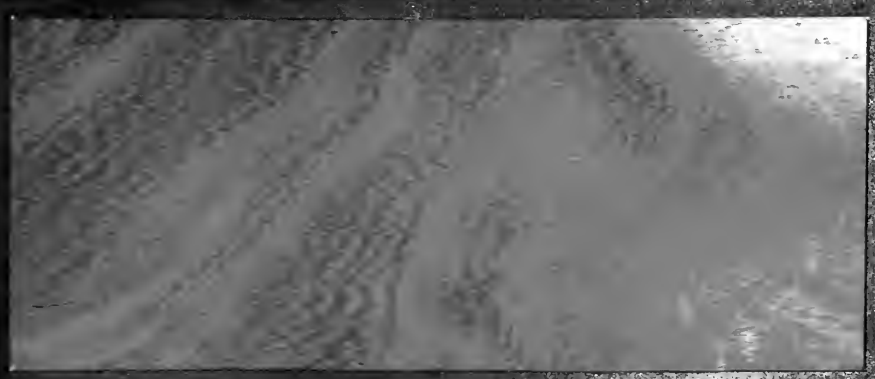
Orange Orange



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

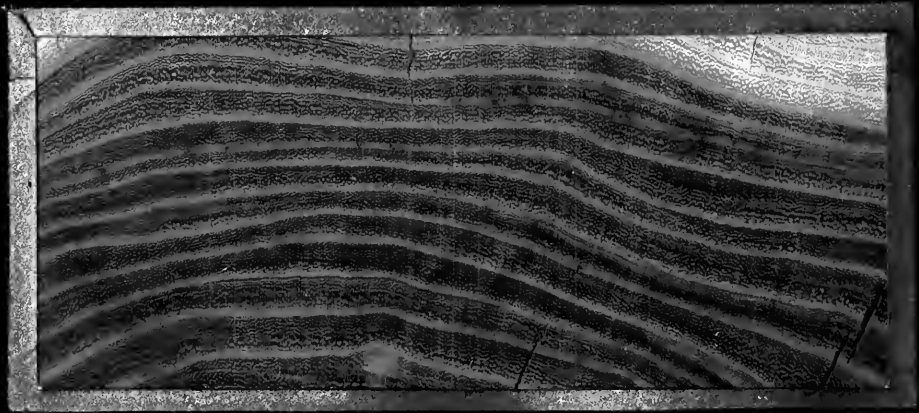
1881 Bogem Sols.

1885 Bois d'Arc.

1886 Mader de arco.

291. TOXYLON POMIFERUM RAF.

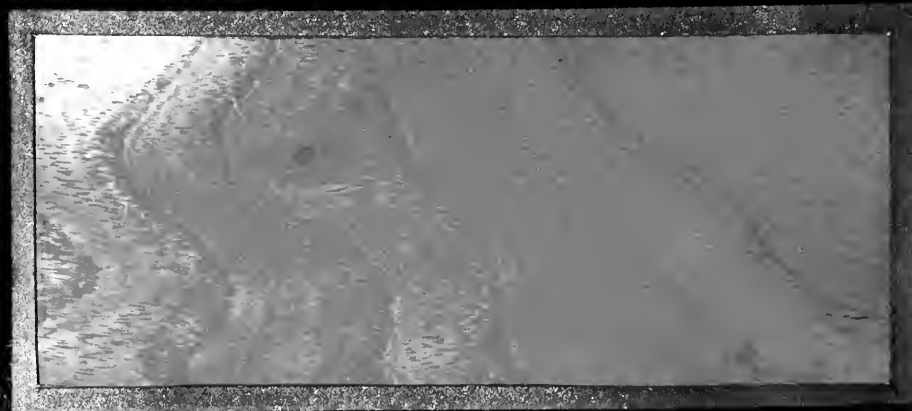
Osage Orange.



TRANSVERSE SECTION



RADIAL SECTION.



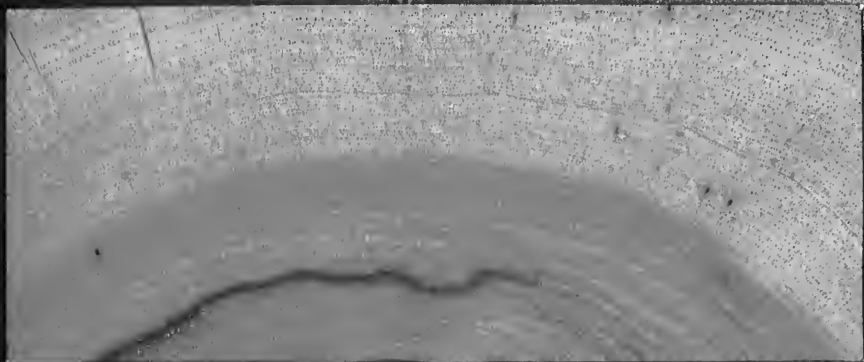
TANGENTIAL SECTION.

Ger. Bogen-Holz.

Fr. Bois d'Arc.

sp. Madera de arco.

Pale-leaf Hickory.



TRANSVERSE SECTION.



RADIAL SECTION



TANGENTIAL SECTION

1100. Zottige Hickory.

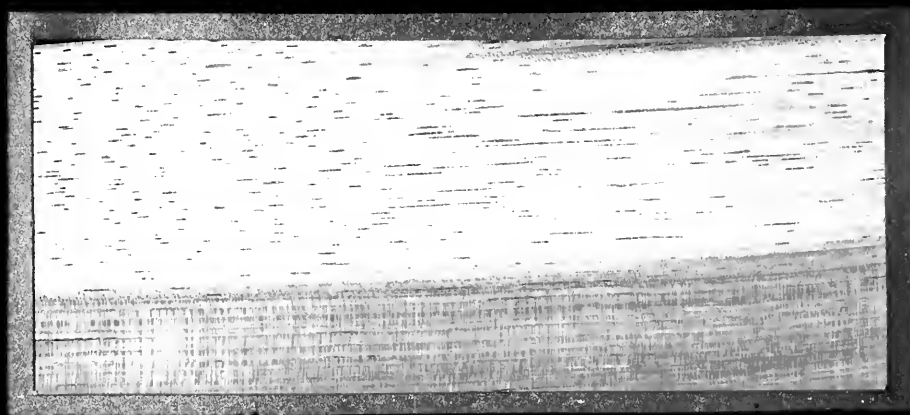
Fr. Noyer villosus.

36. Nogai velludo.

Pale-leaf Hickory.



TRANSVERSE SECTION



RADIAL SECTION.



TANGENTIAL SECTION.

*Ger.* Zottige Hickory.

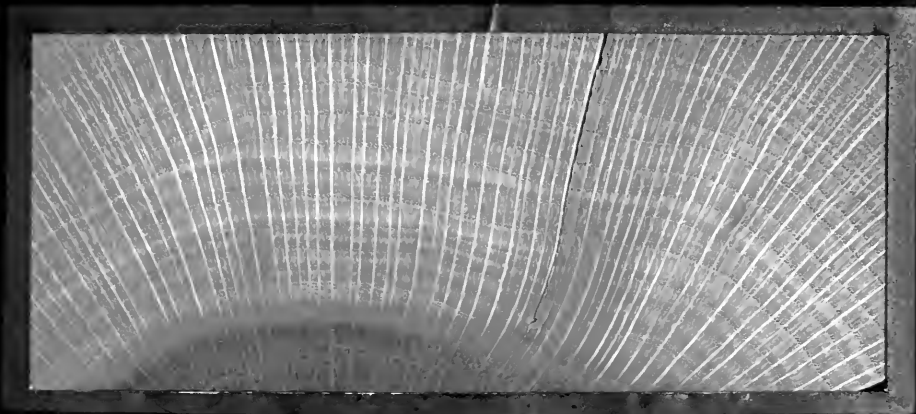
*Fr.* Noyer villosus.

*Sp.* Nogal velludo.



293 QUERCUS LYRATA WALT

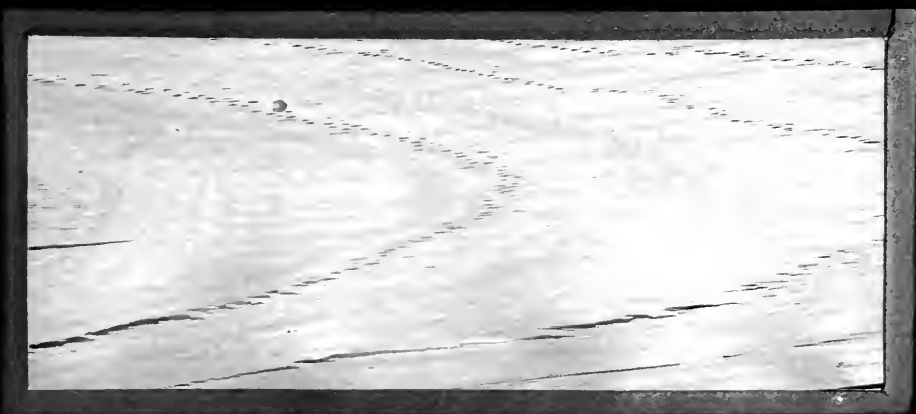
Live Cup Oak



TRANSVERSE SECTION



RADIAL SECTION



TANGENTIAL SECTION

Ger. Überkeich-Eiche Fr. Chêne lyré

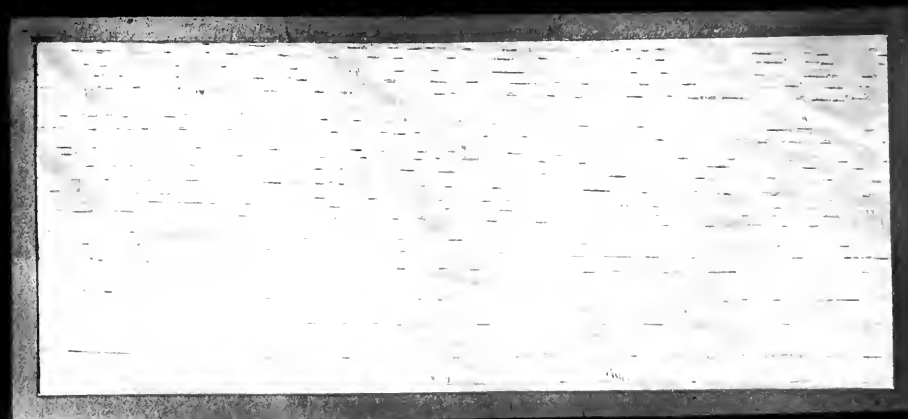
Sp. Roble de pantano.

293. QUERCUS LYRATA WALT

Over-cup Oak.



TRANSVERSE SECTION.



RADIAL SECTION

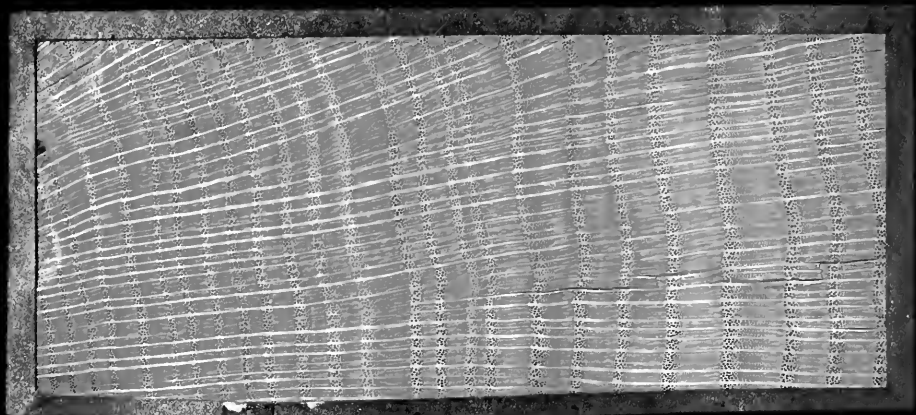


TANGENTIAL SECTION.

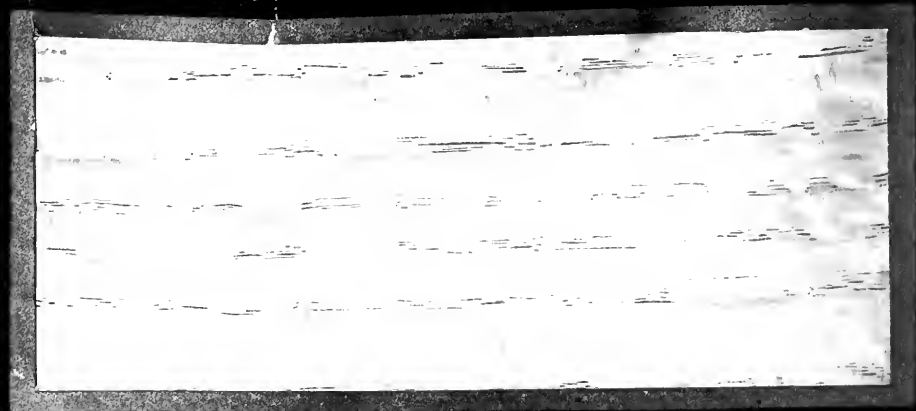
*Ger.* Überkelch-Eiche. *Fr.* Chêne lyre.

*Sp.* Roble de pantano.





TRANSVERSE SECTION

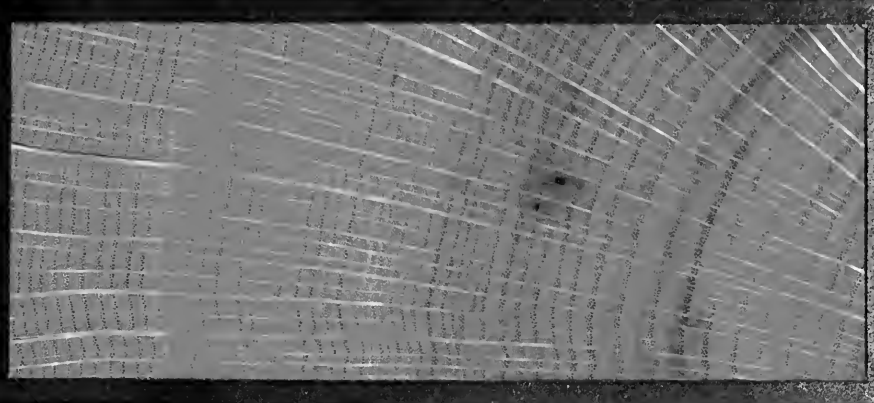


RADIAL SECTION



TANGENTIAL SECTION

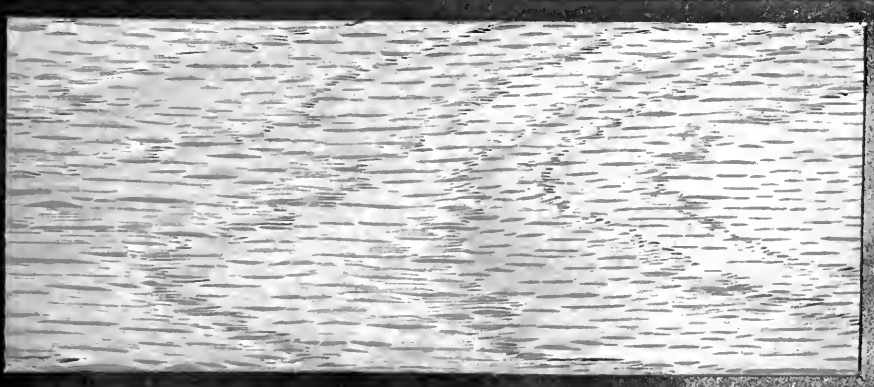
Ger. Südliche Rote Eiche. Fr. Chêne rouge du sud.  
Sp. Roble rojo meridional.



VERSE SECTION.

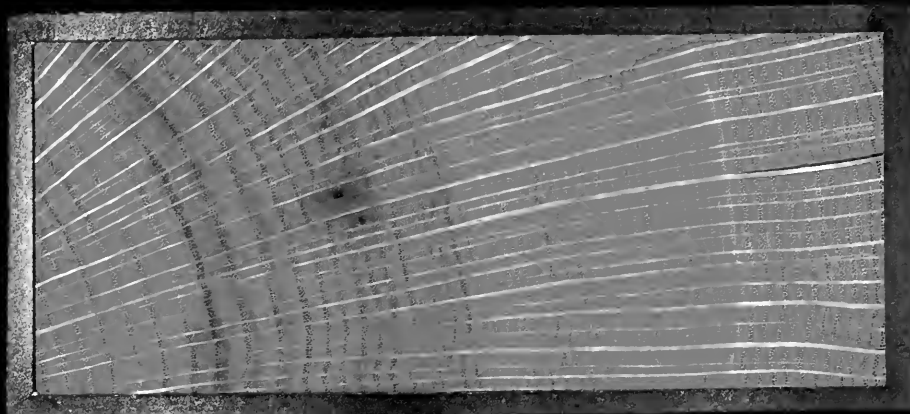


ORIGINAL SECTION

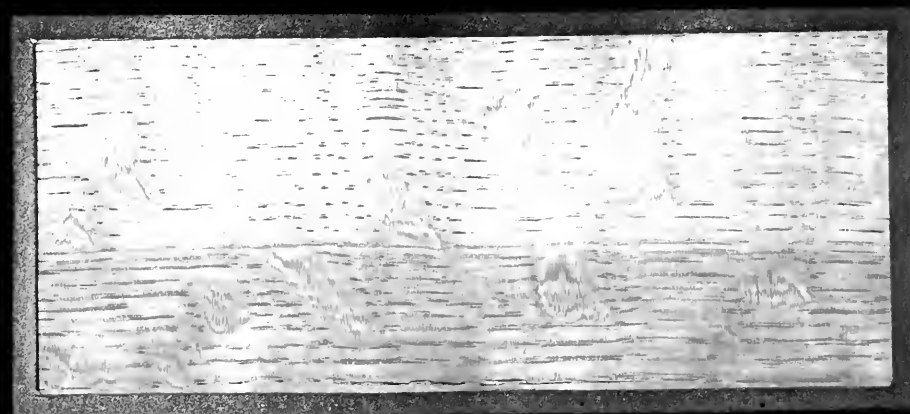


295. QUERCUS LAURIFOLIA Michx.

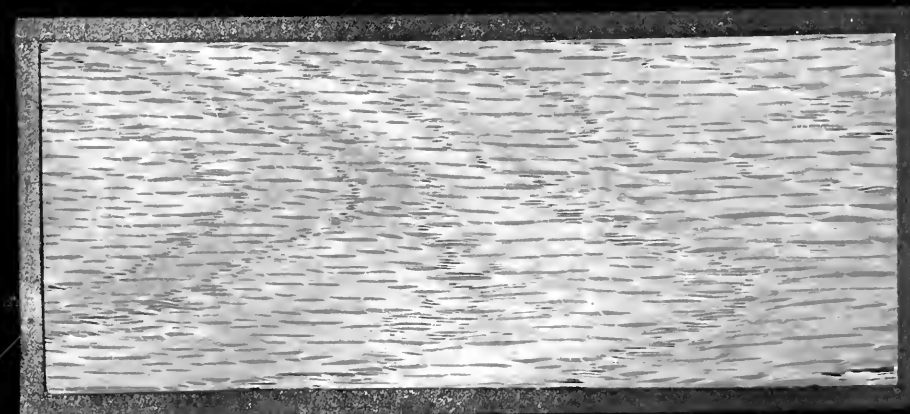
Laurel Oak



TRANSVERSE SECTION



RADIAL SECTION

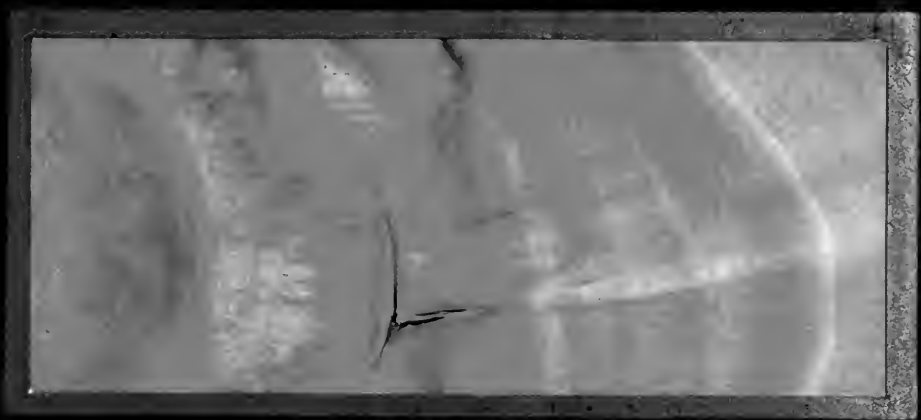


TANGENTIAL SECTION

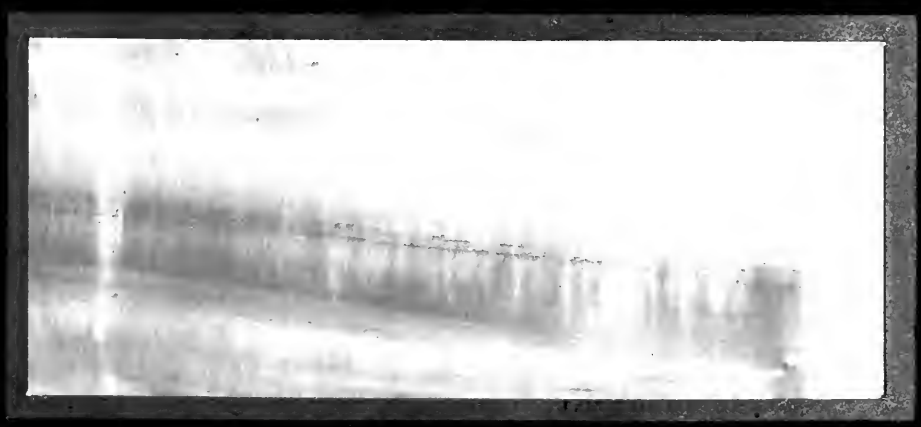
Ger. Lorbeer-Eiche. Fr. Chêne de laurier.

Sp. Roble de laurel.

Long-stalk Willow. Ward Willow.



TRANSVERSE SECTION



RADIAL SECTION.



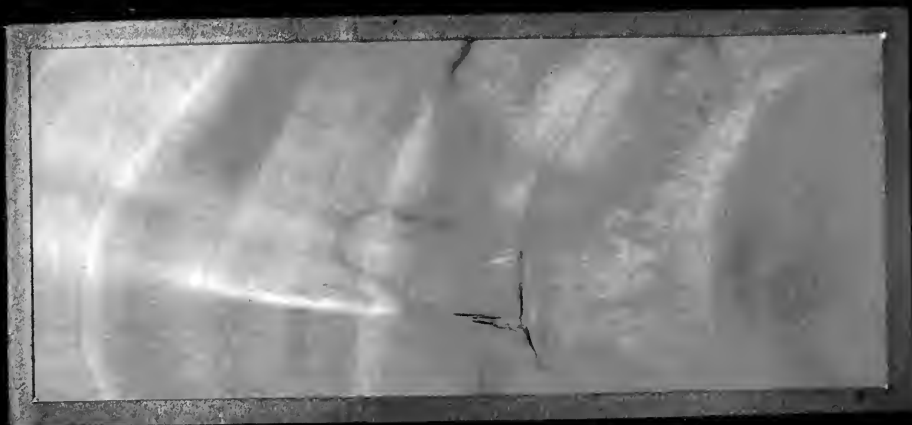
TANGENTIAL SECTION

985. L. c. Engel-Weide. Fr. Saule à tige long.

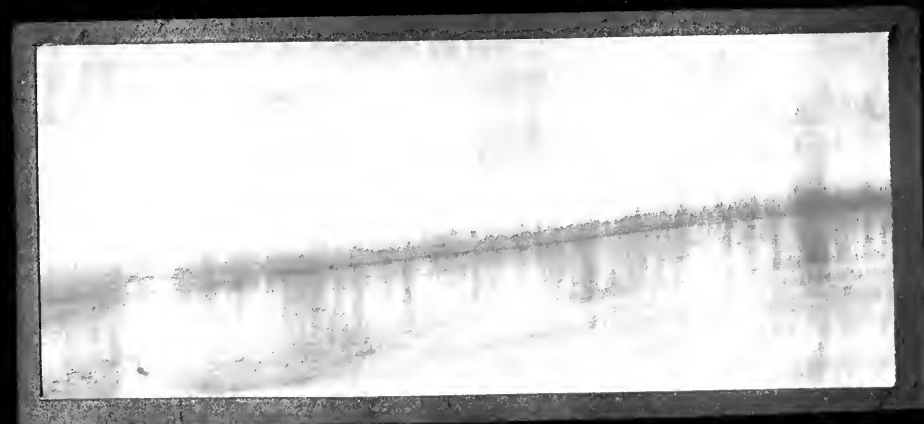
986. Sauce de tallo largo.

296. SALIX LONGIPES ANDREÆ.

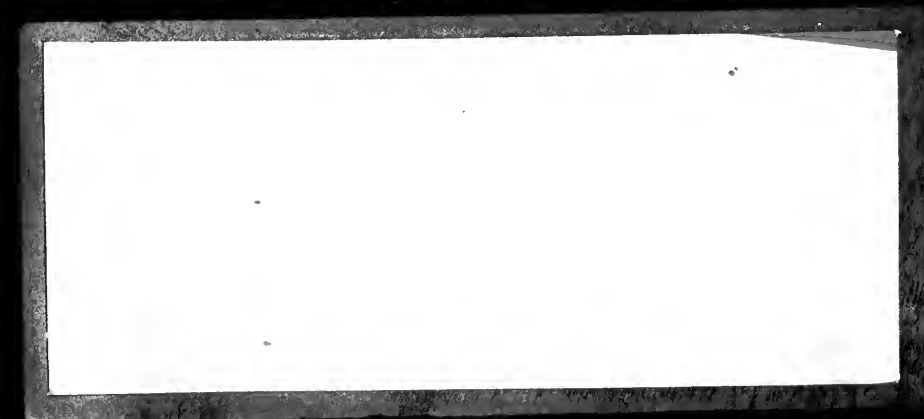
Long-stalk Willow. Ward Willow.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

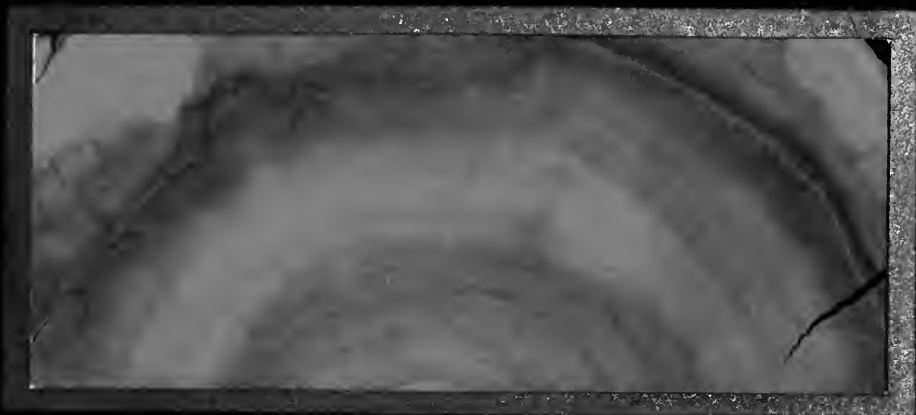
Ger. Langstengel-Weide.

Fr. Saule à tige long.

Sp. Sauce de tallo largo.



Missouri Willow.



TRANSVERSE SECTION



RADIAL SECTION



TANGENTIAL SECTION

Missouri Weide.

Fr. Saule de Missouri.

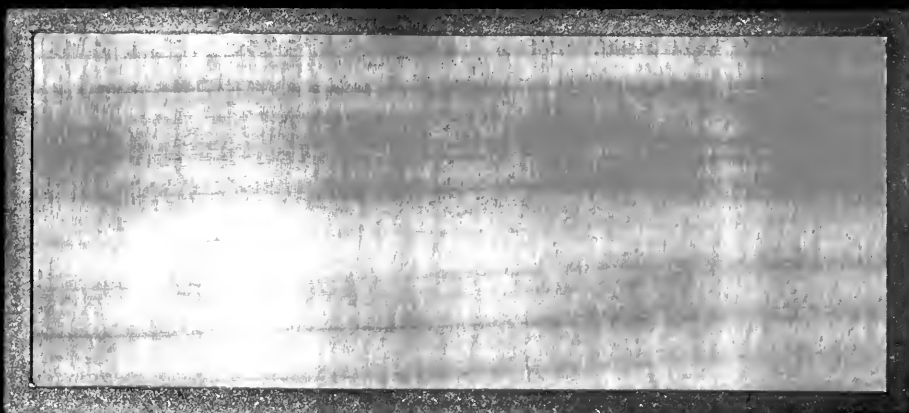
90 Saule de Missouri.

297. SALIX MISSOURIENSIS MICHX.

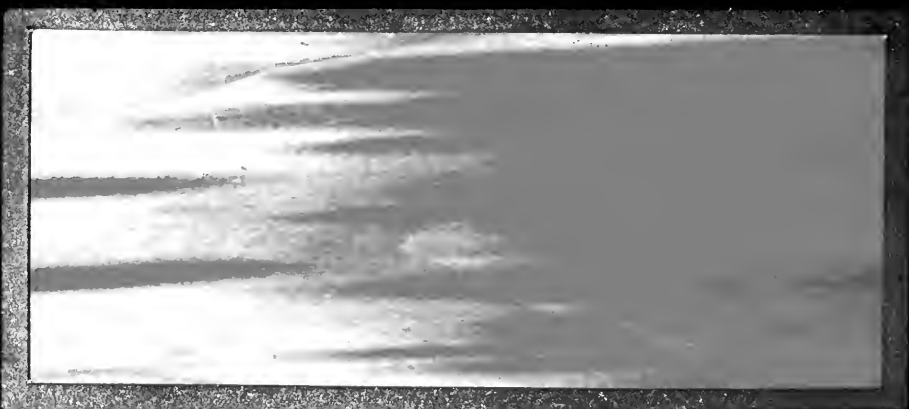
Missouri Willow.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Missouri Weide.

Fr. Saule de Missouri.

Sp. Sauce de Missouri.

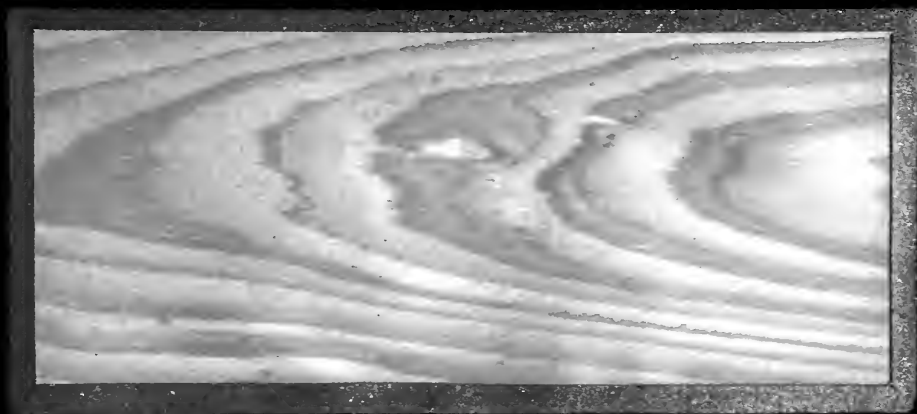
Table mountain Pine.



TRANSVERSE SECTION



RADIAL SECTION.



TANGENTIAL SECTION

*Det.* Tafelberg-Fichte.

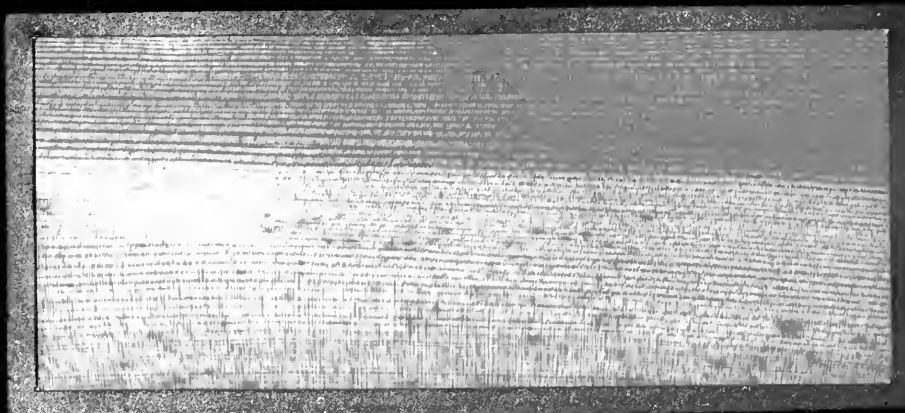
*Fr.* Pin de plateau.

*sp.* Pino de Mesa.

## Table-mountain Pine.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Tafelberg-Fichte.

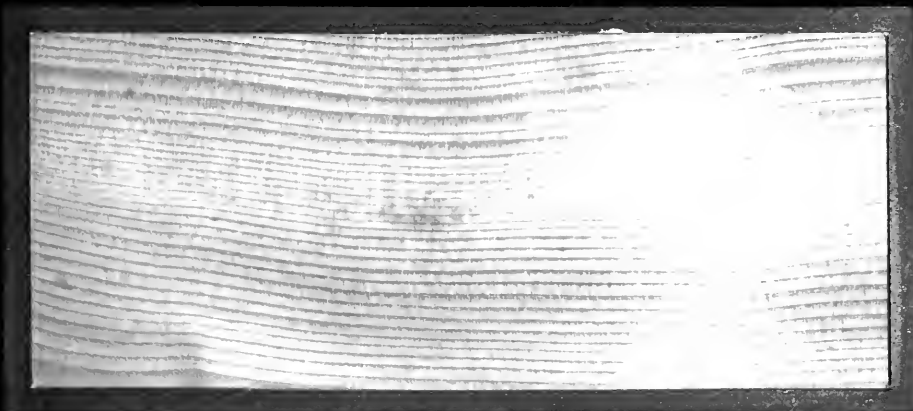
Fr. Pin de plateau.

Sp. Pino de Mesa.

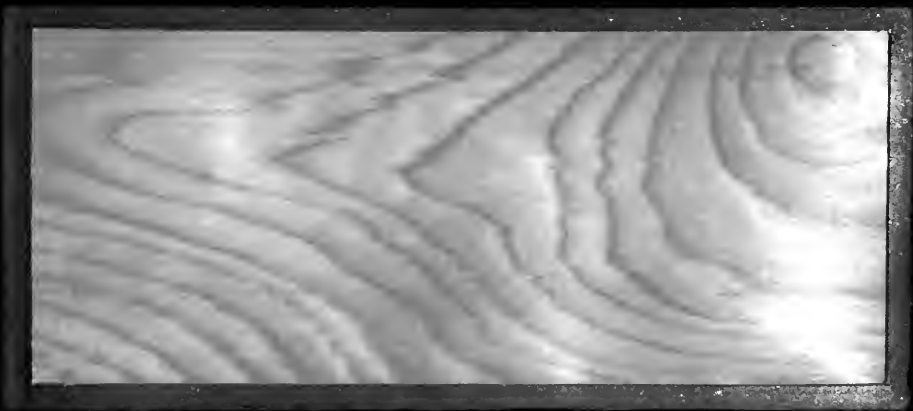
Carolina Hemlock.



TRANSVERSE SECTION.



RADIAL SECTION.



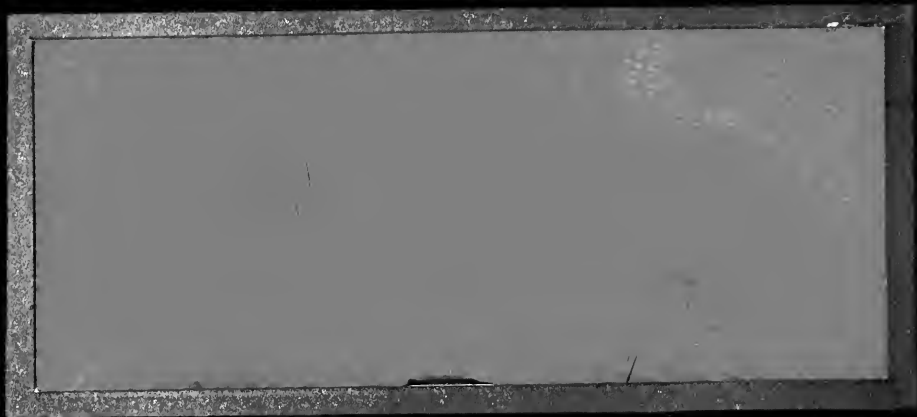
TANGENTIAL SECTION.

1900 Carolina Tanne.

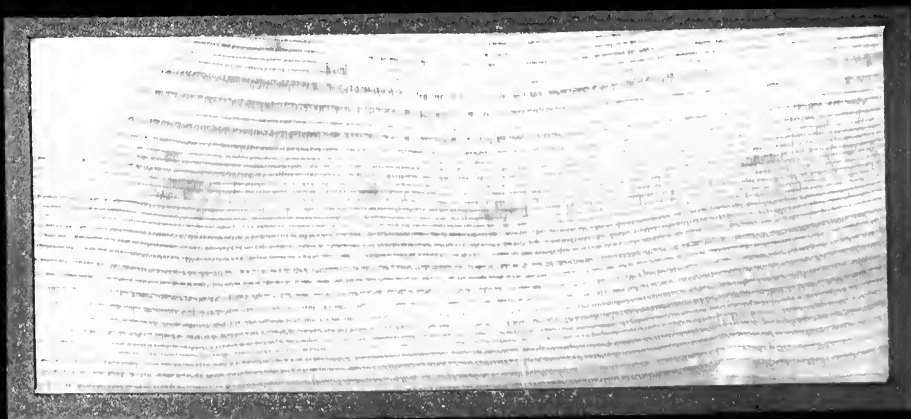
1917 Pruche de Caroline.

1926 Abeto de Carolina.

Carolina Hamlock.



TRANSVERSE SECTION.



RADIAL SECTION.



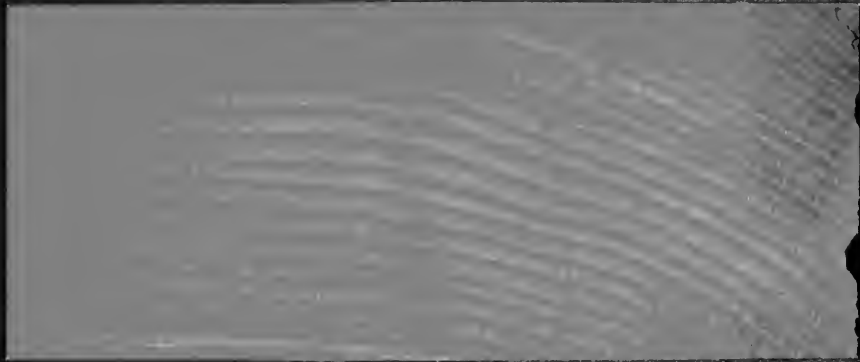
TANGENTIAL SECTION.

*Ger.* Carolina Tanne. *Fr.* Pruche de Caroline.

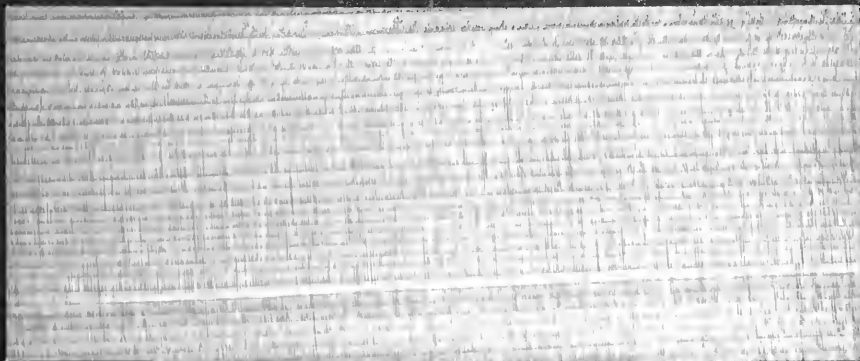
*Sp.* Abeto de Carolina.

# 300 ABIES FRASERI LINDL

## Fraser Fir



TANGENTIAL SECTION



RADIAL SECTION



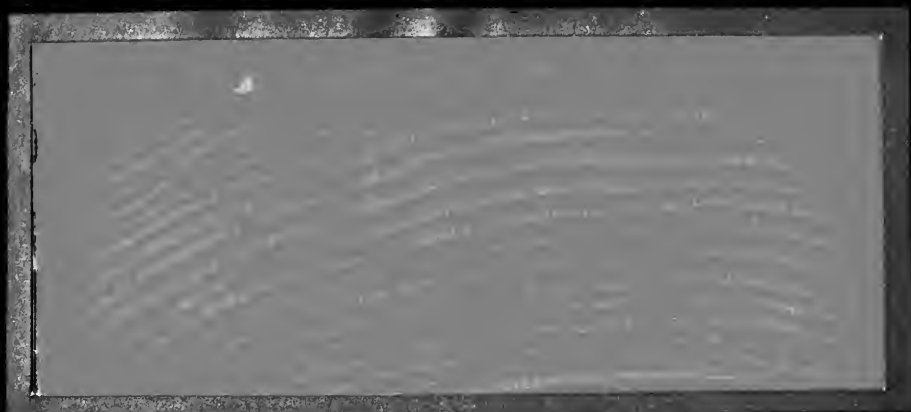
TANGENTIAL SECTION

1000x - Fraser Fir - Fr. Sapin de Fraser

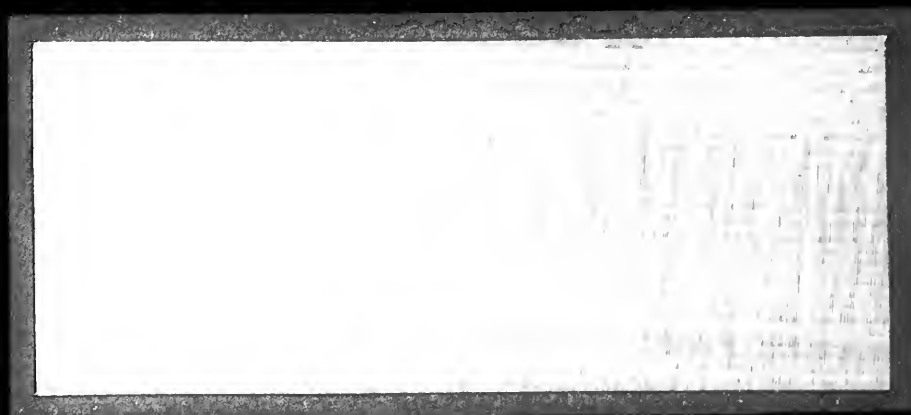
1000x - Abies de Fraser

300. ABIES FRASERI LINDL

Fraser Fir.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Fraser Tanne. Fr. Sapin de Fraser.

Sp. Abeto de Fraser.





