DEPARTMENT OF THE INTERIOR,
CENSUS OFFICE.

FRANCIS A. WALKER, Superintendent,
Appointed April 1, 1879; resigned November 3, 1881.

CHAS. W. SEATON, Superintendent,
Appointed November 4, 1881.

REPORT

ON THE

FORESTS OF NORTH AMERICA

(EXCLUSIVE OF MEXICO),

BY

CHARLES S. SARGENT,
ARNOLD PROFESSOR OF ARBORICULTURE IN HARVARD COLLEGE,
SPECIAL AGENT TENTH CENSUS.

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
CENSUS OFFICE,
Washington, D. C., September 1, 1884.

HON. H. M. TELLER,
Secretary of the Interior.

SIR: I have the honor to transmit herewith the Report on the Forests of North America (exclusive of Mexico), by Charles S. Sargent, Arnold Professor of Arboriculture in Harvard College.

This report constitutes the ninth volume of the series forming the final report on the Tenth Census.

I have the honor to be, most respectfully, your obedient servant,

CHAS. W. SEATON,
Superintendent of Census.

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LETTER OF TRANSMITTAL.

BROOKLINE, MASSACHUSETTS, *July* 1, 1883.

TO THE SUPERINTENDENT OF CENSUS.

SIR: I have the honor to submit the following report upon the nature and condition of the forests of the United States, to which are added statistics of the lumber and other industries directly dependent upon the forest for their support.

Mr. Andrew Robeson, of Brookline, Massachusetts, has prepared the maps which accompany this report; he has supervised the entire statistical work of this division and has conducted its correspondence.

Mr. Stephen P. Sharples, of Cambridge, Massachusetts, has conducted the various experiments undertaken with the view of determining the value of the different woods produced in the forests of the United States.

Mr. C. G. Pringle, of East Charlotte, Vermont, has examined the forests of northern New England and New York, Pennsylvania, and West Virginia; and subsequently, as an agent for the American Museum of Natural History, has greatly increased our knowledge of the trees of Arizona and southern California.

Mr. A. H. Curtiss, of Jacksonville, Florida, has studied the forests of Georgia and Florida, and subsequently, as an agent of the American Museum of Natural History, has added to our knowledge of the semi-tropical forests of southern Florida.

Dr. Charles Mohr, of Mobile, Alabama, has explored the forests of the Gulf states.

Mr. H. C. Putnam, of Eau Claire, Wisconsin, has gathered the forest statistics of Pennsylvania, Michigan, Wisconsin, and Minnesota.

Mr. George W. Letterman, of Allenton, Missouri, has examined the forests extending west of the Lower Mississippi River, and Professor F. L. Harvey, of Fayetteville, Arkansas, has gathered the forest statistics of that state.

Mr. Sereno Watson, of Cambridge, Massachusetts, has studied, during a long and arduous journey, the forests of the northern Rocky Mountain region, and Mr. Robert Douglas, of Waukegan, Illinois, those of the Black hills of Dakota.

I take this opportunity to call your attention to the faithful and admirable manner in which my associates have performed the difficult duties to which they were assigned; their zeal and intelligence have made possible the preparation of this report.

It is my pleasant duty also to call your attention to the fact that this investigation has been greatly aided from the first by the experience and knowledge of Messrs. G. M. Dawson, John Macoun, and Robert Bell, members of the Geological Survey of Canada; the information in regard to the distribution northward of the trees of the eastern United States is entirely derived from the latter's paper upon the Canadian forests, published in the Report of the Geological Survey of Canada for the years 1879–'80.

I am under special obligation to Dr. George Engelmann, of Saint Louis, Missouri, my companion in a long journey through the forests of the Pacific region, for valuable assistance and advice; his unrivaled knowledge of our oaks, pines, firs, and other trees has been lavishly placed at my disposal.

Mr. M. S. Bebb, of Rockford, Illinois, the highest American authority upon the willow, has given me the benefit of his critical advice in the study of this difficult genus. I desire to express to him and to Dr. Laurence Johnson, of New York, who has furnished me with a full series of notes upon the medical properties of the trees of the United States, the deep sense of my obligation. My thanks are also due to Mr. Henry Gannett, Geographer of the Tenth Census, for cordial co-operation in the work of this division; to Colonel T. T. S. Laidley, of the United States army, in command of the arsenal at Watertown, Massachusetts, and to Mr. James E. Howard, in charge of the testing machine there, for advice and assistance afforded Mr. Sharples while conducting the experiments upon the strength of woods, as well as to a large number of correspondents in all parts of the United States who have favored me with their cordial co-operation.

I am, sir, your obedient servant,

CHARLES S. SARGENT,
Special Agent.

PART I.

THE FOREST TREES OF NORTH AMERICA,

EXCLUSIVE OF MEXICO.

THE FORESTS OF NORTH AMERICA.

GENERAL REMARKS.

The North American continent, or that part of it situated north of Mexico, which will alone be considered here, may be conveniently divided, with reference to its forest geography, into the Atlantic and the Pacific regions, by a line following the eastern base of the Rocky mountains and its outlying eastern ranges from the Arctic circle to the Rio Grande. The forests which cover these two divisions of the continent differ as widely, in natural features, composition, and distribution, as the climate and topography of eastern America differ from the climate and topography of the Pacific slope. The causes which have produced the dissimilar composition of these two forests must be sought in the climatic conditions of a geological era earlier than our own and in the actual topographical formation of the continent; they need not be discussed here.

The forests of the Atlantic and the Pacific regions, dissimilar in composition in the central part of the continent, are united at the north by a broad belt of subarctic forests extending across the continent north of the fiftieth degree of latitude. One-half of the species of which this northern forest is composed extends from the Atlantic to the Pacific; and its general features, although differing east and west of the continental divide, in conformity with the climatic conditions peculiar to the Atlantic and the Pacific sides of the continent, still possess considerable uniformity. The forests of the Atlantic and the Pacific regions are also united at the south by a narrow strip of the flora peculiar to the plateau of northern Mexico, here extending northward into the United States. Certain characteristic species of this flora extend from the gulf of Mexico to the shores of the Pacific, and while the peculiar features of the eastern and the western slopes of the interior mountain system of the continent are still maintained here, the Atlantic and the Pacific regions of the Mexican forest belt possess many general features in common. Typical North American species, moreover, peculiar to the forests of the Atlantic or of the Pacific, mingle upon the Black hills of Dakota, and upon the Guadalupe and other mountains of western Texas, the extreme eastern ridges of the Rocky Mountain range, and the outposts between the Atlantic and the Pacific regions.

THE ATLANTIC REGION.

The forests of the Atlantic region may be considered under six natural divisions: the Northern Forest, the Northern Pine Belt, the Southern Maritime Pine Belt, the Deciduous Forest of the Mississippi Basin and the Atlantic Plain, the Semi-tropical Forest of Florida, and the Mexican Forest of Southern Texas (Map No. 2, portfolio).

These natural divisions, although composed in part of species found in other divisions and possessing many general features in common, are still for the most part well characterized by predominant species or groups of species, making such a separation natural and convenient.

The *Northern Forest* stretches along the northern shores of Labrador nearly to the sixtieth degree of north latitude, sweeps to the south of Hudson bay, and then northwestward to within the Arctic circle. This Northern Forest extends southward to the fiftieth degree of north latitude on the Atlantic coast, and nearly to the fifty-fourth degree at the 100th meridian. It occupies 10 degrees of latitude upon the Atlantic sea-board and nearly 20 degrees in its greatest extension north and south along the eastern base of the Rocky mountains. The region occupied by this Northern Forest, except toward its southwestern limits, enjoys a copious rainfall; it is divided by innumerable streams and lakes, and abounds in swampy areas often of great extent. The nature of the surface and the low annual mean temperature check the spread of forest growth and reduce the number of arborescent species, of which this forest is composed, to eight; of these, four cross to the Pacific coast, while the remainder, with a single exception, are replaced west of the continental divide by closely allied forms of the Pacific forest. The white and the black spruces are characteristic trees of this region; they form an open, stunted forest upon the low divides of the water sheds, and reach a higher latitude than any other arborescent species of the continent; the valleys and wide bottoms are clothed with broad sheets of poplars, dwarf birches, and willows. The forest of this entire region is scattered, open, stunted, and of no great economic value. It embraces, south of the sixtieth degree of north latitude, the northern extension of the great midcontinental plateau, which will be considered hereafter.

South of the Northern Forest the *Northern Pine Belt* extends from the Atlantic coast to the ninety-sixth meridian of longitude; east of the Apalachian Mountain system it extends south over nearly 6 degrees of latitude, with a long, narrow spur following the higher Alleghany ridges for nearly 3 degrees farther south; west of the Alleghany mountains, in the region of the great lakes, the pine forest is replaced south of the forty-third degree of latitude by the deciduous growth of the Mississippi basin. This second division of the Atlantic forest may be characterized by the white pine (*Pinus Strobus*), its most important, if not its most generally-distributed, species. East of the Apalachian system this tree often forms extensive forests upon the gravelly drift plain of the Saint Lawrence basin, or farther south and west appears in isolated groves, often of considerable extent, scattered through the deciduous forest. Forests of black spruce are still an important feature of this region, especially at the north, and within its boundaries the hemlock, the yellow cedar, the basswood, the black and the white ash, the sugar maple, and several species of birch and elm find their northern limits and the center of their most important distribution. The hickories and the oaks, characteristic features of the deciduous forests of all the central portion of the Atlantic region, reach here the northern limits of their distribution, as do the chestnut, the sassafras, the tulip tree, the magnolia, here represented by a single species, the red cedar, the tupelo, the sycamore, the beech, and other important genera.

The *Southern Maritime Pine Belt* extends from the thirty-sixth degree of north latitude along the coast in a narrow belt, varying from one hundred to two hundred miles in width, as far south as cape Malabar and Tampa bay; it stretches across the Florida peninsula and along the coast of the gulf of Mexico until the alluvial deposits of the Mississippi are encountered; it reappears west of that river in Louisiana, north and south of the Red river, and here gradually mingles with the deciduous forests of the Mississippi basin in Arkansas and eastern Texas. This belt is well characterized by the almost continuous growth, outside of the broad river bottoms and the immediate neighborhood of the coast, by the open forest of the long-leaved pine (*P. palustris*). The live oak, the palmetto, and various species of pine characterize the coast forest of this region; through the river bottoms and along the borders of the shallow ponds, scattered through the pine forest, different gums, water oaks, hickories, and ashes attain noble dimensions. The southern cypress (*Taxodium*), although extending far beyond the limits of this natural division, here attains its greatest development and value, and, next to the long-leaved pine, may be considered the characteristic species of the maritime pine belt.

The *Deciduous Forest of the Mississippi Basin and the Atlantic Plain* occupies, with two unimportant exceptions to be considered hereafter, the remainder of the Atlantic region. Through this deciduous forest, where peculiar geological features have favored the growth of *Coniferæ*, belts of pine, growing gregariously or mixed with oaks and other broad-leaved trees, occur, especially upon some portions of the Atlantic plain and toward the limits of the Southern Maritime Pine Belt, west of the Mississippi river. The characteristic features of the forest of this whole region are found, however, in the broad-leaved species of which it is largely composed. Oaks, hickories, walnuts, magnolias, and ashes give variety and value to this forest, and here, with the exception of a few species peculiar to a more northern latitude, the deciduous trees of the Atlantic region attain their greatest development and value. Upon the slopes of the southern Alleghany mountains and in the valley of the lower Red river, regions of copious rainfall and rich soil, the deciduous forest of the continent attains unsurpassed variety and richness. Upon the Alleghany mountains northern and southern species are mingled, or are only separated by the altitude of these mountains; rhododendrons, laurels, and magnolias, here attaining their maximum development, enliven the forests of northern pines and hemlocks which clothe the flanks of these mountains or are scattered through forests of other broad-leaved species. The cherry, the tulip tree, and the chestnut here reach a size unknown in other parts of the country. The forest of the Red River valley is hardly less varied. The northern species which the elevation of the Alleghany mountains has carried south are wanting, but other species peculiar to the southern Atlantic and Gulf coasts are here mingled with plants of the southern deciduous forest. The seven species of *Carya* (the hickories) are nowhere else closely associated. A great variety of the most important oaks grow here side by side; here is the center of distribution of the North American hawthorns, which do not elsewhere attain such size and beauty. The osage orange is peculiar to this region; the red cedar, the most widely distributed of American *Coniferæ*, the southern and the yellow pine (*Pinus palustris* and *mitis*) here reach their best development. Just outside of this region, upon the "bluff" formation of the lower Mississippi valley and of western Louisiana, the stately southern magnolia, perhaps the most beautiful of the North American trees, and the beech assume their greatest beauty, and give a peculiar charm to this southern forest.

The western third of the Atlantic region is subjected to very different climatic conditions from those prevailing in the eastern portion of the continent; it consists of an elevated plateau which falls away from the eastern base of the Rocky mountains, forming what is known as the Great Plains. This great interior region, on account of its remoteness from natural reservoirs of moisture, receives a meager and uncertain rainfall, sufficient to insure a growth of herbage, but not sufficient to support, outside the narrow bottoms of the infrequent streams, the scantiest forests. This treeless plateau extends north to the fifty-second degree of north latitude; it follows southward the trend of the Rocky mountains far into Mexico, extending eastward at the point of its greatest width, in about latitude 40° N., nearly to the ninety-seventh meridian. This whole region is generally destitute of forest. The narrow bottoms of the large streams are lined, however, with willows, poplars, elms, and hackberries, trees adapted to flourish under such unfavorable conditions. These diminish in size and number with the rainfall, and often disappear entirely from the banks of even the largest streams toward the western limits of the plateau, south of the forty-fifth degree of latitude. North and east of these central treeless plains a belt of prairie extends from the sixtieth degree of north latitude to southern Texas. The average width east and west of this prairie region, through much of its extent, is not far from 150 miles. Its eastern extension, between the fortieth and forty-fifth degrees of latitude, is much greater, however, here reaching the western shores of lake Michigan, and forming a great recess in the western line of the heavy forest of the Atlantic region with a depth of nearly 600 miles. The transition from the heavy forest of the eastern and central portions of the Atlantic region to the treeless plateau is gradual. The change occurs within the prairie region. Here is the strip of debatable ground where a continuous struggle between the forest and the plain takes place. There is here sufficient precipitation of moisture to cause, under normal conditions, a growth of open forest, but so nicely balanced is the struggle that any interference quickly turns the scale. Trees planted within this prairie belt thrive if protected from fire and the encroachment of the tough prairie sod, and so extend the forest line westward; if the forest which fringes the eastern edge of the prairie is destroyed it does not soon regain possession of the soil, and the prairie is gradually pushed eastward.

The eastern line of the plain where arborescent vegetation is confined to the river bottoms, and which divides it from the prairie where trees grow naturally, to some extent, outside of the bottoms, and where they may be made to grow under favorable conditions everywhere, is determined by the rainfall enjoyed by this part of the continent. The extreme eastern point reached by this line is found, upon the fortieth degree of north latitude, near the northern boundary of the state of Kansas. North of the fortieth degree it gradually trends to the west, reaching the eastern base of the Rocky mountains in about latitude 52°. This northwestern trend of the eastern plain line may be ascribed to the comparatively small evaporation which takes place during the shorter summer of the north and to a slight local increase of spring and summer rainfall. South of the fortieth degree the plain line gradually trends to the southwest under the influence of the gulf of Mexico, reaching its extreme western point in Texas upon the one hundredth meridian.

Other causes, however, than insufficient rainfall and a nicely balanced struggle between the forest and the plain have prevented the general growth of trees in the prairie region east of the ninety-fifth meridian. The rainfall of this region is sufficient to insure the growth of a heavy forest. The rain falling upon the prairies of Minnesota, Wisconsin, Iowa, Illinois, and Missouri equals in amount that enjoyed by the Michigan peninsula and the whole region south of lakes Ontario and Erie, while prairies exist within the region of the heaviest forest growth. It is not want of sufficient heat, or of sufficient or equally distributed moisture, which has checked the general spread of forest over these prairies. The soil of which the prairies are composed, as is shown by the fact that trees planted upon them grow with vigor and rapidity, is not unsuited to tree growth. It is not perhaps improbable that the forests of the Atlantic region once extended continuously as far west at least as the ninety-fifth meridian, although circumstantial evidence of such a theory does not exist; and the causes which first led to the destruction of the forests in this region, supposing that they ever existed, cannot with the present knowledge of the subject be even guessed at. It is, however, fair to assume that forests once existed in a region adapted, by climate, rainfall, and soil, to produce forests, and that their absence under such conditions must be traced to accidental causes. It is not difficult to understand that the forest once destroyed over such a vast area could not easily regain possession of the soil protected by an impenetrable covering of sod and subjected to the annual burnings which have occurred down to the present time; while the force of the wind, unchecked by any forest barrier, over such an area would, even without the aid of fires, have made the spread of forest growth slow and difficult. The assumption that these eastern prairies may have once been covered with forests is strengthened by the fact that since they have been devoted to agriculture, and the annual burning has been stopped, trees which were formerly confined to the river bottoms have gradually spread to the uplands. Small prairies situated just within the western edge of the forest have entirely disappeared within the memory of persons still living; the oak openings—open forests of large oaks through which the annual fires played without greatly injuring the full-grown trees—once the characteristic feature of these prairies, have disappeared. They are replaced by dense forests of oak, which only require protection from fire to spring into existence. In western Texas, the mesquit, forced by annual burning to grow almost entirely below the surface of the ground, is, now that prairie fires are less common and destructive, spreading over what a few years ago was treeless prairie. The prairies, then, or the eastern portions of them situated in the region of abundant rainfall, are fast losing their treeless character, and the forest protected from fire is gradually gaining in every direction; regions which fifty years ago were treeless outside the river bottoms now contain forests covering 10 or even 20 per cent. of their area. These eastern, well-watered prairies must not, however, be confounded with their dry western rim adjoining the plains—the debatable ground between forest and plain—or with the plains themselves. There is now no gradual, constant spread of forest growth upon the plains. They are treeless, on account of insufficient moisture to develop forest growth; and while trees may, perhaps, if planted, survive during a few years beyond the western limits of the prairie as here laid down, the permanent establishment of forests there does not seem practicable, and, sooner or later, a period of unusual drought must put an end to all attempts at forest cultivation in a region of such insufficient and uncertain rainfall (Map No. 1, portfolio).

It remains to consider the *Semi-tropical Forest of Florida* and the *Mexican Forest of Southern Texas.*

A group of arborescent species of West Indian origin occupies the narrow strip of coast and islands of southern Florida. This belt of semi-tropical vegetation is confined to the immediate neighborhood of the coast and to occasional hummocks or islands of high ground situated in the savannas which cover a great portion of southern Florida, checking, by the nature of the soil and want of drainage, the spread of forest growth across the peninsula. This semi-tropical forest belt reaches cape Malabar on the east and the shores of Tampa bay on the west coast, while some of its representatives extend fully 2 degrees farther north. It is rich in composition; nearly a quarter of all the arborescent species of the Atlantic forest are found within this insignificant region. The semi-tropical forest, in spite of its variety, is of little economic importance. The species of which it is composed here reach the extreme northern limit of their distribution; they are generally small, stunted, and of comparatively little value. Certain species, however, attain respectable proportions; the mahogany, the mastic, the royal palm, the mangrove, the sea-grape, the Jamaica dogwood, the manchineel, and other species here become considerable and important trees.

In western and southern Texas the trees of the Mississippi basin, checked by insufficient moisture from farther extension southward outside the river bottoms, are replaced by species of the plateau of northern Mexico. The streams flowing into the gulf of Mexico are still lined, however, east of the one-hundredth meridian, with the species of the Atlantic basin, which thus reach southward to beyond the Rio Grande. The Mexican forest belt of Texas extends from the valley of the Colorado river, near the ninety-eighth meridian, to the Rio Grande. It touches the coast not far from the Nueces river and extends to the eastern base of the mountain ranges west of the Pecos; here the species of which it is composed mingle with those peculiar to the Pacific-Mexican forest. The forest of this region, like that of all countries of insufficient moisture, is open, stunted, and comparatively of little value. It is characterized by enormous areas covered with chaparral (dense and often impenetrable thickets of thorny shrubs and small trees), by a stunted and occasional arborescent growth upon the hills and plains, and by fringes of heavier timber along the river bottoms. The most valuable and perhaps the most characteristic species of this whole region, the mesquit, extends to the Pacific coast. With this exception, none of the arborescent species peculiar to this region attain any considerable size or importance, although the forest of small junipers which covers the low limestone hills of the Colorado valley are locally valuable in a country so generally destitute of trees. The region immediately adjoining the Rio Grande abounds in different species of *Acacia*, *Leucæna*, and other Mexican *Leguminosæ;* and farther west, upon the dry plains of the Presidio, the Spanish bayonet (*Yucca baccata*) covers wide areas with a low, open, and characteristic forest growth.

THE PACIFIC REGION.

The Pacific forest region is coextensive with the great Cordilleran Mountain system of the continent. The causes which have influenced the present position and density of these forests must be sought in the peculiar distribution of the rainfall of the region. The precipitation of moisture upon the northwest coast is unequaled by that of any other part of the continent. It gradually decreases with the latitude until, in southern California, the temperature of the land so far exceeds that of the ocean that precipitation is impossible through a large part of the year. The interior of all this great region, shut off by the high mountain ranges which face the ocean along its entire extent, is very imperfectly supplied with moisture. It is a region of light, uncertain, and unequally distributed rainfall, heavier at the north, as upon the coast, and decreasing gradually with the latitude in nearly the same proportion. This entire region is composed of a mass of mountain ranges with a general north and south trend, separating long and generally narrow valleys. The precipitation of moisture within the interior region is largely regulated by the position of the mountain chains. Warm currents ascending their sides become cold and are forced to deposit the moisture they contain. It follows that, while the interior valleys are rainless or nearly so, the mountain ranges, and especially the high ones, receive during the year a considerable precipitation of both rain and snow. If the distribution of the forests of any region is dependent upon the distribution and amount of moisture it receives, forests exceeding in density those of any other part of the continent would be found upon the northwest coast; they would gradually diminish toward the south, and entirely disappear near the southern boundary of the United States, while the forests of all the interior region, from the summit of the principal Coast Ranges to the eastern base of the Rocky mountains, would be confined to the flanks and summits of the mountains. These forests would be heavy upon the high ranges, especially toward the north; they would disappear entirely from the valleys and low mountain ranges. An examination of the forests of the Pacific region will show that in general distribution and density they actually follow the distribution of the rainfall of the region. These forests well illustrate the influence of moisture upon forest growth. Within the Pacific region the heaviest and the lightest forests of the continent coexist with its heaviest and lightest rainfall.

The forests of the Pacific region may be considered under four divisions: the Northern Forest, the Coast Forest, the Interior Forest, and the Mexican Forest (Map No. 2, portfolio).

The *Northern Forest* of the Pacific region extends from nearly the seventieth to about the fifty-eighth degree of north latitude, or, immediately upon the coast, is replaced by the Coast Forest nearly 2 degrees farther north; it extends from the continental divide, here mingled with the Northern Forest of the Atlantic region, to the shores of the Pacific. The southern limit of this open, scanty Northern Forest, composed of species which extend across the continent, or of species closely allied to those of the Northern Forest of the Atlantic region, is still imperfectly known, especially in the interior. The determination of the southern range in Alaska and British Columbia of several species, as well as the northern range here of a few others, must still be left to further exploration. The white spruce, the most important and the most northern species of the forest of the North Atlantic region, is here also the most important species. It attains a considerable size as far north as the sixty-fifth degree, forming, in the valley of the Yukon, forests of no little local importance. The canoe-birch, the balsam poplar, and the aspen, familiar trees of the North Atlantic region, also occur here. The gray pine and the balsam fir of the Atlantic region are replaced by allied forms of the same genera. The larch alone, of the denizens of the extreme Northern Forest of the Atlantic coast, finds no congener here in the northern Pacific forest.

The Pacific *Coast Forest*, the heaviest, although far from the most varied, forest of the continent, extends south along the coast in a narrow strip from the sixtieth to the fiftieth parallel; here it widens, embracing the shores of Puget sound and extending eastward over the high mountain ranges north and south of the boundary of the United States. This interior development of the Coast Forest, following the abundant rainfall of the region, is carried northward over the Gold, Selkirk, and other interior ranges of British Columbia in a narrow spur extending north nearly to the fifty-fourth parallel. It reaches southward along the Cœur d'Alêne, Bitter-Root, and the western ranges of the Rocky Mountain system to about latitude 47° 30′, covering northern Washington territory, Idaho, and portions of western Montana.

The Coast Forest south of the fiftieth degree of latitude occupies the region between the ocean and the eastern slopes of the Cascade Range; in California the summits of the principal southern prolongation of these mountains, the Sierra Nevada, marks the eastern limits of the Coast Forest, which gradually disappears south of the thirty-fifth parallel, although still carried by the high ridges of the southern Coast Range nearly to the southern boundary of the United States. The Coast Forest, like the forests of the whole Pacific region, is largely composed of a few coniferous species, generally of wide distribution. The absence of broad-leaved trees in the Pacific region is striking; they nowhere form great forests as in the Atlantic region; when they occur they are confined to the valleys of the coast and to the banks of mountain streams, and, economically, are of comparatively little value or importance. The characteristic and most valuable species of the northern Coast Forest are the Alaska cedar (*Chamæcyparis*), the tide-land spruce, and the hemlock. These form the principal forest growth which covers the ranges and islands of the coast between the sixty-first and the fiftieth parallels. Other species of the Coast Forest reach here the northern limits of their distribution, although the center of their greatest development is found farther south.

The red fir (*Pseudotsuga*), the most important and widely-distributed timber tree of the Pacific region, reaches the coast archipelago in latitude 51°; farther inland it extends fully 4 degrees farther north, and in the region of Puget sound and through the Coast Forest of Washington territory and Oregon it is the prevailing forest tree. The characteristic forest of the northwest coast, although represented by several species extending south as far as cape Mendicino, near the fortieth parallel, is replaced south of the Rogue River valley by a forest in which forms peculiar to the south rather than to the north gradually predominate. The forest of the northwest coast reaches its greatest density and variety in the narrow region between the summits of the Cascade Range and the ocean. North of the fifty-first parallel it gradually decreases in density, and south of the forty-third parallel it changes in composition and character. This belt of Coast Forest is only surpassed in density by that of some portions of the redwood forest of the California coast. The red fir, the great tide-land spruce, the hemlock, and the red cedar (*Thuya*) reach here enormous dimensions. The wide river bottoms are lined with a heavy growth of maple, cottonwood, ash, and alder, the narrow interior valley with an open growth of oak. In this great coniferous forest the trunks of trees two or three hundred feet in height are often only separated by the space of a few feet. The ground, shaded throughout the year by the impenetrable canopy of the forest, never becomes dry; it is densely covered by a thick carpet of mosses and ferns, often of enormous size. The more open portions of this forest are choked by an impenetrable growth of various *Vaccineæ* of almost arborescent proportions, of hazel, the vine-maple, and other shrubs. The soil which has produced the maximum growth of forest in this region is, outside the river bottoms, a thin, porous gravel of glacial origin, rarely more than a few inches in depth; the luxuriance of vegetable growth, therefore, illustrates the influence of a heavy rainfall and temperate climate upon the forest.

The general character of this forest in the interior, although composed largely of the species peculiar to the coast, differs somewhat from the Coast Forest proper in composition and largely in natural features. The dense, impenetrable forest of the coast is replaced, east of the summit of the Cascade Range, by a more open growth, generally largely destitute of undergrowth. The red fir, the hemlock, and the red cedar (*Thuya*) are still important elements of the forest. Less valuable species of the Coast Forest—the white fir (*Abies grandis*), the yew, the alders, the mountain hemlock (*Tsuga Pattoniana*), the hawthorn, the buckthorn, and the white pine (*Pinus monticola*)—are still represented. The latter, a local species upon the coast, only reaches its greatest development toward the eastern limit of this region, here forming considerable and important forests. Other species peculiar to the Coast Forest, the maples, the ash, the oak, the arbutus, and the Alaska cedar, do not extend east of the Cascades. The tide-land spruce is replaced by an allied species of the interior region. The widely-distributed yellow pine (*Pinus ponderosa*), barely represented in the northern portions of the immediate Coast Forest, becomes east of the mountains one of the most important and characteristic elements of the forest. The Coast Forest south of the forty-third degree of latitude changes in composition. The tide-land spruce, the hemlock, and the *Thuya* are gradually replaced by more southern species. The sugar pine (*P. Lambertiana*) here first appears. The California laurel (*Umbellularia*) covers with magnificent growth the broad river bottoms. The *Libocedrus*, several oaks, and the chinquapin here reach the northern limits of their distribution. The change from the northern to the southern forest is marked by the appearance of the Port Orford cedar (*Chamæcyparis Lawsoniana*), adding variety and value to the forests of the southern Oregon coast. Farther south, near the northern boundary of California, the redwood forests (*Sequoia*) appear.

The Coast Forest of California will be most conveniently discussed under three subdivisions: the forest of the Coast Range, the forest of the western slope of the Sierra Nevada, which, toward the northern boundary of the state, extends to the coast, covering the mass of mountains which here unite the Sierra Nevada and the Coast Range; and, third, the open forest of the long, narrow valleys lying between the Coast Range and the Sierra Nevada, south of this northern connection. The important feature of the Coast Range, as far south as the thirty-seventh degree of latitude, is the belt of redwood occupying an irregular, interrupted strip of territory facing the ocean, and hardly exceeding thirty miles in width at the points of its greatest development. The heaviest growth of the redwood forest occurs north of the bay of San Francisco, and here, along the slopes and bottom of the narrow cañons of the western slope of the Coast Range, the maximum productive capacity of the forest is reached. No other forest of similar extent equals in the amount of material which they contain the groups of redwood scattered along the coast of northern California. The red fir reaches, in the California Coast Range, a size and value only surpassed in the more northern forests of the coast; the yellow pine is an important tree in the northern portions of this region, and here flourish other species of the genus endemic to this region. The forest of the Coast Range is marked by the presence within its limits of several species of singularly restricted distribution. *Cupressus macrocarpa* and *Pinus insignis* are confined to a few isolated groves upon the shores of the bay of Monterey; *Abies bracteata* occupies three or four cañons high up in the Santa Lucia mountains; it is found nowhere else; and *Pinus Torreyana*, the most local arborescent species of North America, has been detected only in one or two small groups upon the sand-dunes just north of the bay of San Diego. The characteristic forest of the Coast Range is checked from farther southern development, a little below the thirty-fifth parallel, by insufficient moisture; the scanty forests which clothe the high declivities of the Coast Range farther south belong in composition to the Sierra forests.

The heavy forest which covers the western slopes of the Sierra Nevada, a forest only surpassed in density by the redwood belt of the coast and the fir forest of Puget sound, occupies, in its greatest development, a belt situated between 4,000 and 8,000 feet elevation. This forest belt extends from about the base of mount Shasta at the north to the thirty-fifth parallel; farther south it diminishes in density and disappears upon the southern ridges of the Coast Range just north of the southern boundary of California. Its greatest width occurs in northern California, where to the south of mount Shasta the Sierra system is broken down into a broad mass of low ridges and peaks. The characteristic species of this forest is the great sugar pine (*P. Lambertiana*), which here reaches its greatest development and value, and gives unsurpassed beauty to this mountain forest. With the sugar pine are associated the red fir, the yellow pine, two noble *Abies*, the *Libocedrus*; and, toward the central part of the state, the great *Sequoia*, appearing first in small isolated groups, and then, farther south, near the headwaters of Kern river, in a narrow belt extending more or less continuously for several miles. This heavy forest of the Sierras, unlike the forest which farther north covers the western flanks of the Cascade Range, is almost destitute of undergrowth and young trees. It shows the influence of a warm climate and unevenly distributed rainfall upon forest growth. The trees, often remote from one another, have attained an enormous size, but they have grown slowly. Above this belt the Sierra forest stretches upward to the limits of tree growth. It is here subalpine and alpine in character and of little economic value. Different pines and firs, the mountain hemlock, and the western juniper are scattered in open stretches of forest upon the high ridges of the Sierras. The forest below the belt of heavy growth gradually becomes more open. Individual trees are smaller, while the number of species increases. The small pines of the upper foot-hills are mingled with oaks in considerable variety. These gradually increase in number. Pines are less frequent and finally disappear.

The forest of the valleys is composed of oaks, the individuals often widely scattered and of great size, but nowhere forming a continuous, compact growth. The Coast Forest of the Pacific region, unsurpassed in density, is composed of a comparatively small number of species, often attaining enormous size. It presents the same general features throughout its entire extent, except as modified by the climatic conditions of the regions which it covers. The species which compose this forest range through nearly 26 degrees of latitude, or northern species, are replaced in the south by closely allied forms; and, as in the Atlantic region, the southern species far exceed in number those peculiar to the north.

The *Interior Forest* extends from the southern limits of the northern subarctic forest to the plateau of northern Mexico; it occupies the entire region between the eastern limits of the Pacific Coast Forest and the extreme western limits of the Atlantic region. The forests of this entire region, as compared with the forests east and west of it, are stunted and remarkable in their poverty of composition. They are confined to the high slopes and cañons of the numerous mountain ranges composing the interior region, while the valleys are treeless, or, outside of the narrow river bottoms, nearly treeless. The interior forest attains its greatest development and considerable importance upon the western slope of the California Sierras and upon the flanks of the high peaks of the southern Rocky Mountain system, from Colorado, where the timber line reaches an extreme elevation of 13,500 feet, to southern New Mexico and western Arizona. The minimum in North American forest development, outside the absolutely treeless regions, both in the number of species and in the proportion of forest to entire area, is found south of the Blue mountains of Oregon, in the arid region between the Wahsatch mountains and the Sierra Nevada, known as the Great Basin. Here the open, stunted forest is confined to the highest ridges and slopes of the infrequent cañons of the low mountain ranges which occupy, with a general north and south trend, this entire region. The individuals which compose this forest are small, although often of immense age, and everywhere show the marks of a severe struggle for existence. Seven arborescent species only have been detected in the forests of the northern and central portions of this region. The mountain mahogany (*Cercocarpus*), the only broad-leaved species of the region, with the exception of the aspen, which throughout the entire interior region borders, above an elevation of 8,000 feet, all mountain streams, reaches here its greatest development. This tree, with the nut pine (*Pinus monophylla*), characterizes this region. Stunted junipers are scattered over the lowest slopes of the mountains, or farther south often cross the high valleys, and cover with open growth the *mesas*, as the lower foot-hills are locally known. An open forest of arborescent yuccas (*Yucca brevifolia*) upon the high Mojave plateau is a characteristic and peculiar feature of the flora of this interior region. The red fir and the yellow pine, widely distributed throughout the Pacific region, do not occur upon the mountain ranges of the Great Basin.

The heavy forests of the interior region, found along the western slopes of the California Sierras and upon the Rocky Mountain system, are, for the most part, situated south of the forty-second degree of latitude. The forests of the whole northern interior portion of the continent, outside the region occupied in the northern Rocky mountains by the eastern development of the Coast Forest, feel the influence of insufficient moisture; the number of species of which they are composed is not large; the individuals are often small and stunted, while the forests are open, scattered, without undergrowth, and confined to the cañons and high slopes of the mountains. The most generally distributed species of this northern region, a scrub pine (*Pinus Murrayana*), occupies vast areas, almost to the exclusion of other species, and is gradually taking possession of ground cleared by fire of more valuable trees. South of the fifty-second parallel the red fir (*Pseudotsuga*) and the yellow pine (*Pinus ponderosa*) appear; with them is associated, in the Blue mountains and in some of the ranges of the northern Rocky mountains, the western larch (*Larix occidentalis*), the largest and most valuable tree of the Columbian basin.

The forest covering the eastern slope of the Sierra Nevada consists almost exclusively of various species of pine, often of great size and value. The characteristic species of this region are the yellow pine and the closely-allied *Pinus Jeffreyi*, here reaching its greatest development. The red fir is absent from this forest, while the oaks, multiplied in many forms on the western slopes of these mountains, have here no representative.

The forests of the southern Rocky Mountain region, less heavy and less generally distributed than those of the western slope of the Sierras, are, as compared with those of the Great Basin, heavy, dense, and valuable. They owe their existence to the comparatively large precipitation of moisture distributed over this elevated region. The characteristic species of the Colorado mountains is a spruce (*Picea Engelmanni*); it forms, at between 8,000 and 10,000 feet elevation, extensive and valuable forests of considerable density and great beauty; with it are associated a balsam fir of wide northern distribution, and various alpine and subalpine species of pine; at lower elevations forests of yellow pine and red fir cover the mountain slopes, while the bottoms of the streams are lined with cottonwood, alder, and maple, or with an open growth of the white fir (*Abies concolor*), a species of the Coast Forest, here reaching the eastern limits of its distribution; the foot-hills above the treeless plain are covered with scant groves of the nut-pine (*Pinus edulis*), stunted junipers, and a small oak, which in many forms extends through a large area of the southern interior region. A forest similar in general features to that of Colorado, and largely composed of the same species, extends over the high mountains of New Mexico to those of western Texas and western and northwestern Arizona, where a heavier forest of pine covers the elevated region lying along the thirty-fifth parallel, culminating in the high forest-clad San Francisco mountains of northern Arizona.

The species of the interior Pacific region mingle along its southern borders with the species peculiar to the plateau of northern Mexico. The Pacific-Mexican Forest, although differing widely in natural features from the Atlantic-Mexican Forest, possesses several species peculiar to the two. The forests of this region are confined to the high mountains and their foot-hills, and to the banks of the rare water-courses. They disappear entirely from the Colorado desert and from the valleys and low mountain ranges of southwestern Arizona. The most important and generally distributed species peculiar to the valleys of this region is the mesquit, the characteristic species of the Atlantic-Mexican region. The suwarrow, however, the great tree cactus, is perhaps the most remarkable species of the region, giving an unusual and striking appearance to the dry *mesas* of central and southern Arizona. The high mountain ranges, extending across the boundary of the United States, between the one hundred and fifth and the one hundred and eleventh meridians, enjoy a larger and more regularly-distributed rainfall than the regions east, and especially west, of these meridians. The forests which cover these southern mountain ranges are often dense and varied. Upon their summits and almost inaccessible upper slopes the firs and pines of the Pacific region are mingled with pines, a juniper, an arbutus, and various other species peculiar to the Mexican plateau. Extensive forests of a cypress of Mexican origin also characterize this mountain vegetation. The bottoms of the cañons are lined with a dense growth of cottonwood, hackberry, a noble sycamore, an ash, a cherry, and other deciduous trees. The high foot-hills and *mesas* are covered with open groves of various oaks peculiar to the Mexican-Pacific region, here reaching, within the United States at least, their greatest development.

Such are some of the prominent forest features of North America; a dense forest, largely composed, except at the north, of a great variety of broad-leaved species, and extending from the Atlantic sea-board in one nearly unbroken sheet until checked by insufficient moisture from further western development—the forest of the Atlantic region; a forest of conifers, occupying the ranges of the great Cordilleran mountain system, unsurpassed in density in the humid climate of the coast, open and stunted in the arid interior—the forest of the Pacific region.

A more detailed examination of the distribution of North American arborescent genera and species will serve to illustrate the wealth of the forests of the Atlantic and the comparative poverty of those of the Pacific region. It will show, too, more clearly how widely the forests of these two great regions differ in composition.

DISTRIBUTION OF GENERA.

The forests of North America contain arborescent representatives of 158 genera; 142 genera occur in the Atlantic and 59 genera in the Pacific region. Of the Atlantic genera, 48 are not represented in the United States outside the semi-tropical region of Florida.

The following table illustrates the distribution of these genera; the genera of semi-tropical Florida are designated by a *.

	Genera represented by arborescent species in the Atlantic region.	Genera represented by arborescent species in the Pacific region.		Genera represented by arborescent species in the Atlantic region.	Genera represented by arborescent species in the Pacific region.
Magnolia	✓		Eysenhardtia	✓	✓
Liriodendron	✓		Dalea		✓
Asimina	✓		Robinia	✓	✓
*Anona	✓		Olneya		✓
*Capparis	✓		*Piscidia	✓	
*Canella	✓		Cladrastis	✓	
*Clusia	✓		Sophora	✓	
Gordonia	✓		Gymnocladus	✓	
Fremontia		✓	Gleditschia	✓	
Tilia	✓		Parkinsonia	✓	✓
*Byrsonima	✓		Cercis	✓	
*Guaiacum	✓		Prosopis	✓	✓
Porliera	✓		Leucæna	✓	
Xanthoxylum	✓		Acacia	✓	✓
Ptelia	✓	✓	*Lysiloma	✓	
Canotia		✓	*Pithecolobium	✓	
*Simaruba	✓		*Chrysobalanus	✓	
*Bursera	✓		Prunus	✓	✓
*Amyris	✓		Vauquelinia		✓
*Swietenia	✓		Cercocarpus		✓
*Ximenia	✓		Pyrus	✓	✓
Ilex	✓		Cratægus	✓	✓
Cyrilla	✓		Heteromeles		✓
Cliftonia	✓		Amelanchier	✓	
Euonymus	✓		Hamamelis	✓	
*Myginda	✓		Liquidambar	✓	
*Schæfferia	✓		Rhizophora	✓	
*Reynosia	✓		*Conocarpus	✓	
Condalia	✓	✓	*Laguncularia	✓	
Rhamnus	✓	✓	*Calyptranthes	✓	
Ceanothus		✓	*Eugenia	✓	
*Colubrina	✓		Cereus		✓
Æsculus	✓	✓	Cornus	✓	✓
Ungnadia	✓	✓	Nyssa	✓	
Sapindus	✓	✓	Sambucus	✓	✓
*Hypelate	✓		Viburnum	✓	
Acer	✓	✓	*Exostemma	✓	
Negundo	✓	✓	Pinckneya	✓	
Rhus	✓		*Genipa	✓	
Pistacia	✓		*Guettarda	✓	

	Genera represented by arborescent species in the Atlantic region.	Genera represented by arborescent species in the Pacific region.		Genera represented by arborescent species in the Atlantic region.	Genera represented by arborescent species in the Pacific region.
Vaccinium	✓	....	Planera	✓	....
Andromeda	✓	....	Celtis	✓	✓
Arbutus	✓	✓	*Ficus	✓	....
Oxydendrum	✓	....	Morus	✓	✓
Kalmia	✓	....	Maclura	✓	....
Rhododendron	✓	....	Platanus	✓	✓
*Myrsine	✓	....	Juglans	✓	✓
*Ardisia	✓	....	Carya	✓	....
*Jacquinia	✓	....	Myrica	✓	✓
*Chrysophyllum	✓	....	Quercus	✓	✓
*Sideroxylon	✓	....	Castanopsis	....	✓
*Dipholis	✓	....	Castanea	✓	....
Bumelia	✓	✓	Fagus	✓	....
*Mimusops	✓	....	Ostrya	✓	....
Diospyros	✓	....	Carpinus	✓	....
Symplocos	✓	....	Betula	✓	✓
Halesia	✓	....	Alnus	✓	✓
Fraxinus	✓	✓	Salix	✓	✓
Forestiera	✓	....	Populus	✓	✓
Chionanthus	✓	....	Libocedrus	....	✓
Osmanthus	✓	....	Thuya	✓	✓
Cordia	✓	....	Chamæcyparis	✓	✓
*Bourreria	✓	....	Cupressus	....	✓
*Ehretia	✓	....	Juniperus	✓	✓
Catalpa	✓	....	Taxodium	✓	....
Chilopsis	✓	✓	Sequoia	....	✓
*Crescentia	✓	....	Taxus	✓	✓
*Citharexylum	✓	....	Torreya	✓	✓
*Avicennia	✓	....	Pinus	✓	✓
*Pisonia	✓	....	Picea	✓	✓
*Coccoloba	✓	....	Tsuga	✓	✓
Persea	✓	....	Pseudotsuga	....	✓
*Nectandra	✓	....	Abies	✓	✓
Sassafras	✓	....	Larix	✓	✓
Umbellularia	....	✓	Sabal	✓	....
*Drypetes	✓	....	Washingtonia	....	✓
*Sebastiania	✓	....	*Thrinax	✓	....
*Hippomane	✓	....	*Oreodoxa	✓	....
Ulmus	✓	....	Yucca	✓	✓

Arborescent species of 43 genera occur within the limits of the two regions. They are:

Ptelia.
Condalia.
Rhamnus.
Æsculus.
Ungnadia.
Sapindus.
Acer.
Negundo.
Eysenhardtia.
Robinia.
Parkinsonia.
Prosopis.
Acacia.
Prunus.
Pyrus.
Cratægus.
Cornus.
Sambucus.
Arbutus.
Bumelia.
Fraxinus.
Chilopsis.
Celtis.
Morus.
Platanus.
Juglans.
Myrica.
Quercus.
Betula.
Alnus.
Salix.
Populus.
Thuya.
Chamæcyparis.
Juniperus.
Taxus.
Torreya.
Pinus.
Picea.
Tsuga.
Abies.
Larix.
Yucca.

The following genera, 44 in number, of the Atlantic region, exclusive of those of semi-tropical Florida, are not represented in the Pacific forest:

Magnolia.
Liriodendron.
Asimina.
Gordonia.
Tilia.
Porliera.
Xanthoxylum.
Ilex.
Cyrilla.
Cliftonia.
Pistacia.
Cladrastis.
Sophora.
Gymnocladus.
Gleditschia.
Leucæna.
Hamamelis.
Liquidambar.
Rhizophora.
Nyssa.
Viburnum.
Pinckneya.
Andromeda.
Oxydendrum.
Diospyros.
Symplocos.
Halesia.
Forestiera.
Chionanthus.
Osmanthus.
Cordia.
Catalpa.
Persea.
Sassafras.
Ulmus.
Planera.
Maclura.
Carya.
Castanea.
Fagus.
Ostrya.
Carpinus.
Taxodium.
Sabal.

The following genera of the Atlantic region, 9 in number, are represented in the Pacific flora by one or more frutescent, but by no arborescent, species:

Euonymus.	Amelanchier.	Vaccinum.	Rhododendron.
Rhus.	Viburnum.	Kalmia.	Forestiera.
Cercis.			

Ptelia, *Condalia*, *Sapindus*, *Robinia*, *Bumelia*, *Celtis*, *Morus*, and *Juglans*, genera reaching their greatest development in North America in the Atlantic region, extend with a single arborescent representative into the Pacific region. *Rhamnus*, *Æsculus*, *Acer*, *Negundo*, *Prunus*, *Pyrus*, *Cratægus*, *Cornus*, *Sambucus*, *Fraxinus*, *Platanus*, *Myrica*, *Quercus*, *Betula*, *Alnus*, *Salix*, *Populus*, *Thuya*, *Chamæcyparis*, *Juniperus*, *Taxus*, *Torreya*, *Pinus*, *Picea*, *Tsuga*, *Abies*, and *Larix*, characteristic North American genera, are widely represented in the two regions.

Ungnadia, *Eysenhardtia*, *Parkinsonia*, *Prosopis*, *Acacia*, *Chilopsis*, and *Yucca*, genera of the Mexican flora, are common to the two regions.

Arbutus, a genus of the Pacific region, just reaches, with a doubtful species, the Atlantic region through western Texas.

The following genera of the Pacific region, 13 in number, have no representatives in the Atlantic region:

Fremontia.	Cercocarpus.	Castanopsis.	Sequoia.
Canotia.	Heteromeles.	Libocedrus.	Pseudotsuga.
Olneya.	Umbellularia.	Cupressus.	Washingtonia.
Vauquelinia.			

The following genera of the Pacific, 3 in number, are represented in the Atlantic region by frutescent species:

Ceanothus.	Dalea.	Cereus.

The Atlantic forest, exclusive of semi-tropical Florida, contains 45 genera entirely unrepresented in the Pacific region and 7 genera without Pacific arborescent representatives. The Pacific forest contains 13 genera unrepresented in the Atlantic region and 3 genera without Atlantic arborescent representatives.

The following genera of the Mexican region, 14 in number, are not elsewhere represented in North America. Genera with arborescent representatives in both the Atlantic- and Pacific-Mexican regions are designated by a star (*):

Porliera.	Pistacia.	Olneya.	Acacia.	*Chilopsis.
Canotia.	*Eysenhardtia.	*Parkinsonia.	Vauquelinia.	Washingtonia.
*Ungnadia.	Dalea.	Leucæna.	Cereus.	

Porliera and *Leucæna* belong to the Atlantic; *Canotia*, *Dalea*, *Olneya*, *Vauquelinia*, *Cereus*, and *Washingtonia* to the Pacific region.

DISTRIBUTION OF SPECIES.

In the forests of North America 412 arborescent species have been detected; of these, 292 species belong to the Atlantic region, and 153 occur within the limits of the Pacific region. Species common to the two regions are rare; they are principally confined to the subarctic Northern Forest and to the narrow belt along the southern boundary of the United States.

The following species, 10 in number, cross the continent:

Prosopis juliflora.	Sambucus Mexicana.	Salix longifolia.	Populus balsamifera.	Picea alba.
Pyrus sambucifolia.	Betula papyrifera.	Populus tremuloides.	Juniperus Virginiana.	Yucca baccata.

Prosopis juliflora, *Sambucus Mexicana*, and *Yucca baccata* belong to the Mexican flora of the south; *Salix longifolia* also belongs here, although extending northward into the Atlantic and through the Pacific Coast region of the United States. *Populus balsamifera*, *Betula papyrifera*, and *Picea alba* belong to the Northern Forest. *Pyrus sambucifolia*, *Populus tremuloides* and *Juniperus Virginiana* are widely distributed through the central portions of the Atlantic and Pacific regions; they are the only really continental arborescent species.

The following species of the Atlantic region, 15 in number, extend from the Atlantic into the Pacific region:

Ptelia trifoliata.	Negundo aceroides.	Cratægus tomentosa.	Quercus Emoryi.
Condalia obovata.	Parkinsonia aculeata.	Fraxinus viridis.	Alnus incana.
Sapindus marginatus.	Prunus Americana.	Celtis occidentalis.	Salix nigra.
Ungnadia speciosa.	Prunus Pennsylvanica.	Morus microphylla.	

Ptelia trifoliata, a widely distributed species of the Atlantic region, extends through western Texas into the extreme southeastern portion of the Pacific region. *Condalia obovata*, *Ungnadia speciosa*, *Parkinsonia aculeata*, *Morus microphylla*, and *Quercus Emoryi*, of the Atlantic-Mexican forest, extend into the Pacific-Mexican region. *Sapindus marginatus*, of the southern Atlantic region, extends through western Texas to the Pacific-Mexican region. *Prunus Americana*, *Prunus Pennsylvanica*, and *Alnus incana*, widely distributed through the northern portions of the Atlantic region, just reach the eastern limits of the central Pacific region.

Negundo aceroides, *Cratægus tomentosa*, *Fraxinus viridis*, and *Celtis occidentalis* are widely distributed through the interior Pacific region, although nowhere reaching the coast.

The following species of the Pacific region, 8 in number, extend through the Mexican into the Atlantic region:

Eysenhardtia orthocarpa.	Acacia Greggii.	Chilopsis saligna.	Juniperus occidentalis.
Prosopis pubescens.	Fraxinus pistaciæfolia.	Juglans rupestris.	Juniperus pachyphlœa.

Juglans rupestris and *Juniperus occidentalis* reach their greatest development in the Pacific Coast region, and extend through the Pacific-Mexican region into western Texas; no other species are common to the Pacific Coast forest and the Atlantic-Mexican region. The 6 remaining Pacific-Atlantic species belong to the Pacific-Mexican region, just reaching western Texas.

The following species of the Southern Pacific region extends into the Atlantic region:

Salix amygdaloides.

The following species of the Pacific forest, 12 in number, endemic to the interior arid region, do not extend beyond its limits:

Acer grandidentatum.	Cratægus rivularis.	Populus angustifolia.	Pinus monophylla.
Robinia Neo-Mexicana.	Fraxinus anomala.	Pinus flexilis.	Picea pungens.
Cercocarpus ledifolius.	Quercus undulata.	Pinus edulis.	Yucca brevifolia.

A detailed examination of the distribution of the arborescent species composing the North American forests shows that—

Magnolia is represented by seven Atlantic species, with the center of its distribution in the southern Alleghany region.

Liriodendron is represented by a single species, widely-distributed through the eastern and central portions of the Atlantic region.

Asimina is represented by a single widely-distributed arborescent species and by three frutescent species of the Atlantic region.

Anona, *Capparis*, *Canella*, and *Clusia* are represented each by a single semi-tropical species.

Gordonia is represented by two species of the southern Atlantic region, one of wide distribution, the other rare and local.

Fremontia, a genus endemic to the Pacific region, is represented by a single species of the southern Pacific Coast region.

Tilia is represented by two Atlantic species, with its center of distribution in the southern Alleghany region.

Byrsonima is represented by a single semi-tropical species.

Guaiacum is represented by a single semi-tropical species.

Porliera is represented by a single species of the Atlantic-Mexican region.

Xanthoxylum is represented by two species of the Atlantic region, by a semi-tropical species, and by a second semi-tropical species which reaches the Atlantic-Mexican region.

Ptelia is represented by a single arborescent species of wide distribution in the Atlantic, reaching also the Pacific region, where a frutescent species occurs, and by a second frutescent species of the south Atlantic region.

Canotia, a genus endemic to the Pacific-Mexican region, is represented by a single species.

Simaruba, *Amyris*, *Swietenia*, *Ximenia*, are each represented by a single semi-tropical species.

Bursera is represented by a single semi-tropical species and by a second frutescent species of the Pacific-Mexican region.

Ilex, an Atlantic genus, is represented by four arborescent and several frutescent species, with its center of distribution in the southern Atlantic region.

Cyrilla and *Cliftonia* are each represented by a single species of the southern Atlantic region.

Euonymus is represented by a widely-distributed arborescent species in the Atlantic, and by a frutescent species in both the Atlantic and the Pacific regions.

Myginda, *Schæfferia*, and *Reynosia* are each represented by a single semi-tropical species.

Condalia is represented by one semi-tropical and by one species of the Atlantic-Mexican reaching the Pacific-Mexican region.

Rhamnus is represented by one arborescent and by one frutescent species in the Atlantic, by two arborescent and one frutescent species in the Pacific region, and by one frutescent species common to the two regions.

Ceanothus is represented by a single arborescent species in the Pacific Coast region and by several frutescent species widely distributed through the Atlantic and the Pacific regions.

Colubrina is represented by a single semi-tropical species.

Æsculus is represented by two arborescent and by three frutescent species in the Atlantic, and by an arborescent species in the Pacific region.

Ungnadia, an endemic genus of the Atlantic-Mexican region, and just reaching the Pacific-Mexican region, is represented by a single species.

Sapindus is represented by one species widely distributed through the southern Atlantic, and reaching the Pacific region, and by one semi-tropical species.

Acer is represented by five Atlantic and four Pacific species.

Negundo is represented by one species widely distributed through the Atlantic and the Pacific regions and by a second species in the Pacific region.

Rhus is represented by five arborescent species in the Atlantic and by several frutescent species in both the Atlantic and the Pacific regions.

Pistacia is represented by a single species in the Atlantic-Mexican region.

Eysenhardtia is represented by a single arborescent species in the Pacific-Mexican, extending into the Atlantic-Mexican region, where a second frutescent species occurs.

Dalea is represented by a single arborescent species in the Pacific-Mexican and by numerous frutescent and herbaceous species in the Atlantic and the Pacific regions.

Robinia, with its center of distribution in the southern Alleghany region, is represented by two arborescent and one frutescent species in the Atlantic and by one arborescent species in the Pacific region.

Olneya, an endemic genus of the Pacific-Mexican region, is there represented by a single species.

Piscidia is represented by a single semi-tropical species.

Cladrastis is represented by a single local species in the southern Atlantic region.

Sophora is represented by a species in the southern Atlantic and by a second species in the Atlantic-Mexican region, and by four frutescent or suffrutescent species.

Gymnocladus is represented by a single species in the central Atlantic region.

Gleditschia is represented by two widely-distributed species in the Atlantic region.

Parkinsonia is represented by an arborescent species common to the Atlantic- and the Pacific-Mexican regions, by two arborescent and one frutescent species in the Pacific-Mexican, and by a frutescent species in the Atlantic-Mexican region.

Cercis is represented by a widely-distributed species in the Atlantic, by a second species in the Atlantic-Mexican, and a frutescent species of the California Coast region.

Prosopis is represented by two arborescent species common to the Atlantic- and the Pacific-Mexican regions, and by two frutescent species.

Leucæna is represented by two species in the Atlantic-Mexican region.

Acacia is represented by two arborescent species in the Atlantic-Mexican, by one arborescent species of the Pacific-Mexican extending into the Atlantic-Mexican region, and by several frutescent species widely distributed through the two regions.

Lysiloma is represented by a single semi-tropical species.

Pithecolobium is represented by a single polymorphous arborescent species of semi-tropical Florida, and by a shrubby species of the Mexican Boundary region.

Chrysobalanus is represented by one arborescent and one frutescent semi-tropical species.

Prunus is represented by seven arborescent species in the Atlantic region; of these, one is semi-tropical and two extend into the Pacific region. This genus is represented in the Pacific region by four species, of which one belongs to the Mexican region, and by several frutescent species.

Vauquelinia, an endemic genus of the Pacific-Mexican region, is there represented by a single species.

Cercocarpus is represented by two widely-distributed species in the Pacific region.

Pyrus is represented by one species common to both Atlantic and Pacific, by three arborescent and one frutescent species in the Atlantic, and by one arborescent species in the Pacific region.

Cratægus is represented by twelve arborescent and frutescent species in the Atlantic, of which one extends into the Pacific region, and by two species in the Pacific region.

Heteromeles is represented by a single species in the Pacific Coast region.

Amelanchier is represented by one arborescent species in the Atlantic and by one frutescent species in the Pacific region.

Hamamelis and *Liquidambar* are each represented by one widely-distributed species in the Atlantic region.

Rhizophora is represented by a single species in the southern Atlantic region.

Conocarpus, *Laguncularia*, and *Calyptranthes* are each represented by a single semi-tropical species.

Eugenia is represented by five semi-tropical species.

Cereus is represented by a single arborescent species in the Pacific and by several frutescent species in the Atlantic and Pacific regions.

Cornus is represented by two arborescent species in the Atlantic, by a single arborescent species in the Pacific region, and by several frutescent and herbaceous species in the two regions.

Nyssa is represented by three species in the Atlantic region.

Sambucus is represented by one arborescent species of wide distribution in the Pacific, by one species in the Pacific-Mexican extending into the Atlantic-Mexican, by a frutescent species in the Atlantic, by a second frutescent species in the Pacific, and by a frutescent species common to the Atlantic and Pacific regions.

Viburnum is represented by two arborescent species in the Atlantic and by several frutescent species in the Atlantic and the Pacific regions.

Exostemma is represented by a single semi-tropical species.

Pinckneya, an endemic genus of the southern Atlantic region, is there represented by a single species.

Genipa is represented by a single semi-tropical species.

Guettarda is represented by one arborescent and by one frutescent semi-tropical species.

Vaccinium is represented by one arborescent species in the Atlantic and by several frutescent species in the Atlantic and the Pacific regions.

Andromeda is represented by an arborescent and several frutescent species in the Atlantic region.

Arbutus is represented by one species in the Pacific Coast, by a second species in the Pacific Mexican, and by one species in the Atlantic-Mexican region.

Oxydendrum, an endemic genus of the Atlantic region, is there represented by a single species.

Kalmia is represented by one arborescent species and by three frutescent species in the Atlantic region, of which one extends to the Pacific region.

Rhododendron is represented by one arborescent and by several frutescent species in the Atlantic and by several frutescent species in the Pacific region.

Myrsine, *Ardisia*, *Jacquinia*, *Chrysophyllum*, *Sideroxylon*, and *Dipholis* are each represented by a single semi-tropical species.

Bumelia is represented by four species in the Atlantic and by one species in the Pacific-Mexican region.

Mimusops is represented by one semi-tropical species.

Diospyros is represented by one species in the Atlantic and by one in the Atlantic-Mexican region.

Symplocos is represented by one species in the southern Atlantic region.

Halesia is represented by two arborescent and by one frutescent species in the southern Atlantic region.

Fraxinus, with its center of distribution in the southern Atlantic region, is represented by seven species in the Atlantic, of which one extends into the Pacific region, and one belongs to the Mexican region, and by three arborescent and one frutescent species in the Pacific, of which one belongs to the Mexican region.

Forestiera is represented by one arborescent and seven frutescent species in the Atlantic region, of which one reaches the Mexican-Pacific region.

Chionanthus and *Osmanthus* are each represented by a single species in the southern Atlantic region.

Cordia is represented by one arborescent and by one frutescent semi-tropical species and by one arborescent and one frutescent species in the Atlantic-Mexican region.

Bourreria and *Ehretia* are each represented by a single semi-tropical species.

Catalpa is represented by two species in the southern Atlantic region.

Chilopsis is represented by a single species in the Pacific-Mexican region, extending into the Atlantic-Mexican region.

Crescentia, *Citharexylum*, and *Avicennia* are each represented by a single semi-tropical species.

Pisonia is represented by one arborescent and by two frutescent semi-tropical species.

Coccoloba is represented by two semi-tropical species.

Persea is represented by one species in the southern Atlantic region.

Nectandra is represented by one semi-tropical species.

Sassafras is represented by one widely-distributed species in the Atlantic region.

Umbellularia is represented by a single species in the Pacific Coast region.

Drypetes, *Sebastiania*, and *Hippomane* are each represented by a single semi-tropical species.

Ulmus, with its center of distribution in the Mississippi basin, is represented in the Atlantic region by five species.

Planera is represented by a single species in the southern Atlantic region.

Celtis is represented by a single polymorphous species of wide distribution in the Atlantic region, extending into the Pacific region, and by a frutescent species common to the Atlantic-Mexican and the Pacific-Mexican regions.

Ficus is represented by three semi-tropical species.

Morus is represented by one widely-distributed species in the Atlantic region, and by one species in the Atlantic-Mexican, extending into the Pacific-Mexican region.

Maclura is represented by a single local species in the southern Atlantic region.

Platanus is represented by one widely-distributed species in the Atlantic region, by a species in the Pacific coast, and by a species in the Pacific-Mexican region.

Juglans is represented by two widely-distributed species in the Atlantic region and by a species in the Pacific coast, extending through the Pacific-Mexican into the Atlantic-Mexican region.

Carya, an endemic genus of the Atlantic region, with its center of distribution west of the Mississippi river, is represented by seven species.

Myrica is represented by one arborescent and two frutescent species in the Atlantic region and by one arborescent species in the Pacific Coast region.

Quercus, with its center of most important distribution in the basin of the lower Ohio river, is represented in the Atlantic region by twenty-four arborescent species, of which one, belonging to the Mexican region, extends into the Pacific-Mexican region; and in the Pacific region by twelve arborescent species, of which one belongs to the interior and four to the Mexican region, and by two frutescent species.

Castanopsis is represented by a single species in the Pacific Coast region.

Castanea is represented by two species in the Atlantic region.

Fagus, *Ostrya*, and *Carpinus* are each represented by a single widely-distributed species in the Atlantic region.

Betula, with its center of distribution in the northern Atlantic region, is represented by one arborescent and by one frutescent species common to the Atlantic and the Pacific regions, by four arborescent and one frutescent species in the Atlantic region, and by one arborescent species in the Pacific region.

Alnus is represented by three arborescent species in the Atlantic, of which one extends to the Pacific region, by three arborescent species in the Pacific region, and by two frutescent species common to the Atlantic and the Pacific regions.

Salix is represented in the Atlantic region by five arborescent species, of which three are found in the Pacific region, and by many frutescent species. This genus is represented in the Pacific region by ten arborescent and by many frutescent species.

Populus is represented by two species common to the Atlantic and the Pacific regions, by three species in the Atlantic region, and by three species in the Pacific region.

Libocedrus is represented by a single species in the Pacific Coast region.

Thuya is represented by one species in the Atlantic and by one species in the Pacific region.

Chamæcyparis is represented by one species in the Atlantic and by two species in the Pacific Coast region.

Cupressus is represented by four species in the Pacific region, of which three occur in the coast and one in the Mexican region.

Juniperus is represented by one arborescent species in the Atlantic region, by three arborescent species in the Pacific, of which one belongs to the Pacific-Mexican and one extends to the Atlantic-Mexican region, and by two frutescent species common to both regions.

Taxodium is represented by a single species in the southern Atlantic region.

Sequoia, an endemic genus of the Pacific Coast region, is there represented by two species.

Taxus is represented by an exceedingly local arborescent species in the southern Atlantic region, by a frutescent species in the northern Atlantic region, and by an arborescent species in the Pacific Coast region.

Torreya is represented by a single exceedingly local arborescent species in the southern Atlantic region and by a single species in the Pacific Coast region.

Pinus, with its center of distribution in the southern Pacific Coast region, is represented by thirteen species in the Atlantic and by twenty-two species in the Pacific region, of which three belong to the interior and four to the Mexican region.

Picea is represented by one species common to the Atlantic and the Pacific regions, by one species in the Atlantic, and by three species in the Pacific region, of which one belongs to the interior region.

Tsuga is represented by two species in the Atlantic and by two species in the Pacific region.

Pseudotsuga, an endemic genus of the Pacific region, is there represented by a single widely-distributed species.

Abies is represented by one widely-distributed and by one exceedingly local species in the Atlantic region and by seven species in the Pacific region, of which one is exceedingly local.

Larix is represented by one species in the Atlantic and by two species in the Pacific region.

Sabal is represented by a single species in the southern Atlantic region.

Washingtonia is represented by a single species in the Pacific Mexican region.

Thrinax is represented by two semi-tropical species, and *Oreodoxa* by one.

Yucca is represented by one arborescent and one frutescent species common to the Atlantic and the Pacific regions, by one arborescent and by two frutescent species in the Atlantic, and by two arborescent and by one frutescent species in the Pacific region.

A CATALOGUE

OF THE

FOREST TREES OF NORTH AMERICA, EXCLUSIVE OF MEXICO,

WITH

REMARKS UPON THEIR SYNONYMY, BIBLIOGRAPHICAL HISTORY, DISTRIBUTION, ECONOMIC VALUE, AND USES.

FOREST TREES OF NORTH AMERICA.

Species which grow from the ground with a single stem, either wholly or over a large portion of the area of their distribution, are admitted as trees into the following catalogue, without reference to the height or size they may attain.

The line which divides trees from shrubs is entirely arbitrary, and is often unsatisfactory in application. A separation of this nature, however, based upon habit rather than upon size, is perhaps less objectionable, all things considered, than any other, and serves at least to keep this catalogue within reasonable limits.

The word "compact", used in the description of various woods mentioned in the catalogue, indicates that they show no tendency to check or open in drying, and does not refer to their structure.

CATALOGUE OF FOREST TREES.

MAGNOLIACEÆ.

1.—Magnolia grandiflora, Linnæus,

Spec. 2 ed. 755.—Marshall, Arbustum, 84.—Am. Gewach. t. 185, 186.—Walter, Fl. Caroliniana, 158.—Gærtner, Fruct. i, 343, t. 70.—B. S. Barton, Coll. i, 13; ii, 20.—Aiton, Hort. Kew. ii, 251; 2 ed. iii, 329.—Bartram, Travels, 2 ed. 82.—Lamarck, Dict. iii, 672; Ill. iii, 35, t. 490.—Mœnch, Meth. 274.—Willdenow, Spec. ii, 1255; Enum. i, 579.—Michaux, Fl. Bor.-Am. i, 327.—Nouveau Duhamel, ii, 219, t. 65.—Desfontaines, Hist. Arb. ii, 5.—Robin, Voyages, iii, 265.—Andrews, Bot. Rep. viii, t. 518.—Titford, Hort. Bot. Am. 76.—Michaux f. Hist. Arb. Am. iii, 71, t. 1; N. American Sylva, 3 ed. ii, 8, t. 51.—Pursh, Fl. Am. Sept. ii, 380.—Nuttall, Genera, ii, 18; Sylva, i, 81; 2 ed. i, 96.—De Candolle, Syst. i, 450; Prodr. i, 80.—Hayne, Dend. Fl. 116.—Elliott, Sk. ii, 36.—Loddiges, Bot. Cab. t. 814.—Sprengel, Syst. ii, 642.—Audubon, Birds, t. 5, 32.—Rafinesque, Med. Bot. ii, 32.—Don, Miller's Dict. i, 82.—Eaton, Manual, 6 ed. 218.—Croom in Am. Jour. Sci. 1 ser. xxvi, 314.—Loudon, Arboretum, i, 261 & t.—Hooker, Jour. Bot. i, 188.—Eaton & Wright, Bot. 312.—Torrey & Gray, Fl. N. America, i, 42.—Spach, Hist. Veg. vii, 470.—Dietrich, Syn. iii, 308.—Seringe, Fl. Jard. iii, 225.—Darby, Bot. S. States, 210.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 13.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 66.—Wood, Cl. Book, 214; Bot. & Fl. 24.—Porcher, Resources S. Forests, 38.—Baillon, Hist. Pl. i, 133, f. 165-169.—Koch, Dendrologie, i, 367.—Young, Bot. Texas, 148.—Vasey, Cat. Forest Trees, 6.

M. Virginiana, var. *β. fœtida*, Linnæus, Spec. 1 ed. 536, in part.

M. grandiflora, var. *elliptica* and *obovata*, Pursh, Fl. Am. Sept. ii, 380.

M. grandiflora, var. *lanceolata*, Pursh, Fl. Am. Sept. ii, 380.—Bot. Mag. t. 1952.—Eaton, Manual, 6 ed. 218.

BIG LAUREL. BULL BAY.

Cape Fear river, North Carolina, south near the coast to Mosquito inlet, and Tampa bay, Florida; basin of the Mississippi river south of latitude 32° 30′, extending westward to southwestern Arkansas, and along the Texas coast to the valley of the Brazos river.

One of the most magnificent trees of the Atlantic forest, evergreen, 18 to 27 meters in height, with a trunk 0.60 to 1.20 meter in diameter; reaching its greatest development on the "bluff" formations along the eastern bank of the Mississippi river from Vicksburg to Natchez, and of western Louisiana.

Wood heavy, hard, not strong, close-grained, compact, easily worked, satiny; medullary rays very numerous, thin; color, creamy white or often light brown, the heavier sap-wood nearly white; specific gravity, 0.6360; ash, 0.53; little used except as fuel; suitable for interior finish, fine cabinet work, etc.

2.—Magnolia glauca, Linnæus,

Spec. 2 ed. 755.—Kalm, Travels, English ed. i, 204.—Schœpf, Mat. Med. Am. 91.—Marshall, Arbustum, 83.—Wangenheim, Amer. 60, t. 19, f. 46.—Walter, Fl. Caroliniana, 158.—B. S. Barton, Coll. i, 13; ii, 20.—Lamarck, Dict. iii, 674.—Aiton, Hort. Kew. ii, 251; 2 ed. iii, 329.—Mœnch, Meth. 274.—Willdenow, Spec. ii, 1256; Enum. i, 579.—Schkuhr, Handb. ii, 1441, t. 148.—Michaux, Fl. Bor.-Am. i, 327.—Nouveau Duhamel, ii, 223, t. 66.—Desfontaines, Hist. Arb. ii, 5.—Titford, Hort. Bot. Am. 76.—Bonpland, Pl. Malm. 103, t. 42.—Michaux f. Hist. Arb. Am. iii, 77, t. 2; N. American Sylva, 3 ed. ii, 12, t. 52.—Pursh, Fl. Am. Sept. ii, 381.—Eaton, Manual, 6 ed. 218.—Bigelow, Med. Bot. ii, 67, t. 27; Fl. Boston. 3 ed. 244.—Nuttall, Genera, ii, 18.—Barton, Prodr. Fl. Philadelph. 59; Med. Bot. i, 77, t. 7; Compend. Fl. Philadelph. ii, 17.—Loddiges, Bot. Cab. t. 215.—De Candolle, Syst. i, 452; Prodr. i, 80.—Hayne, Dend. Fl. 116.—Elliott, Sk. ii, 37.—Bot. Mag. t. 2164.—Sprengel, Syst. 642.—Torrey, Compend. Fl. N. States, 221; Fl. N. York, i, 17, t. 5.—Audubon, Birds, t. 118.—Rafinesque, Med. Bot. ii, 34.—Don, Miller's Dict. i, 82.—Eaton, Manual, 6 ed. 218.—Hooker, Jour. Bot. i, 188.—Beck, Bot. 15.—Sertum Botanicum, v & t.—Reichenbach, Fl. Exot. v, 37, t. 342.—Lindley, Fl. Med. 23.—Eaton & Wright, Bot. 312.—Torrey & Gray, Fl. N. America, i, 42.—Spach, Hist. Veg. vii, 473.—Dietrich, Syn. iii, 308.—Griffith, Med. Bot. 96, f. 56.—Loudon, Arboretum, i, 267 & t.—Emerson, Trees Massachusetts, 527; 2 ed. ii, 603 & t.—Seringe, Fl. Jard. iii, 226.—Gray, Genera, i, 61, t. 23; Manual N. States, 5 ed. 49.—Schnizlein, Icon. t. 176.—Darlington, Fl. Cestrica, 3 ed. 8.—Darby, Bot. S. States, 211.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 13.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 66.—Lesquereux in Owen's 2d Rep. Arkansas, 374.—Wood, Cl. Book, 214; Bot. & Fl. 24.—Porcher, Resources S. Forests, 36.—Koch, Dendrologie, i, 369.—Young, Bot. Texas, 148.—Vasey, Cat. Forest Trees, 6.

M. Virginiana, var. *a. glauca*, Linnæus, Spec. 1 ed. 535.

M. fragrans, Salisbury, Prodr. 379.—Rafinesque, Fl. Ludoviciana, 91; Med. Bot. ii, 32.

M. longifolia, Sweet, Hort. Brit. 11.—Don, Miller's Dict. i, 83.—Dietrich, Syn. iii, 308.

M. glauca, var. *latifolia*, Aiton, Hort. Kew. 2 ed. iii, 350.—Pursh, Fl. Am. Sept. ii, 381.—Eaton, Manual, 6 ed. 218.

M. glauca, var. *longifolia*, Aiton, Hort. Kew. 2 ed. iii, 330.—Pursh, Fl. Am. Sept. ii, 381.—Rafinesque, Fl. Ludoviciana, 91.—Hayne, Dend. Fl. 116.—Eaton, Manual, 6 ed. 218.

SWEET BAY. WHITE BAY. BEAVER TREE. WHITE LAUREL. SWAMP LAUREL.

Cape Ann, Massachusetts; New Jersey southward, generally near the coast, to bay Biscayne and Tampa bay, Florida; basin of the Mississippi river south of latitude 35°, extending west to southwestern Arkansas and the valley of the Trinity river, Texas.

A tree 15 to 22 meters in height, with a trunk sometimes 1.20 meter in diameter, or toward its northern limits reduced to a low shrub; swamps or low wet woods, reaching its greatest development on the rich hummocks of the interior of the Florida peninsula and along the low sandy banks of pine-barren streams of the Gulf states.

Wood light, soft, not strong, close-grained, compact; medullary rays very numerous, thin; color, light brown tinged with red, the sap-wood nearly white; specific gravity, 0.5035; ash, 0.47; in the Gulf states sometimes used in the manufacture of broom handles and small woodenware.

The dried bark, especially of the root, of this species and of *M. acuminata* and *M. Umbrella* is included in the American *Materia Medica*, furnishing an aromatic tonic and stimulant used in intermittent and remittent fevers; a tincture made by macerating the fresh fruit or bark in brandy is a popular remedy for rheumatism (*U. S. Dispensatory*, 14 ed. 567.—*Nat. Dispensatory*, 2 ed. 891).

3.—Magnolia acuminata, Linnæus,

Spec. 2. ed. 756.—Marshall, Arbustum, 83.—Walter, Fl. Caroliniana, 159.—B. S. Barton, Coll. i, 13.—Aiton, Hort. Kew. ii, 251; 2 ed. iii, 331.—Lamarck, Dict. iii, 674.—Willdenow, Spec. ii, 1257; Enum. i, 579.—Michaux, Fl. Bor.-Am. i, 329.—Nouveau Duhamel, ii, 222.—Desfontaines, Hist. Arb. ii, 5.—Michaux f. Hist. Arb. Am. iii, 82, t. 3; N. American Sylva, 3 ed. ii, 15, t. 53.—Pursh, Fl. Am. Sept. ii, 381.—De Candolle, Syst. i, 453; Prodr. i, 80.—Loddiges, Bot. Cab. t. 418.—Nuttall, Genera, ii, 18.—Bot. Mag. t. 2427.—Hayne, Dend. Fl. 117.—Elliott, Sk. ii, 37.—Rafinesque, Med. Bot. ii, 32.—Guimpel, Otto & Hayne, Abb. Holz. 18, t. 17.—Sprengel, Syst. ii, 642.—Torrey, Compend. Fl. N. States, 221; Fl. N. York, i, 28.—Rafinesque, Med. Bot. ii, 34.—Beck, Bot. 15.—Sertum Botanicum, v. & t.—Don, Miller's Dict. i, 83.—Reichenbach, Fl. Exot. t. 251.—Eaton, Manual, 6 ed. 218.—Loudon, Arboretum, i, 273 & t.—Eaton & Wright, Bot. 312.—Torrey & Gray, Fl. N. America, i, 43.—Dietrich, Syn. iii, 308.—Griffith, Med. Bot. 98.—Darlington, Fl. Cestrica, 3. ed. 9.—Darby, Bot. S. States, 211.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 14.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 67.—Wood, Cl. Book, 214; Bot. & Fl. 24.—Porcher, Resources S. Forests, 38.—Baillon, Hist. Pl. i, 140.—Gray, Manual N. States, 5. ed. 49.—Koch, Dendrologie, i, 371.—Young, Bot. Texas, 149.—Vasey, Cat. Forest Trees, 6.—Nat. Dispensatory, 2 ed. 891.—Ridgway in Proc. U. S. Nat. Mus. 1882, 58.

M. Virginiana, var. *e.* Linnæus, Spec. 1 ed. 536.

M. DeCandollii, Savi, Bibl. Ital. i, 224 & t.

Tulipastrum Americanum, Spach, Hist. Veg. vii, 483.

CUCUMBER TREE. MOUNTAIN MAGNOLIA.

Western New York to southern Illinois, southward along the Alleghany mountains, and scattered through eastern and middle Kentucky and Tennessee, usually on Carboniferous deposits, to southern Alabama (Stockton, *Mohr*) and northeastern Mississippi; Arkansas, Crowley's ridge, and in the southern and southwestern part of the state (Texarkana, *Harvey*, and in Polk, Howard, Cross, and Pike counties).

A large tree, 20 to 30 meters in height, with a trunk 0.60 to 1.20 meter in diameter; rich woods, reaching its greatest development on the slopes of the southern Alleghany mountains.

Wood durable, light, soft, not strong, close-grained, compact, satiny; medullary rays numerous, thin; color, yellow-brown, the sap-wood lighter, often nearly white; specific gravity, 0.4690; ash, 0.29; used for pump-logs, water-troughs, flooring, cabinet-making, etc.

4.—Magnolia cordata, Michaux,

Fl. Bor.-Am. i, 328.—Aiton, Hort. Kew. 2 ed. iii, 331.—Poiret, Suppl. iii, 547.—Michaux f. Hist. Arb. Am. iii, 87, t. 4; N. American Sylva, 3 ed. ii, 18, t. 54.—Pursh, Fl. Am. Sept. ii, 382.—Lindley, Bot. Reg. iv, t. 325.—Nuttall, Genera, ii, 18.—De Candolle, Syst. i, 455; Prodr. i, 80.—Hayne, Dend. Fl. 118.—Elliott, Sk. ii, 38.—Loddiges, Bot. Cab. t. 474.—Sprengel, Syst. ii, 642.—Rafinesque, Med. Bot. ii, 32.—Eaton, Manual, 6 ed. 218.—Sertum Botanicum, v & t.—Don, Miller's Dict. i, 83.—Reichenbach, Fl. Exot. t. 250.—Loudon, Arboretum, i, 275 & t.—Eaton & Wright, Bot. 312.—Torrey & Gray, Fl. N. America, i, 43.—Dietrich, Syn. iii, 308.—Darby, Bot. S. States, 211.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 14.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 68.—Wood, Cl. Book, 214; Bot. & Fl. 25.—Koch, Dendrologie, i, 371.—Vasey, Cat. Forest Trees, 6.

Tulipastrum Americanum, var. *subcordatum*, Spach, Hist. Veg. vii, 483.

CUCUMBER TREE.

Southern Alleghany Mountain region, near Augusta, Georgia (*Michaux, Elliott*), head of Sipsey creek, "valley of Davidson creek", Winston county, Alabama (*Mohr*).

A tree 22 to 24 meters in height, with a trunk sometimes 0.60 meter in diameter; low, rich woods; very rare and local.

Wood light, soft, not strong, close-grained, compact; medullary rays very numerous, thin; color, light brown streaked with yellow, the sap-wood light yellow; specific gravity, 0.4139; ash, 0.32.

5.—Magnolia macrophylla, Michaux,

Fl. Bor.-Am. i, 327.—Nouveau Duhamel, ii, 221.—Desfontaines, Hist. Arb. ii, 5.—Aiton, Hort. Kew. 2 ed. iii, 331.—Poiret, Suppl. iii, 573.—Michaux f. Hist. Arb. Am. iii, 99, t. 7; N. American Sylva, ii, 26, t. 57.—Bonpland, Pl. Malm. 84, t. 33.—Pursh, Fl. Am. Sept. ii, 381.—Nuttall, Genera, ii, 18; Sylva, i, 83; 2 ed. i, 99.—De Candolle, Syst. i, 454; Prodr. i, 80.—Bot. Mag. t. 2189.—Hayne, Dend. Fl. 117.—Elliott, Sk. ii, 40.—Sprengel, Syst. ii, 642.—Rafinesque, Med. Bot. ii, 31, t. 62.—Eaton, Manual, 6 ed. 218.—Sertum Botanicum, v & t.—Don, Miller's Dict. i, 83.—Croom in Am. Jour. Sci. 1 ser. xxv, 76.—Reichenbach, Fl. Exot. ii, 44, t. 139.—London, Arboretum, i, 271 & t.—Eaton & Wright, Bot. 312.—Torrey & Gray, Fl. N. America, i, 43.—Spach, Hist. Veg. vii, 479.—Dietrich, Syn. iii, 308.—Griffith, Med. Bot. 98, f. 57.—Darby, Bot. S. States, 211.—Cooper in Smithsonian Rep. 1858, 250.—Seringe, Fl. Jard. iii, 230.—Chapman, Fl. S. States, 14.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 67.—Wood, Cl. Book, 214; Bot. & Fl. 25.—Gray, Manual N. States, 5 ed. 49.—Koch, Dendrologie, i, 374.—Vasey, Cat. Forest Trees, 6.

LARGE-LEAVED CUCUMBER TREE.

North Carolina, eastern base of the Alleghany mountains (Iredell and Lincoln counties); southeastern Kentucky southward to middle and western Florida and southern Alabama, extending west to the valley of Pearl river, Louisiana; central Arkansas (Garland, Montgomery, Hot Springs, and Sebastian counties).

A tree 6 to 18 meters in height, with a trunk rarely 0.60 meter in diameter; rich woods, reaching its greatest development in the limestone valleys of northern Alabama; rare and local.

Wood light, hard, not strong, close-grained, compact, satiny; medullary rays numerous, thin; color, brown, the sap-wood light yellow; specific gravity, 0.5309; ash, 0.35.

6.—Magnolia Umbrella, Lamarck,

Dict. iii, 673.—Nouveau Duhamel, ii, 221.—De Candolle, Prodr. i, 80.—Loiseleur, Herb. Amat. iii, t. 198.—Sprengel, Syst. ii, 642.—Don, Miller's Dict. i, 83.—Torrey & Gray, Fl. N. America, i, 43.—Spach, Hist. Veg. vii, 475.—Dietrich, Syn. iii, 308.—Seringe, Fl. Jard. iii, 227.—Gray, Genera, i, 62, t. 24; Proc. Linnæan Soc. ii, 106, f. 1-18; Manual N. States, 5 ed. 49.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 13.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 67.—Wood, Cl. Book, 214; Bot. & Fl. 25.—Porcher, Resources S. Forests, 38.—Vasey, Cat. Forest Trees, 6.

M. Virginiana, var. *tripetala*, Linnæus, Spec. 1 ed. 536.

M. tripetala, Linnæus, Spec. 2 ed. 756.—Marshall, Arbustum, 84.—Walter, Fl. Caroliniana, 159.—B. S. Barton, Coll. i, 14.—Aiton, Hort. Kew. ii, 252; 2 ed. iii, 331.—Willdenow, Spec. ii, 1258; Enum. i, 579.—Michaux, Fl. Bor.-Am. i, 327.—Desfontaines, Hist. Arb. ii, 5.—De Candolle, Syst. i, 452.—Michaux f. Hist. Arb. Am. iii, 90, t. 5; N. American Sylva, 3 ed. ii, 20, t. 5.—Pursh, Fl. Am. Sept. ii, 381.—Nuttall, Genera, ii, 18; Sylva, i, 84; 2 ed. i, 100.—Guimpel, Otto & Hayne, Abb. Holz. 20, t. 18.—Hayne, Dend. Fl. 116.—Elliott, Sk. ii, 38.—Torrey, Compend. Fl. N. States, 221.—Rafinesque, Med. Bot. ii, 32.—Eaton, Manual, 6 ed. 218.—Eaton & Wright, Bot. 312.—Griffith, Med. Bot. 98.—Loudon, Arboretum, i, 269, t. 5.—Darby, Bot. S. States, 211.—Koch, Dendrologie, i, 370.—Nat. Dispensatory, 2 ed. 891.

UMBRELLA TREE. ELK WOOD.

Southeastern Pennsylvania, southward along the Alleghany mountains to central Alabama (Prattville, *Mohr*) and northeastern Mississippi, westward through Kentucky and Tennessee; in central (Hot Springs) and southwestern Arkansas (Fulton, valley of the Red river, *Harvey*).

A small tree, rarely exceeding 12 meters in height, with a trunk 0.10 to 0.40 meter in diameter; rich, shady hillsides; most common and reaching its greatest development along the western slope of the southern Alleghany mountains.

Wood light, soft, not strong, close-grained, compact; medullary rays very numerous, thin; color, brown, the heavier sap-wood nearly white; specific gravity, 0.4487; ash, 0.20.

7.—Magnolia Fraseri, Walter,

Fl. Caroliniana, i, 59 & t.—Torrey & Gray, Fl. N. America, i, 43.—Walpers, Rep. i, 70.—Dietrich, Syn. iii, 308.—Chapman, Fl. S. States, 14.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 68.—Wood, Cl. Book, 214; Bot. & Fl. 25.—Gray, Manual N. States, 5 ed. 49.—Koch, Dendrologie, i, 372.—Vasey, Cat. Forest Trees, 6.

M. auriculata, Lamarck, Dict. iii, 673.—Bartram, Travels, 2 ed. 337.—Willdenow, Spec. ii, 1258; Enum. i, 579.—Michaux, Fl. Bor.-Am. i, 328.—Nouveau Duhamel, ii, 222.—Desfontaines, Hist. Arb. ii, 5.—Michaux f. Hist. Arb. Am. iii, 94, t. 6; N. American Sylva, 3 ed. ii, 23, t. 56.—Andrews, Bot. Rep. ix, t. 573.—Bot. Mag. t. 1206.—Cubières, Mem. Mag. & t.—Aiton, Hort. Kew. 2 ed. iii, 332.—Pursh, Fl. Am. Sept. ii, 382.—Nuttall, Genera, ii, 18; Sylva, i, 84; 2 ed. i, 98.—De Candolle, Syst. i, 454; Prodr. i, 80.—Hayne, Dend. Fl. 117.—Elliott, Sk. ii, 39.—Sprengel, Syst. ii, 642.—Audubon, Birds, t. 38.—Don, Miller's Dict. i, 83.—Eaton, Manual, 6 ed. 218.—Hooker, Jour. Bot. i, 188.—Spach, Hist. Veg. vii, 477.—Loudon, Arboretum, i, 276 & t.—Seringe, Fl. Jard. iii, 229.

M. pyramidata, Bartram, Travels, 2 ed. 338.—Pursh, Fl. Am. Sept. ii, 382.—De Candolle, Syst. i, 454; Prodr. i, 80.—Hayne, Dend. Fl. 117.—Lindley, Bot. Reg. v, t. 407.—Loddiges, Bot. Cab. t. 1092.—Rafinesque, Med. Bot. ii, 32.—Don, Miller's Dict. i, 83.—Eaton, Manual, 6 ed. 221.—London, Arboretum, i, 277 & t.—Seringe, Fl. Jard. iii, 230.—Darby, Bot. S. States, 211.

M. auricularis, Salisbury, Parad. Lond. i, t. 43.—Kerner, Hort. t. 360.

LONG-LEAVED CUCUMBER TREE.

Alleghany mountains, from Virginia southward to the Chattahoochee region of western Florida, and southern Alabama (Clark county, *Mohr*), extending west to the valley of Pearl river, Mississippi.

A small tree, 8 to 12 meters in height, with a trunk 0.15 to 0.20 meter in diameter; rich woods.

Wood light, soft, not strong, close-grained, compact; medullary rays very numerous, thin; color, brown, the sap-wood nearly white; specific gravity, 0.5003; ash, 0.28.

8.—Liriodendron Tulipifera, Linnæus,

Spec. 1 ed. i, 535.—Kalm, Travels, English ed. i, 202.—Marshall, Arbustum, 78.—Wangenheim, Amer. 32, t. 13, f. 32.—Walter, Fl. Caroliniana, 158.—Schmidt, Arb. i, 48.—B. S. Barton, Coll. i, 14, 45.—Aiton, Hort. Kew. ii, 250; 2 ed. iii, 329.—Gærtner, Fruct. ii, t. 178.—Bot. Mag. t .275.—Mœnch, Meth. 222.—Abbot, Insects Georgia, ii, t. 102.—Schkuhr, Handb. ii, 93, t. 147.—Trew, Icon. t. 10.—Willdenow, Spec. ii, 1254; Enum. i, 579.—Michaux, Fl. Bor.-Am. i, 326.—Nouveau Duhamel, iii, 62, t. 18.—Desfontaines, Hist. Arb. ii, 15.—Poiret in Lamarck, Dict. viii, 137; Ill. iii, 36, t. 491.—St. Hilaire, Pl. France, iii, t. 377.—Titford, Hort. Bot. Am. 76.—Michaux f. Hist. Arb. Am. iii, 202, t. 5; N. American Sylva, 3 ed. ii, 35, t. 61.—Eaton, Manual, 63; 6 ed. 208.—Nuttall, Genera, ii, 18; Sylva, i, 84; 2 ed. i, 100.—Barton, Prodr. Fl. Philadelph. 59; Med. Bot. i, 91, t. 8; Compend. Fl. Philadelph. ii, 18.—De Candolle, Syst. i, 462; Prodr. i, 82.—Bigelow, Med. Bot. ii, 107, t. 31.—Hayne, Dend. Fl. 115.—Elliott, Sk. ii, 40.—Torrey, Compend. Fl. N. States, 221; Fl. N. York, i, 28.—Rafinesque, Med. Bot. ii, 239.—Guimpel, Otto & Hayne, Abb. Holz. 34, t. 29.—Cobbett, Woodlands, No. 516.—Sprengel, Syst. ii, 642.—Audubon, Birds, t. 12.—Don, Miller's Dict. i, 86.—Beck, Bot. 15.—Lindley, Fl. Med. 23.—Spach, Hist. Veg. vi, 488.—London, Arboretum, i, 284 & t.—Eaton & Wright, Bot. 302.—Penn. Cycl. xxv, 341.—Torrey & Gray, Fl. N. America, i, 44.—Dietrich, Syn. iii, 309.—Griffith, Med. Bot. 98, f. 58.—Emerson, Trees Massachusetts, 529; 2 ed. ii, 605 & t.—Seringe, Fl. Jard. iii, 240.—Gray, Genera, i, 64, t. 25; Manual N. States, 5 ed. 50.—Darlington, Fl. Cestrica, 3 ed. 9.—Darby, Bot. S. States, 212.—Agardh, Theor. & Syst. Pl. t. 11, f. 2.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 14.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 77.—Lemaire, Ill. Hort. 15, t. 571.—Wood, Cl. Book, 215; Bot. & Fl. 25.—Porcher, Resources S. Forests, 39.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 183.—Baillon, Hist. Pl. i, 143, f. 175–178.—Koch, Dendrologie, i, 380.—Guibourt, Hist. Drogues, 7 ed. iii, 746.—Ridgway in Am. Nat. vi, 663; Proc. U. S. Nat. Mus. 1882, 59.—Vasey, Cat. Forest Trees, 6.—Eichler, Sit. Bot. Brand. xxii, 83, f. 1–3.—Bell in Geological Rep. Canada, 1879–'80, 53c.

Tulipifera Liriodendron, Miller, Dict. No. 1.

L. procera, Salisbury, Prodr. 379.

TULIP TREE. YELLOW POPLAR. WHITE WOOD.

Southwestern Vermont, through western New England, southward to northern Florida (latitude 30°); west through New York, Ontario, and Michigan to lake Michigan, south of latitude 43° 30′, thence south to latitude 31° in the Gulf states east of the Mississippi river; through southern Illinois and southeastern Missouri to Crowley's ridge, northeastern Arkansas.

One of the largest and most valuable trees of the Atlantic forests, 30 to 60 meters in height, with a trunk 2 to 4 meters in diameter (*Ridgway*); rich woods and intervale lands, reaching its greatest development in the valley of the lower Wabash river and along the western slopes of the Alleghany mountains in Tennessee and North Carolina.

Wood light, soft, not strong, brittle, very close straight-grained, compact, easily worked; medullary rays numerous, not prominent; color, light yellow or brown, the thin sap-wood nearly white; specific gravity, 0.4230; ash, 0.23; largely manufactured into lumber and used for construction, interior finish, shingles, in boat-building, and especially in the manufacture of wooden pumps, woodenware, etc.; varieties varying slightly in color and density are recognized by lumbermen.

Liriodendrin, a stimulant tonic, with diaphoretic properties, is obtained by macerating the inner bark, especially of the root (*Jour. Philadelphia Col. Phar.* iii. 5.—*U. S. Dispensatory*, 14 ed. 556.—*Nat. Dispensatory*, 2 ed. 871).

ANONACEÆ.

9.—Asimina triloba, Dunal,

Mon. Anon. 83.—De Candolle, Syst. i, 479; Prodr. i, 87.—Elliott, Sk. ii, 42.—Guimpel, Otto & Hayne, Abb. Holz. 66, t. 53.—Hayne, Dend. Fl. 118.—Sprengel, Syst. ii, 639.—Torrey, Compend. Fl. N. States, 222; Ann. Lyc. N. York, ii, 165 —Beck, Bot. 16.—Don, Miller's Dict. i, 91.—Nuttall in Jour. Philadelphia Acad. vii, 11.—Dietrich, Syn. iii, 304.—London, Arboretum, i, 293, f. 39.—Gray, Genera, i, 69, t. 26, 27; Manual N. States, 5 ed. 50.—Parry in Owen's Rep. 609.—Darlington, Fl. Cestrica, 3 ed. 9.—Darby, Bot. S. States, 212.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 15.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 94.—Lesquereux in Owen's 2d Rep. Arkansas, 347.—Maout & Decaisne, Bot. English ed. 199 & figs.—Bot. Mag. t. 5854.—Wood, Cl. Book, 215; Bot. & Fl. 26.—Porcher, Resources S. Forests, 41.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 183.—Koch, Dendrologie, ii, 383.—Young, Bot. Texas, 149.—Vasey, Cat. Forest Trees, 6.—Ridgway in Proc. U. S. Nat. Mus. 1882, 60.—Burgess in Coulter's Bot. Gazette, vii, 95.

Anona triloba, Linnæus, Spec. 1 ed. 537.—Marshall, Arbustum, 10.—Lamarck, Dict. ii, 125.—Walter, Fl. Caroliniana, 158.—B. S. Barton, Coll. i, 29.—Aiton, Hort. Kew. ii, 254; 2 ed. iii, 335.—Willdenow, Spec. ii, 1267; Enum. i, 580.—Nouveau Duhamel, ii, 83, t. 25.—Desfontaines, Hist. Arb. ii, 21.—Michaux f. Hist. Arb. Am. iii, 161, t. 9; N. American Sylva, 3 ed. ii, 33, t. 60.—Barton, Prodr. Fl. Philadelph. 59.—Schkuhr, Handb. ii, 95, t. 149.

Anona pendula, Salisbury, Prodr. 380.

Orchidocarpum arietinum, Michaux, Fl. Bor.-Am. i, 329.

Porcelia triloba, Persoon, Syn. ii, 95.—Pursh, Fl. Am. Sept. ii, 383.—Rafinesque, Fl. Ludoviciana, 92.—Barton, Compend. Fl. Philadelph. ii, 18.—Nuttall, Genera, ii, 19.—Poiret, Suppl. iv, 529.—Eaton, Manual, 6 ed. 278.—Audubon, Birds, t. 2, 162.—Eaton & Wright, Bot. 371.

Uvaria triloba, Torrey & Gray, Fl. N. America, i, 45.—Torrey, Fl. N. York, i, 30.—Caruel in Ann. Mus. Firenze, 1864, 9, t. 1, f. 1-7.—Baillon, Adansonia, viii, 333; Hist. Pl. i, 193, f. 220-228.

A. campaniflora, Spach, Hist. Veg. vii, 529.

PAPAW. CUSTARD APPLE.

Western New York (Lockport and in Monroe county); Ontario (Queenstown heights); eastern and central Pennsylvania, west to southern Michigan, southern Iowa, and eastern Kansas (Manhattan), south to middle Florida and the valley of the Sabine river, Texas.

A small tree, sometimes 12 meters in height, with a trunk rarely exceeding 0.30 meter in diameter, or often reduced to a slender shrub; rich, rather low woods, reaching its greatest development in the lower Wabash valley and in the valley of the White river, Arkansas.

Wood very light, very soft and weak, coarse-grained, spongy; layers of annual growth clearly marked by several rows of large open ducts; color, light yellow shaded with green, the sap-wood lighter; specific gravity, 0.3969; ash, 0.21.

10.—Anona laurifolia, Dunal,

Mon. Anon. 65.—De Candolle, Syst. i, 468; Prodr. i, 84.—Sprengel, Syst. ii, 641.—Lindley, Bot. Reg. xvi, t. 1328.—Schnizlein, Icon. t. 174, f. 9.—Grisebach, Fl. British West Indies, 4.—Cooper in Smithsonian Rep. 1860, 439.—Chapman, Fl. S. States, Suppl. 603.

A. glabra, Chapman in Coulter's Bot. Gazette, iii, 2 [not Linnæus].

A. species, Vasey, Cat. Forest Trees, 6.

POND APPLE.

Semi-tropical Florida, cape Malabar to bay Biscayne, on the west coast, Pease creek to the Caloosa river, and through the West Indies.

A small tree, sometimes 9 meters in height, with a trunk 0.30 meter in diameter, or toward its northern limit and on the west coast often reduced to a stout, wide-spreading shrub; common and reaching its greatest development within the United States on the low islands and shores of the Everglades in the neighborhood of bay Biscayne.

Wood light, soft, not strong, rather close-grained, compact, containing many scattered open ducts; color, light brown streaked with yellow, sap-wood lighter; specific gravity, 0.5053; ash, 4.86.

The large fruit (0.14 to 0.28 meter long) scarcely edible.

CAPPARIDACEÆ.

11.—Capparis Jamaicensis, Jacquin,

Stirp. Am. 160, t. 101.—Aiton, Hort. Kew. 2 ed. iii, 285.—De Candolle, Prodr. i, 252.—Descourtilz, Fl. Med. Antilles, v. t. 273.—Macfadyen, Fl. Jamaica, 39.—Grisebach, Fl. British West Indies, 18.—Chapman, Fl. S. States, 32.—Porcher, Resources S. Forests, 75.—Eichler in Martius, Fl. Brasil. xiii, 270, t. 64, f. 11.—Vasey, Cat. Forest Trees, 6.

C. Breynia, Linnæus, Spec. 2 ed. 721, in part.—Aiton, Hort. Kew. 2 ed. iii, 285.—De Candolle, Prodr. i, 252, in part.—Swartz, Obs. 210 [not Jacquin].—Macfadyen, Fl. Jamaica, 39.

C. cynophyllophora, Linnæus, Spec. 1 ed. 504 [not subsequent ed. *fide* Eichler, *l. c.*].—Aiton, Hort. Kew. 2 ed. iii, 285.—Macfadyen, Fl. Jamaica, 39.

C. siliquosa, Linnæus, Spec. 2 ed. 721.

C. torulosa, Swartz, Prodr. 81.—De Candolle, Prodr. i, 252.—Grisebach, Fl. British West Indies, 18.

C. uncinata, Loddiges, Cat. [not Wallich].

C. emarginata, Richard, Fl. Cuba, 78, t. 9.—Walpers, Rep. i, 201.

Semi-tropical Florida, cape Canaveral to the southern keys; in the West Indies and southward to Brazil.

A small tree, sometimes 6 meters in height, with a trunk 0.15 meter in diameter, or reduced to a low shrub; common and reaching its greatest development within the United States on Upper Metacombe and Umbrella Keys.

Wood heavy, hard, close-grained, compact, satiny, containing many evenly-distributed large open ducts; medullary rays numerous, obscure; color, yellow tinged with red, the sap-wood lighter; specific gravity, 0.6971; ash, 4.76.

CANELLACEÆ.

12.—Canella alba, Murray;

Linnæus, Syst. 14 ed. iv, 443.—Swartz, Obs. 190; Trans. Linnæan Soc. i, 96, t. 8.—Willdenow, Spec. ii, 851; Enum. i, 496.—Aiton, Hort. Kew. 2 ed. iii, 144.—Titford, Hort. Bot. Am. Suppl. 3, t. 10, f. 4.—De Candolle, Prodr. i, 563.—Hayne, Arzn. 9, t. 5.—Stevenson & Churchill, Med. Bot. ii, t. 66.—Woodville, Med. Bot. 3 ed. iv, 694, t. 237.—Lindley, Med. Bot. 116.—Carson, Med. Bot. i, 24, t. 16.—Griffith, Med. Bot. 181, f. 98.—Miers in Ann. Nat. Hist. 3 ser. i, 348; Contrib. i, 116.—Grisebach, Fl. British West Indies, 109.—Chapman, Fl. S. States, 93.—Guibourt, Hist. Drogues, 7 ed. iii, 621, f. 767.—Vasey, Cat. Forest Trees, 7.—Bentley & Trimen, Med. Pl. i, 26, t. 26.

C. Winterana, Gærtner, Fruct. i, 377, t. 77.

Wintera Canella, Linnæus, Spec. 2 ed. 636.—Poiret in Lamarck, Dict. viii, 799, t. 399.

C. laurifolia, Loddiges, Cat.—Sweet, Hort. Brit. 65.—Don, Miller's Dict. i, 680.

WHITE WOOD. CINNAMON BARK. WILD CINNAMON.

Semi-tropical Florida, on the southern keys (Elliott's Key, Key Largo to Jew Fish Key); through the West Indies.

A small tree, often 10 meters in height, with a trunk 0.22 meter in diameter; not rare.

Wood very heavy, exceedingly hard, strong, close-grained, compact; medullary rays numerous, thin; color, dark reddish-brown, the sap-wood light brown or yellow; specific gravity, 0.9893; ash, 1.75.

The pale inner bark appears in the *Pharmacopœa* under the name of *Cortex canellæ albæ*, furnishing an aromatic stimulant and tonic, occasionally employed in cases of debility of the digestive organs, or as an adjunct to more active remedies (*Miers, l. c.—Flückiger & Hanbury, Pharmacographia*, 68.—*U. S. Dispensatory*, 14 ed. 210.—*Nat. Dispensatory*, 2 ed. 337).

GUTTIFERÆ.

13.—Clusia flava, Linnæus,

Spec. 2 ed. 1495.—Willdenow, Spec. iv, 977; Enum. ii, 1043.—Aiton, Hort. Kew. 2 ed. v, 444.—Titford, Hort. Bot. Am. 105.—De Candolle, Prodr. i, 559.—Macfadyen, Fl. Jamaica, 134.—Nuttall, Sylva, ii, 111, t. 77; 2 ed. ii, 58, t. 77.—Grisebach, Fl. British West Indies, 407.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 43.—Planchon & Triana in Ann. Sci. Nat. 4 ser. xiii, 352.—Walpers, Ann. vii, 340.—Vasey, Cat. Forest Trees, 7.

C. rosea, Torrey & Gray, Fl. N. America, i, 168.

Jamaica and other West Indian islands; Key West (*Blodgett*) prior to 1840. Not detected by later explorers (*Palmer*, *Garber*, *Chapman*, *Curtiss*) of the botany of semi-tropical Florida, and probably not now growing spontaneously within the limits of the United States.

Wood not examined.

TERNSTRŒMIACEÆ.

14.—Gordonia Lasianthus, Linnæus,

Mant. i, 570.—Ellis, Phil. Trans. 60, 518, t. 11; Letters, t. 2.—L'Heritier, Stirp. Nov. 156.—Cavanilles, Diss. ii, 307, t. 161.—Walter, Fl. Caroliniana, 177.—Aiton, Hort. Kew. ii, 231; 2 ed. iv, 234.—Lamarck, Dict. ii, 770; Ill. iii, 146, t. 594, f. 1.—Swartz, Obs. 271.—Willdenow, Spec. iii, 840.—Michaux, Fl. Bor.-Am. ii, 43.—Bot. Mag. t. 668.—Nouveau Duhamel, ii, 236, t. 68.—Desfontaines, Hist. Arb. i, 484.—Persoon, Syn. ii, 259.—Michaux f. Hist. Arb. Am. iii, 131, t. 1; N. American Sylva, 3 ed. ii, 29, t. 58.—Pursh, Fl. Am. Sept. i, 451.—Nuttall, Genera, ii, 84.—De Candolle, Prodr. i, 528.—Elliott, Sk. ii, 171.—Sprengel, Syst. iii, 125.—Don, Miller's Dict. i, 573, f. 99.—Audubon, Birds, t. 168.—Reichenbach, Fl. Exot. t. 151.—Spach, Hist. Veg. iv, 79.—Loudon, Arboretum, i, 379, f. 93.—Torrey & Gray, Fl. N. America, i, 223.—Eaton, Manual, 6 ed. 161.—Eaton & Wright, Bot. 258.—Browne, Trees of America, 52.—Dietrich, Syn. iv, 862.—Gray, Genera, ii, 103, t. 140, 141; Manual N. States, 5 ed. 104.—Choisy, Mem. Ternst. & Camel. 51.—Darby, Bot. S. States, 256.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 60.—Curtis in Rep. Geological Surv. N. Carolina 1860, iii, 80.—Maout & Decaisne, English ed. 274 & figs.—Wood, Cl. Book, 274; Bot. & Fl. 65.—Baillon, Hist. Pl. iv, 230, f. 254, 255.—Vasey, Cat. Forest Trees, 7.

Hypericum Lasianthus, Linnæus, Spec. 1 ed. 783.—Hill, Veg. Syst. xv, t. 1, f. 3.

G. pyramidalis, Salisbury, Prodr. Stirp. 386.

LOBLOLLY BAY. TAN BAY.

Southern Virginia, south near the coast to cape Malabar, and cape Romano, Florida, west along the Gulf coast to the valley of the Mississippi river.

A tree 15 to 24 meters in height, with a trunk often 0.45 to 0.50 meter in diameter; low, sandy swamps.

Wood light, soft, not strong, close-grained, compact, not durable; medullary rays numerous, thin; color, light red, the sap-wood lighter; specific gravity, 0.4728; ash, 0.76; somewhat employed in cabinet-making.

The bark, rich in tannin, was once occasionally used, locally, in tanning leather (*Bartram, Travels*, 2 ed. 160).

15.—Gordonia pubescens, L'Heritier,

Stirp. Nov. 156.—Lamarck, Dict. ii, 770.—Cavanilles, Diss. ii, 308, t. 162.—Aiton, Hort. Kew. ii, 231; 2 ed. iv, 234.—Willdenow, Spec. iii, 841.—Michaux, Fl. Bor.-Am. ii, 43.—Ventenat, Jard. Malm. t. 1 (Schrader, Neues Jour. Bot. 1806, 121).—Nouveau Duhamel, ii, 237.—Kœnig & Sims, Ann. Bot. i, 171.—Desfontaines, Hist. Arb. i, 484.—Persoon, Syn. ii, 259.—Michaux f. Hist. Arb. Am. iii, 135, t. 2; N. American Sylva, 3 ed. ii, 31, t. 59.—Pursh, Fl. Am. Sept. ii, 451.—Nuttall, Genera, ii, 84.—Loiseleur, Herb. Amat. iv, t. 236.—Elliott, Sk. ii, 171.—De Candolle, Prodr. i, 528.—Sprengel, Syst. iii, 125.—Don, Miller's Dict. i, 573.—Eaton, Manual, 6 ed. 161.—Audubon, Birds, t. 185.—Spach, Hist. Veg. iv, 80.—Loudon, Arboretum, i, 380, f. 94.—Torrey & Gray, Fl. N. America, i, 223.—Eaton & Wright, Bot. 258.—Browne, Trees of America, 54.—Dietrich, Syn. iv, 862.—Gray, Genera, ii, 102, t. 141, f. 11-14, t. 142.—Choisy, Mem. Ternst. & Camel. 51.—Darby, Bot. S. States, 257.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 60.—Wood, Cl. Book, 274; Bot. & Fl. 65.—Vasey, Cat. Forest Trees, 7.—Goodale & Sprague, Wild Flowers, 193, t. 47.

Franklinia Altamaha, Marshall, Arbustum, 49.—Bartram, Travels, 2 ed. 16, 465.—Rafinesque, Atlant. Jour. 79 & f.

G. Franklini, L'Heritier, Stirp. Nov. 156.—Willdenow, Spec. iii, 841.—Nouveau Duhamel, ii, 237.—Desfontaines, Hist. Arb. i, 484.—Persoon, Syn. ii, 259.—Poiret, Suppl. ii, 816.

Michauxia sessilis, Salisbury, Prodr. Stirp. 386.

Lacathea florida, Salisbury, Parad. Lond. t. 56.—Colla, Hort. Ripul. Appx. i, 134.

FRANKLINIA.

Near Fort Barrington, on the Altamaha river, Georgia (*J. & W. Bartram*, *Dr. Moses Marshall*).

Careful explorations of Bartram's original locality by later botanists, especially by Mr. H. W. Ravenel, have failed to rediscover this species, which is, however, still preserved in cultivation through the original plants introduced by the Bartrams. "Florida" given as a locality by Torrey & Gray, *l. c.*, on the authority of *Herb. Schweinitz*, and followed by Chapman, *l. c.*, is probably an error (*Ravenel in Am. Naturalist*, xvi, 235).

STERCULIACEÆ.

16.—Fremontia Californica, Torrey,

Smithsonian Contrib. vi, 5, t. 2, f. 2; Proc. Am. Assoc. iv, 191; Pacific R. R. Rep. iv, 15, 71.—Newberry in Pacific R. R. Rep. vi, 68.—Walpers, Ann. iv, 319.—Gray in Jour. Boston Soc. Nat. Hist. vii, 146.—Bentham & Hooker, Genera, i, 212, 982.—Bot. Mag. t. 5591.—Lemaire, Ill. Hort. xiii, t. 496.—Belgo Hort. xvii, 236, t. 13.—Carrière in Rev. Hort. 1867, 91 & t.—Koch, Dendrologie, i, 483.—Masters in London Gard. Chronicle, 1869, 610.—Seemann, Jour. Bot. vii, 297.—London Garden, 1873, 54 & t.—Planchon in Fl. des Serres, xxii, 175.—Brewer & Watson, Bot. California, i, 88; ii, 437.—Rothrock in Wheeler's Rep. vi, 41, 357.

Cheiranthodendron Californicum, Baillon, Hist. Pl. iv, 70.

SLIPPERY ELM.

California, valley of Pitt river, southward along the western foot-hills of the Sierra Nevada, and in the Santa Lucia mountains southward through the Coast ranges to the San Jacinto mountains; rare at the north, most common and reaching its greatest development on the southern sierras and the San Gabriel and San Bernardino ranges.

A small tree, 6 to 10 meters in height, the short trunk often 0.30 to 0.45 meter in diameter, or more often a tall, much branched shrub; dry, gravelly soil.

Wood heavy, hard, very close-grained, compact, satiny, containing many groups of small ducts parallel to the thin, conspicuous medullary rays, layers of annual growth obscure; color, dark brown tinged with red, the thick sap-wood lighter; specific gravity, 0.7142; ash, 1.69.

The mucilaginous inner bark used locally in poultices.

TILIACEÆ.

17.—Tilia Americana, Linnæus,

Spec. 1 ed. 514.—Marshall, Arbustum, 153.—Wangenheim, Amer. 55.—Aiton, Hort. Kew. ii, 229; 2 ed. iii, 299.—Willdenow, Spec. ii, 1162; Enum. i, 565.—Desfontaines, Hist. Arb. ii, 37.—Persoon, Syn. ii, 66.—Michaux f. Hist. Arb. Am. iii, 311, t. 1; N. American Sylva, 3 ed. iii, 81, t. 131.—Barton, Prodr. Fl. Philadelph. 58; Compend. Fl. Philadelph. ii, 6.—Eaton, Manual, 59.—James in Long's Exped. i, 69.—Watson, Dend. Brit. ii, 134, t. 134.—Torrey, Compend. Fl. N. States, 214; Fl. N. York, i, 116.—Loudon, Arboretum i, 373 & t.—Torrey & Gray, Fl. N. America, i, 239.—Bigelow, Fl. Boston. 3 ed. 227.—Emerson, Trees Massachusetts, 511; 2 ed. ii, 584 & t.—Browne, Trees of America, 47.—Gray, Genera, ii, 96, t. 136; Manual N. States, 5 ed. 103; Hall's Pl. Texas, 5.—Darlington, Fl. Cestrica, 3 ed. 38.—Darby, Bot. S. States, 262.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 59.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 79.—Lesquereux in Owen's 2d Rep. Arkansas, 352.—Wood, Cl. Book, 272; Bot. & Fl. 64.—Porcher, Resources S. Forests, 103.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 186.—Walpers, Ann. vii, 449.—Koch, Dendrologie, i, 480.—Young, Bot. Texas, 188.—Vasey, Cat. Forest Trees, 7.—Macoun in Geological Rep. Canada, 1875-'76, 191.—Sears in Bull. Essex Inst. xiii, 174.—Bell in Geological Rep. Canada, 1879-'80, 51c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 61.

T. nigra, Borkhausen, Handb. d. Forstbot. ii, 1219.

T. glabra, Ventenat in Mem. Acad. Sci. iv, 9, t. 2.—Nouveau Duhamel, i, 228.—Poiret in Lamarck, Dict. vii, 681.—Pursh, Fl. Am. Sept. ii, 362.—Nuttall, Genera, ii, 3.—De Candolle, Prodr. i, 513.—Hayne, Dend. Fl. 112.—Elliott, Sk. ii, 2.—Guimpel, Otto & Hayne, Abb. Holz. 55, t. 45.—Hooker, Fl. Bor.-Am. i, 108.—Don, Miller's Dict. i, 553.—Eaton, Manual, 6 ed. 365.—Beck, Bot. 59.—Darlington, Fl. Cestrica, 2 ed. 312.—Eaton & Wright, Bot. 452.—Dietrich, Syn. iii, 237.—Richardson, Arctic Exped. 422.

T. latifolia, Salisbury, Prodr. 367.

T. Canadensis, Michaux, Fl. Bor.-Am. 306.—Persoon, Syn. ii, 66.—Poiret in Lamarck, Dict. vii, 683.

T. neglecta, Spach, Ann. Sci. Nat. 2 ser. ii, 346, t. 15; Hist. Veg. iv, 27, 29.—Walpers, Rep. i, 359.

LIME TREE. BASS WOOD. AMERICAN LINDEN. LIN. BEE TREE.

Northern New Brunswick, westward in British America to about the one hundred and second meridian, southward to Virginia and along the Alleghany mountains to Georgia and southern Alabama; extending west in the United States to eastern Dakota, eastern Nebraska, eastern Kansas, the Indian territory, and southwest to the valley of the San Antonio river, Texas.

A large tree, 20 to 24 meters in height, with a trunk 0.90 to 1.20 meter in diameter, or, exceptionally, 30 to 45 meters in height, with a trunk 0.92 to 1.84 meter in diameter (valley of the lower Wabash river, *Ridgway*); common in all northern forests, and always an indication of rich soil; toward its western and southwestern limits only along river bottoms.

Wood light, soft, not strong, very close-grained, compact, easily worked; medullary rays numerous, rather obscure; color, light brown, or often slightly tinged with red, the sap-wood hardly distinguishable; specific gravity, 0.4525; ash, 0.55; largely used in the manufacture of woodenware and cheap furniture, for the panels and bodies of carriages, the inner soles of shoes, in turnery, and the manufacture of paper-pulp (the quickly-discolored sap renders it unfit for making white paper).

The inner bark, macerated, is sometimes manufactured into coarse cordage and matting; the flowers, rich in honey, highly prized by apiarists.

Aqua tiliæ, an infusion of the flowers, buds, and leaves of the different species of *Tilia*, is used in Europe as a domestic remedy in cases of indigestion, nervousness, etc. (*Nat. Dispensatory*, 2 ed. 1429).

Var. pubescens, London,

Arboretum, i, 374 & t.—Browne, Trees of America, 48.—Gray, Manual N. States, 5 ed. 103; Hall's Pl. Texas, 5.

T. Caroliniana, Miller, Dict. No. 4.—Wangenheim, Amer. 56.—Marshall, Arbustum, 154.

T. Americana, Walter, Fl. Caroliniana, 153 [not Linnæus].

T. pubescens, Aiton, Hort. Kew. ii, 229; 2 ed. iii, 299.—Willdenow, Spec. ii, 1162; Enum. i, 566.—Ventenat in Mem. Acad. Sci. iv, 10, t. 3.—Nouveau Duhamel, i, 228, t. 51.—Persoon, Syn. ii, 66.—Desfontaines, Hist. Arb. ii, 37.—Michaux f. Hist. Arb. Am. iii, 317, t. 3; N. American Sylva, 3 ed. iii, 85, t. 133.—Pursh, Fl. Am. Sept. ii, 363.—De Candolle, Prodr. i, 513.—Hayne, Dend. Fl. 112.—Elliott, Sk. ii, 3.—Watson, Dend. Brit. ii, t. 135.—Torrey, Comp. Fl. N. States, 215.—Don, Miller's Dict. i, 553.—Eaton, Manual, 6 ed. 365.—Beck, Bot. 59.—Eaton & Wright, Bot. 452.—Penn. Cycl. xxiv, 447.—Dietrich, Syn. iii, 237.—Darby, Bot. S. States, 262.—Chapman, Fl. S. States, 59.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 79.—Walpers, Ann. vii, 449.—Koch, Dendrologie, i, 479.—Vasey, Cat. Forest Trees, 7.

T. laxiflora, Michaux, Fl. Bor.-Am. i, 306.—Poiret in Lamarck, Dict. vii, 683.—Persoon, Syn. ii, 66.—Willdenow, Enum. Suppl. 38.—De Candolle, Prodr. i, 513.—Hayne, Dend. Fl. 113.—Torrey, Compend. Fl. N. States, 215.—Don, Miller's Dict. i, 553.—Eaton, Manual, 6 ed. 365.—Beck, Bot. 59.—Spach, Ann. Sci. Nat. 2 ser. ii, 343, t. 15; Hist. Veg. iv, 32.—Browne, Trees of America, 48.—Dietrich, Syn. iii, 237.

T. grata, Salisbury, Prodr. 367.

T. pubescens, var. *leptophylla*, Pursh, Fl. Am. Sept. ii, 63.

? *T. stenopetala*, Rafinesque, Fl. Ludoviciana, 92.—Robin, Voyages, iii, 484.

T. truncata, Spach, Ann. Sci. Nat. 2 ser. ii, 342; Hist. Veg. iv, 30.—Dietrich, Syn. iii, 237.

T. Americana, var. *Walteri*, Wood, Cl. Book, 272; Bot. & Fl. 64.

North Carolina to the Chattahoochee region of western Florida, usually near the coast; Houston, Texas (*E. Hall*).

A small tree, rarely exceeding 15 meters in height, with a trunk 0.30 meter in diameter; swamps or low ground; rare, or often confounded with the typical *T. Americana*.

Wood lighter, but not otherwise distinguishable from that of *T. Americana*; specific gravity 0.4074; ash, 0.65.

18.—Tilia heterophylla, Ventenat,

Mem. Acad. Sci. iv, 16, t. 5.—Nouveau Duhamel, i, 229.—Poiret in Lamarck, Dict. vii, 683.—Pursh, Fl. Am. Sept. ii, 363.—Nuttall, Genera, ii, 3; Sylva, i, 90, t. 23; 2 ed. i, 107, t. 23.—De Candolle, Prodr. i, 513.—Don, Miller's Dict. i, 553.—Eaton, Manual, 6 ed. 365.—Spach in Ann. Sci. Nat. 2 ser. ii, 345; Hist. Veg. iv, 34.—Torrey & Gray, Fl. N. America, i, 239.—Eaton & Wright, Bot. 452.—Penn. Cycl. xxiv, 447.—Walpers, Rep. i, 359.—Dietrich, Syn. iii, 237.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 60.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 79.—Wood, Cl. Book, 272; Bot. & Fl. 64.—Gray, Manual N. States, 5 ed. 103.—Vasey, Cat. Forest Trees, 7.—Nat. Dispensatory, 2 ed. 1429.—Ridgway in Proc. U. S. Nat. Mus. 1882, 61.

T. alba, Michaux f. Hist. Arb. Am. iii, 315, t. 2; N. American Sylva, 3 ed. iii, 84, t. 132 [not Waldstein & Kitaibel].—Eaton & Wright, Bot. 452.—Darby, Bot. S. States, 262.

T. laxiflora, Pursh, Fl. Am. Sept. ii, 363 [not Michaux].—Elliott, Sk. ii, 2.

T. Americana, var. *heterophylla*, Loudon, Arboretum, i, 375 & t.

T. heterophylla, var. *alba*, Wood, Cl. Book, 272; Bot. & Fl. 64.

WHITE BASS WOOD. WAHOO.

Mountains of Pennsylvania, southward along the Alleghany mountains to northern Alabama and Florida (valley of the Apalachicola river, opposite Chattahoochee, *Mohr*), west to middle Tennessee and Kentucky, southern Indiana, and southern and central Illinois (valley of the Illinois river).

A tree 15 to 20 meters in height, with a trunk 0.60 to 1.20 meter in diameter; rich woods and river bottoms, often on limestone; most common and reaching its greatest development along the western slopes of the southern Alleghany mountains and in middle Tennessee.

Wood light, soft, not strong, close-grained, compact, easily worked; medullary rays numerous, obscure; color, light brown, the sap-wood hardly distinguishable; specific gravity, 0.4253; ash, 0.62; generally confounded with that of *Tilia Americana*, and used for similar purposes.

MALPIGHIACEÆ.

19.—Byrsonima lucida, HBK.

Nov. Gen. & Spec. v, 147.—De Candolle, Prodr. i, 580.—Jussieu, Mon. Malpig. ii, 40.—Walpers, Rep. v, 168.—Richard, Fl. Cuba, 115, t. 28a.—Grisebach, Fl. British West Indies, 115.—Chapman, Fl. S. States, 82.

Malpighia lucida, Swartz, Fl. Ind. Occ. ii, 852.

TALLOWBERRY. GLAMBERRY.

Semi-tropical Florida, on the southern keys (Boca Chica, No-Name Key, etc.); through the West Indies.

A small tree, sometimes 6 to 8 meters in height, with a trunk 0.15 to 0.25 meter in diameter, or often branching from the ground, and frutescent in habit.

Wood light, soft, weak, close-grained, compact; medullary rays numerous, thin; color, light red, the sap-wood a little lighter; specific gravity, 0.5888; ash, 2.46.

Fruit edible.

ZYGOPHYLLACEÆ.

20.—Guaiacum sanctum, Linnæus,

Spec. 1 ed. 382.—De Candolle, Prodr. i, 707.—Nuttall, Sylva, iii, 16, t. 86; 2 ed. ii, 86, t. 86.—Gray, Genera, ii, 123, t. 148.—Schnizlein, Icon. t. 253, f. 21.—Cooper in Smithsonian Rep. 1858, 264.—Grisebach, Fl. British West Indies, 134.—Chapman, Fl. S. States, 64.—Wood, Bot. & Fl. 67.—Vasey, Cat. Forest Trees, 7.

G. verticale, Richard, Fl. Cuba, 321.

LIGNUM-VITÆ.

Semi-tropical Florida, Upper Metacombe and Lignum-Vitæ Keys, common; Lower Metacombe and Umbrella Keys, rare; in the Bahamas, St. Domingo, Cuba, Porto Rico, etc.

A low, gnarled tree, not exceeding, within the limits of the United States, 8 meters in height, with a trunk sometimes 0.30 meter in diameter.

Wood exceedingly heavy, very hard, strong, brittle, close-grained, compact, difficult to work, splitting irregularly, containing many evenly-distributed resinous ducts; medullary rays numerous, obscure; color, rich yellow-brown, varying in older specimens to almost black, the sap-wood light yellow; specific gravity, 1.1432; ash, 0.82; used in turnery and for the sheaves of ships' blocks, for which it is preferred to other woods.

Lignum Guaiaci, *Guaiacum wood*, the heart of this and the allied *G. officinale*, Linnæus, formerly largely used in the treatment of syphilis, is now only retained in the *Materia Medica* as an ingredient in the compound decoction of sarsaparilla.

Guaiac, the resinous gum obtained from these species, is a stimulating diaphoretic and alterative, or in large doses cathartic, and is still employed in cases of chronic rheumatism, gout, etc. (*Flückiger & Hanbury*, *Pharmacographia*, 92.—*U. S. Dispensatory*, 14 ed. 456.—*Nat. Dispensatory*, 2 ed. 696.—*Guibourt*, *Hist. Drogues*, 7 ed. iii, 551.—*Berg*, *Pharm. Anat. Atl.* 53, t. 27).

21.—Porliera angustifolia, Gray,

Smithsonian Contrib. iii, 28.—Torrey, Bot. Mex. Boundary Survey, 42.

Guaiacum angustifolium, Engelmann, Wislizenus' Rep. 29.—Gray in Jour. Boston Soc. Nat. Hist. vi, 158; Genera, ii, 123, t. 149.—Walpers, Ann. iii, 840.—Watson in Proc. Am. Acad. xvii, 334.

Western Texas, valley of the Colorado river to the Rio Grande (Austin, Matagorda bay, New Braunfels, San Antonio, Brownsville, Fort McIntosh), extending west to the Rio Pecos (*Havard*); in northern Mexico.

A small tree, 8 to 10 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or toward its eastern, northern, and western limits reduced to a low shrub; reaching its greatest development in the United States on the calcareous hillsides bordering the valley of the Guadalupe river.

Wood exceedingly heavy, very hard, close-grained, compact, the open ducts smaller and less regularly distributed than in *Guaiacum;* medullary rays very thin, numerous; color, rich dark brown, turning green with exposure, the sap-wood bright yellow; specific gravity, 1.1101; ash, 0.51; probably possessing medicinal properties similar to those of lignum-vitæ.

RUTACEÆ.

22.—Xanthoxylum Americanum, Miller,

Dict. No. 2.—Du Roi, Obs. Bot. 57.—Wangenheim, Amer. 116.—Torrey & Gray, Fl. N. America, i, 214.—Torrey in Nicollet's Rep. 147.—Emerson, Trees Massachusetts, 509; 2 ed. ii, 581.—Gray, Genera, ii, 148, t. 156; Pacific R. R. Rep. xii², 41; Manual N. States, 5 ed. 110.—Richardson, Arctic Exped. 423.—Parry in Owen's Rep. 610.—Darby, Bot. S. States, 253.—Cooper in Smithsonian Rep. 1858, 250.—Wood, Cl. Book, 282; Bot. & Fl. 70.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 187.—Koch, Dendrologie, i, 563.—Vasey, Cat. Forest Trees, 8.

X. Clava-Herculis, Lamarck, Dict. ii, 38; Ill. t. 811, f. 3 [not Linnæus].—Aiton, Hort. Kew. iii, 399.—Mœnch, Meth. 340.

X. fraxinifolium, Marshall, Arbustum, 167.—B. S. Barton, Coll. i, 52; ii, 38.

X. fraxineum, Willdenow, Spec. iv, 757; Enum. 1013; Berl. Baumz. 413.—Persoon, Syn. ii, 615.—Desfontaines, Hist. Arb. ii, 343.—Aiton, Hort. Kew. 2 ed. v, 383.—Pursh, Fl. Am. Sept. i, 210.—Nuttall, Genera, ii, 236.—Nouveau Duhamel, vii, 3. t. 2.—Hayne, Dend. Fl. 197.—Bigelow, Med. Bot. iii, 156, t. 59; Fl. Boston. 3 ed. 405.—De Candolle, Prodr. i, 726.—Sprengel, Syst. i, 945.—Torrey, Compend. Fl. N. States, 373.—Rafinesque, Med. Bot. ii, 113, f. 96.—Don, Miller's Dict. i, 802.—Eaton, Manual, 6 ed. 399.—Beck, Bot. 70.—Spach, Hist. Veg. ii, 364.—Lindley, Fl. Med. 216.—Loudon, Arboretum, i, 488, f. 158 & t.—Dietrich, Syn. ii, 1000.—Hooker, Fl. Bor.-Am. i, 118.—Eaton & Wright, Bot. 482.—Nees, Pl. Wied. 5.—Griffith, Med. Bot. 195, f. 103.—Browne, Trees of America, 150.—Agardh, Theor. & Syst. Pl. t. 19, f. 9.—Schnizlein, Icon. t. 250, f. 1-14.—Maout & Decaisne, Bot. English ed. 324 & figs.—Baillon, Hist. Pl. iv, 398, f. 433-438.

X. mite, Willdenow, Enum. 1013.—Poiret, Suppl. v, 622.—De Candolle, Prodr. i, 727.—Don, Miller's Dict. i, 802.—Loudon, Arboretum, i, 489.

X. ramiflorum, Michaux, Fl. Bor.-Am. ii, 235.

X. tricarpum, Hooker, Fl. Bor.-Am. i, 118 [not Michaux].

Thylax fraxineum, Rafinesque, Med. Bot. ii, 114.

PRICKLY ASH. TOOTHACHE TREE.

Eastern Massachusetts, west to northern Minnesota, eastern Nebraska, and eastern Kansas, south to the mountains of Virginia and northern Missouri.

A small tree, not often 7 meters in height, with a trunk 0.15 to 0.20 meter in diameter; or, reduced to a shrub, 1.50 to 1.80 meter in height; common and reaching its greatest development in the region of the great lakes; rocky hillsides, or more often along streams and rich river bottoms.

Wood light, soft, coarse-grained; medullary rays numerous, thin; color, light brown, the sap-wood lighter; specific gravity, 0.5654; ash, 0.57.

The bark of *Xanthoxylum*, an active stimulant, is used in decoction to produce diaphoresis in cases of rheumatism, syphilis, etc., and as a popular remedy for toothache (*U. S. Dispensatory*, 14 ed. 940.—*Bentley in London Pharm. Jour.* 2 ser. v, 399.—*Guibourt, Hist. Drogues*, 7 ed. iii, 562.—*Nat. Dispensatory*, 2 ed. 1535).

23.—Xanthoxylum Clava-Herculis, Linnæus,

Spec. 1 ed. 270, in part.—B. S. Barton, Coll. i, 25, 52; ii, 38.—Willdenow, Spec. iv, 754, in part.—Aiton, Hort. Kew. 2 ed. v, 382.—Elliott, Sk. ii, 690.—Planchon & Triana in Ann. Sci. Nat. 5 ser. xiv, 312.

X. fraxinifolium, Walter, Fl. Caroliniana, 243 [not Marshall].

Fagara fraxinifolia, Lamarck, Ill. i, 334.

X. Carolinianum, Lamarck, Dict. ii, 39; Ill. 403, t. 811, f. 1.—Torrey & Gray, Fl. N. America, i, 214.—Engelmann & Gray in Jour. Boston Soc. Nat. Hist. v, 213.—Gray, Genera, ii, 148, t. 156, f. 13, 14; Manual N. States, 5 ed. 110; Hall's Pl. Texas, 5.—Scheele in Rœmer, Texas, 432.—Nuttall, Sylva, iii, 8, t. 83; 2 ed. ii, 78, t. 83.—Darby, Bot. S. States, 253.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 66.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 103.—Wood, Cl. Book, 282; Bot. & Fl. 70.—Young, Bot. Texas, 194.—Vasey, Cat. Forest Trees, 8.

X. aromaticum, Willdenow, Spec. iv, 755 (excl. syn.).—Jacquin f. Eclogæ, i, 103, t. 70.

X. tricarpum, Michaux, Fl. Bor.-Am. ii, 235.—Poiret, Suppl. ii, 294.—Aiton, Hort. Kew. 2 ed. v, 383.—Pursh, Fl. Am. Sept. i, 210.—De Candolle, Prodr. i, 726.—Elliott, Sk. ii, 690.—A. de Jussieu in Mem. Mus. xii, t. 25, f. 38.—Sprengel, Syst. i, 945.—Don, Miller's Dict. i, 803.—Spach, Hist. Veg. ii, 365.—London, Arboretum, i, 488.—Eaton, Manual, 6 ed. 399.—Eaton & Wright, Bot. 482.—Dietrich, Syn. ii, 1000.

Kampmania fraxinifolia, Rafinesque, Med. Rep. v, 354.

Pseudopetalon glandulosum, Rafinesque, Fl. Ludoviciana, 108; Med. Bot. ii, 114.

Pseudopetalon tricarpum, Rafinesque, Fl. Ludoviciana, 108; Med. Bot. ii, 114.

X. Catesbianum, Rafinesque, Med. Bot. ii, 114.

TOOTHACHE TREE. PRICKLY ASH. SEA ASH. PEPPER WOOD. WILD ORANGE.

Southern Virginia, southward near the coast to bay Biscayne and Tampa bay, Florida, westward through the Gulf states to northwestern Louisiana, southern Arkansas (south of the Arkansas river), and the valley of the Brazos river, Texas.

A small tree, rarely 12 to 14 meters in height, with a trunk 0.30 meter in diameter, of very rapid growth; usually along streams and low, rich river bottoms, reaching its greatest development in southern Arkansas, Louisiana, and eastern Texas.

A form with trifoliate leaves is—

X. macrophyllum, Nuttall, Sylva, iii, 10; 2 ed. ii, 80.—Lesquereux in Owen's 2d Rep. Arkansas, 353.

X. Clava-Herculis, var. Watson in Proc. Am. Acad. xvii, 335.

Wood light, hard, not strong, soft, coarse-grained, not durable, containing many scattered open ducts; medullary rays numerous, thin; color, light brown, the sap-wood lighter; specific gravity, 0.5056; ash, 0.82.

X. Clava-Herculis probably possesses similar medicinal properties to those of the last species (*Nat. Dispensatory* 2 ed. 1535).

Var. fruticosum, Gray,

Smithsonian Contrib. iii, 30.—Torrey & Gray in Pacific R. R. Rep. ii, 161.—Torrey, Bot. Mex. Boundary Survey, 43.—Chapman, Fl. S. States, 66?—Wood, Bot. & Fl. 71.

X. hirsutum, Buckley in Proc. Philadelphia Acad. 1861, 450; 1870, 136 (see Gray in same, 1862, 162).—Young, Bot. Texas, 195.

Western Texas, Corpus Christi (*Buckley*), mouth of the Colorado river (*Mohr*), near Austin, and west to Devil's river and Eagle pass; Florida (?) (*Chapman l. c.*).

A low shrub, or on the Texas coast a small tree, 6 to 8 meters in height, with a trunk 0.20 to 0.30 meter in diameter.

Wood light, soft, close-grained, compact; medullary rays numerous, thin; color, light brown, the sap-wood yellow; specific gravity, 0.5967; ash, 0.76.

24.—Xanthoxylum Caribæum, Lamarck,

Dict. ii, 40.—Gærtner, Fruct. i, 333, t. 68, f. 8.—Descourtilz, Fl. Med. Antilles, ii, 58.—Planchon & Triana in Ann. Sci. Nat. 5 ser. xiv, 315.—Guibourt, Hist. Drogues, 7 ed. iii, 562.

X. Clava-Herculis, Linnæus, Spec. 1 ed. 270, in part.—De Candolle, Prodr. i, 727.—Macfadyen, Fl. Jamaica, 194.—Grisebach, Fl. British West Indies, 138.

X. lanceolatum, Poiret, Suppl. ii, 293.—De Candolle, Prodr. i, 727.

X. Floridanum, Nuttall, Sylva, iii, 14, t. 85; 2 ed. ii, 85, t. 85.—Chapman, Fl. S. States, 66.—Wood, Bot. & Fl. 70.—Young, Bot. Texas, 194.—Vasey, Cat. Forest Trees, 8.

SATIN WOOD.

Semi-tropical Florida, south Bahia Houda and Boca Chica Keys; in the West Indies.

A small tree, 6 to 10 meters in height, with a trunk 0.30 to 0.40 meter in diameter.

Wood very heavy, exceedingly hard, not strong, brittle, fine-grained, compact, satiny, susceptible of a beautiful polish; medullary rays numerous, thin, conspicuous; color, light orange, the sap-wood lighter; specific gravity, 0.9002; ash, 2.02.

25.—Xanthoxylum Pterota, HBK.

Nov. Gen. & Spec. vi, 3.—Kunth, Syn. iii, 325.—De Candolle, Prodr. i, 725.—Torrey & Gray, Fl. N. America, i, 680.—Macfadyen, Fl. Jamaica, 190.—Nuttall, Sylva, iii, 11, t. 84; 2 ed. ii, 81, t. 84.—Seemann, Bot. Herald, 275.—Torrey, Bot. Mex. Boundary Survey, 43.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 66.—Young, Bot. Texas, 195.—Planchon & Triana in Ann. Sci. Nat. 5 ser. xiv, 311.—Engler in Martius, Fl. Brasil. xii², 154.—Vasey, Cat. Forest Trees, 8.—Hemsley, Bot. Am.-Cent. i, 169.—Watson in Proc. Am. Acad. xvii, 335.

Fagara Pterota, Linnæus, Amœn, v, 393, in part.—Lamarck, Dict. ii, 444; Ill. i, 335, t. 84.—Willdenow, Spec. i, 666.—Aiton, Hort. Kew. 2 ed. i, 263.—Titford, Hort. Bot. Am. 40.—Turpin, Dict. Sci. Nat. xvi, 107, t. 127.

Fagara lentiscifolia, Willdenow, Enum. i, 166.—Grisebach, Fl. British West Indies, 137.

WILD LIME.

Semi-tropical Florida, Mosquito inlet to the southern keys, on the west coast from about latitude 29° to cape Sable; southwestern Texas, and southward through Mexico to Brazil.

A small tree, sometimes 8 meters in height, with a trunk rarely exceeding 0.15 meter in diameter, or often reduced to a slender shrub; in Florida common, and reaching its greatest development on the keys of the west coast; in Texas not common, but widely distributed as a small shrub, or on the shores of Matagorda bay, west of the Nueces river, and in the valley of the Rio Grande a low tree.

Wood heavy, hard, close-grained, compact; medullary rays thin, numerous; color, brown tinged with red, the sap-wood yellow; specific gravity, 0.7444; ash, 0.78.

26.—Ptelia trifoliata, Linnæus,

Spec. 1 ed. 118.—Medicus, Bot. Beobacht. 215.—Marshall, Arbustum, 115.—Walter, Fl. Caroliniana, 88.—Aiton. Hort. Kew. i, 162; 2 ed. i, 264.—Lamarck, Ill. i, 336, t. 84.—Mœnch, Meth. 55.—Willdenow, Spec. i, 670; Enum. i, 116.—Nouveau Duhamel, i, 252, t. 57.—Michaux, Fl. Bor. Am. i, 99.—Schkuhr, Handb. 83, t. 83.—Poiret in Lamarck, Dict. v, 706.—Persoon, Syn. i, 145.—Desfontaines, Hist. Arb. ii, 343.—Robin, Voyages, iii, 509.—Pursh, Fl. Am. Sept. i, 107.—Nuttall, Genera, i, 104.—Guimpel, Otto & Hayne, Abb. Holz. 94, t. 74.—Hayne, Dend. Fl. 8.—Elliott, Sk. i, 201.—Rœmer & Schultes, Syst. iii, 291.—Torrey, Fl. U. S. 189; Compend. Fl. N. States, 86.—Fl. N. York, i, 133; Pacific R. R. Rep. iv, 73; Bot. Mex. Boundary Survey, 43.—De Candolle, Prodr. ii, 82.—Sprengel, Syst. i, 441.—Turpin, Dict. Sci. Nat. xliv, 2, t. 128.—A. de Jussieu in Mem. Mus. xii, t. 26, f. 42.—Beck in Am. Jour. Sci. 1 ser. x, 264; Bot. 71.—Don, Miller's Dict. i, 806.—Spach, Hist. Veg. ii, 369.—Hooker, Jour. Bot. i, 202.—Lindley, Fl. Med. 215.—Loudon, Arboretum, i, 489 & t.—Eaton, Manual, 6 ed. 288.—Torrey & Gray, Fl. N. America, i, 215.—Eaton & Wright, Bot. 379.—Dietrich, Syn. i, 497.—Browne, Trees of America, 153.—Scheele in Rœmer, Texas, 432.—Gray, Genera, ii, 150, t. 157; Manual N. States, 5 ed. 110.—Richardson, Arctic Exped. 423.—Parry in Owen's Rep. 610.—Agardh, Theor. & Syst. Pl. t. 19, f. 7, 8.—Cooper in Smithsonian Rep. 1858, 250.—Darby, Bot. S. States, 254.—Chapman. Fl. S. States, 66.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 107.—Lesquereux in Owen's 2d Rep. Arkansas, 353.—Wood, Cl. Book, 283; Bot. & Fl. 71.—Schnizlein, Icon. t. 250, f. 15-26.—Young, Bot. Texas, 195.—Baillon, Hist. Pl. iv, 395, f. 445, 446.—Koch, Dendrologie, i, 566.—Vasey, Cat. Forest Trees, 8.—Hemsley, Bot. Am.-Cent. i, 171.—Burgess in Coulter's Bot. Gazette, vii, 95.

Amyris elemifera, Linnæus, Spec. 2 ed. 295.—St. Hilaire, Fam. Nat. i, 253.

P. viticifolia, Salisbury, Prodr. 68.

HOP TREE. SHRUBBY TREFOIL. WAFER ASH.

Ontario and New York (banks of the Niagara river), Pennsylvania southward to northern Florida, west to Minnesota and the headwaters of the Canadian river; through western Texas to the valley of the Mimbres river, New Mexico (*Bigelow*), and southward into northern Mexico.

A small tree, sometimes 4 to 6 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or more often reduced to a slender shrub; shady, rocky hillsides.

A variety with more or less pubescent leaves, not rare on the south Atlantic coast, and the common form of western Texas, is—

var. mollis, Torrey & Gray, Fl. N. America, i, 680.—Engelmann & Gray in Jour. Boston Soc. Nat. Hist. v, 213.—Torrey in Marcey's Rep. 282.—Gray in Smithsonian Contrib. iii, 31; Hall's Pl. Texas, 5.—Wood, Bot. & Fl. 71.—Watson in Proc. Am. Acad. xvii, 335.

P. mollis, Curtis in Am. Jour. Sci. 2 ser. vii, 406; Rep. Geological Surv. N. Carolina, 1860, iii, 107.—Walpers, Ann. ii, 259.—Chapman, Fl. S. States, 67.—Young, Bot. Texas, 196.

Wood heavy, hard, close-grained, compact, satiny, the annual growths clearly marked by two or three rows of open ducts; medullary rays few, thin; color, yellow-brown, the sap-wood hardly distinguishable; specific gravity, 0.8319; ash, 0.30.

The bark of the root possesses tonic properties and is employed by herbalists in the form of tinctures and fluid extracts in cases of dyspepsia, debility, etc. (*Am. Jour. Pharm.* 1862, 198; 1867, 337.—*U. S. Dispensatory*, 14 ed. 1740.—*Nat. Dispensatory*, 2 ed. 1179); the bitter fruit is occasionally used domestically as a substitute for hops.

27.—Canotia holocantha, Torrey,

Pacific R. R. Rep. iv, 68.—Gray in Ives' Rep. 15; Proc. Am. Acad. xii, 159.—Baillon, Adansonia, x, 18; Hist. Veg. vi, 7, 42.—Brewer & Watson, Bot. California, i, 190.—Rothrock in Wheeler's Rep. 24, 81, t. 1.—Maximowicz in Act. Hort. St. Petersburg v, 256.—Rusby in Bull. Torrey Bot. Club, ix, 106.

Arizona, White Mountain region, valley of the Gila river (*Rothrock*), valley of Bill Williams Fork (*Bigelow*).

A small tree, 6 to 8 meters in height, with a trunk sometimes 0.30 meter in diameter, or often a large shrub; dry, rocky *mesas*. Wood heavy, hard, close-grained, compact; medullary rays numerous, not prominent; color light brown, the sap-wood lighter; specific gravity, 0.6885; ash, 5.33.

SIMARUBEÆ.

28.—Simaruba glauca, De Candolle,

Diss. in Ann. Mus. xvii, 323; Prodr. i, 733.—Humboldt, Bonpland & Kunth, Nov. Gen. et Spec. vi, 16.—Descourtilz, Fl. Med. Antilles, i, 66, t. 14.—Planchon in London Jour. Bot. v, 567.—Gray, Genera, ii, 152.—Nuttall, Sylva, iii, 20, t. 87; 2 ed. ii, 88, t. 87.—Cooper in Smithsonian Rep. 1858, 264.—Grisebach, Fl. British West Indies, 139.—Chapman, Fl. S. States, 67.—Wood, Bot. & Fl. 72.—Planchon & Triana in Ann. Sci. Nat. 5 ser. xv, 357.—Engler in Martius, Fl. Brasil. xii², 223.—Vasey, Cat. Forest Trees, 8.—Hemsley, Bot. Am.-Cent. i, 173.

Quassia Simaruba, Linnæus, Suppl. 234.—Wright, Trans. Edinburgh Soc. ii, 73, t. 1, 2; Bot. & Med. Account of *Q. Simaruba*.—Gærtner, Fruct. i, 340, t. 70.—Lamarck, Ill. ii, 478, t. 343, f. 2.—Willdenow, Spec. ii, 568.—Aiton, Hort. Kew. 2 ed. iii, 42.—Descourtilz, Fl. Med. Antilles, i, 23, t. 5.

Quassia dioica, Bergius, Mat. Med. 355.

S. amara, Aublet, Guian. t. 331.—Hayne, Arzn. iv, t. 15.—Schnizlein, Icon. t. 249, f. 1-6.

S. medicinalis, Endlicher, Medz. Pf. 525.—Berg, Handb. i, 373.—Berg & Schmidt, Off. Gew. ii, t. 13.

PARADISE TREE.

Semi-tropical Florida, cape Canaveral to the southern keys; through the West Indies to Brazil.

A tree sometimes 15 meters in height, with a trunk 0.60 meter in diameter; within the United States not common, and reaching its greatest development on the shores of bay Biscayne.

Wood light, soft, not strong, coarse-grained, containing many large scattered open ducts; medullary rays few, thin; color, light brown, the sap-wood a little darker; specific gravity, 0.4136; ash, 0.93.

The bark of this species has been occasionally used as a substitute for that of *S. officinalis*, *DC.* as an aromatic, bitter tonic (*U. S. Dispensatory*, 14 ed. 838.—*Nat. Dispensatory*, 2 ed. 1294).

BURSERACEÆ.

29.—Bursera gummifera, Jacquin,

Am. Pict. t. 65.—Linnæus, Spec. 2 ed. 741.—Lamarck, Ill. ii, 392, t. 256.—Willdenow, Spec. iv, 1119.—Aiton, Hort. Kew. 2 ed. v, 481.—Titford, Hort. Bot. Am. 107.—De Candolle, Prodr. ii, 78.—Descourtilz, Fl. Med. Antilles, ii, t. 97.—Spach, Hist. Veg. ii, 239.—Macfadyen, Fl. Jamaica, 229.—Nuttall, Sylva, ii, 117, t. 79; 2 ed. ii, 64, t. 79.—Richard, Fl. Cuba, 390.—Browne, Trees of America, 189.—Grisebach, Fl. British West Indies, 173.—Cooper in Smithsonian Rep. 1858, 264; 1860, 440.—Chapman, Fl. S. States, 68.—Wood, Bot. & Fl. 72.—Planchon & Triana in Ann. Sci. Nat. 5 ser. xv, 302.—Vasey, Cat. Forest Trees, 8.—Hemsley, Bot. Am.-Cent. i, 177.—Engler in De Candolle, Suites, iv, 39.

B. acuminata, Willdenow, Spec. iv, 1120.—De Candolle, Prodr. ii, 78.

Elaphrium integerrimum, Tulasne in Ann. Sci. Nat. 3 ser. vi, 369. (*Fide* Engler, *l. c.*)

GUM ELEMI. GUMBO LIMBO. WEST-INDIAN BIRCH.

Semi-tropical Florida, cape Canaveral to the southern keys, west coast Caloosa river and Caximbas bay; through the West Indies.

A tree often 18 meters in height, with a trunk 0.50 to 0.70 meter in diameter; one of the largest and most common trees of southern Florida, of very rapid growth and decay.

Wood very light, exceedingly soft and weak, spongy, containing many scattered open ducts; medullary rays numerous, thin; color, light brown or gray, quickly discoloring with decay; specific gravity, 0.3003; ash, 2.04; used in making live-fences, pieces of the trunk when planted in the coral rock of the keys throwing out roots and growing rapidly.

The aromatic resin obtained from this species was formerly somewhat used in various forms, under the name of *Caranna*, as a remedy for gout (*Watts, Chem. Dict.* i, 749.—*Guibourt, Hist. Drogues*, 7 ed. iii, 525, f. 749); and in the West Indies is manufactured into a valuable varnish. An infusion of the leaves is occasionally used as a domestic substitute for tea.

30.—Amyris sylvatica, Jacquin,

Am. Pict. t. 108.—Willdenow, Spec. ii, 333.—Aiton, Hort. Kew. 2 ed. ii, 351.—De Candolle, Prodr. ii, 81.—Dietrich, Syn. ii, 1271.—Macfadyen, Fl. Jamaica, 231.—Richard, Fl. Cuba, 393.—Grisebach, Fl. British West Indies, 174.—Planchon & Triana in Ann. Sci. Nat. 5 ser. xv, 321.—Vasey, Cat. Forest Trees, 8.

Toxicodendron arborescens, Miller, Dict. No. 9.

A. dyatripa, Sprengel, Neue Entdeck. iii, 48.—De Candolle, Prodr. ii, 81.

Rhus arborescens, De Candolle, Prodr. ii, 73.

A. Plumieri, De Candolle, Prodr. ii, 81.

A. Floridana, Nuttall in Am. Jour. Sci. v, 294; Sylva ii, 114, t. 78; 2 ed. ii, 61, t. 78.—De Candolle, Prodr. ii, 81.—Torrey & Gray, Fl. N. America, i, 221.—Eaton, Manual, 6 ed. 16.—Eaton & Wright, Bot. 123.—London, Arboretum, ii, 561.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 68.—Wood, Bot. & Fl. 72.—Vasey, Cat. Forest Trees, 8.

A. cymosa, Reichenbach in Sieb. Pl. Trin. No. 29?.

A. maritima, Richard, Fl. Cuba, 392 [not Jacquin].

TORCH WOOD.

Semi-tropical Florida, Mosquito inlet to the southern keys; in the West Indies.

A small tree sometimes 7 meters in height, with a trunk 0.20 to 0.25 meter in diameter; common.

Wood very heavy, exceedingly hard and strong, close-grained, compact, resinous, exceedingly durable, susceptible of a beautiful polish; medullary rays obscure; color, light orange, the sap-wood lighter; specific gravity, 1.0459; ash, 0.59.

MELIACEÆ.

31.—Swietenia Mahogoni, Linnæus,

Spec. 2 ed. 548.—Jacquin, Stirp. Am. t. 127.—Cavanilles, Diss. ii, 365, t. 209.—Gærtner, Fruct. ii, 89, t. 96.—Lamarck, Dict. iii, 678.—Willdenow, Spec. ii, 557.—Aiton, Hort. Kew. 2 ed. ii, 338.—Titford, Hort. Bot. Am. 64.—Descourtilz, Fl. Med. Antilles, ii, 125, t., 99.—De Candolle, Prodr. i, 625.—Turpin in Dict. Sci. Nat. Atlas, t. 170.—Tussac, Fl. Antilles, iv, t. 23.—Hayne, Arzn. i, t. 19.—Hooker, Bot. Misc. i, 21, t. 16, 17.—A. de Jussieu in Mem. Mus. xix, 248, t. 11.—Don, Miller's Dict. i, 687, f. 116.—Woodville, Med. Bot. 3 ed. iii, 620, t. 220.—Spach, Hist. Veg. iii, 164, t. 21.—Lindley, Fl. Med. 155.—Macfadyen, Fl. Jamaica, 175.—Torrey & Gray, Fl. N. America, i, 242.—Eaton, Manual, 6 ed. 360.—Eaton & Wright, Bot. 447.—Walpers, Rep. i, 436.—Nuttall, Sylva, ii, 98, t. 75; 2 ed. ii, 46, t. 75.—Richard, Fl. Cuba, 304.—Schnizlein, Icon. t. 226, f. 1.—Cooper in Smithsonian Rep. 1858, 264.—Darby, Bot. S. States, 263.—Chapman, Fl. S. States, 62.—Grisebach, Fl. British West Indies, 131.—Wood, Bot. & Fl. 66.—Baillon, Hist. Pl. v, 478, f. 472–476.—Guibourt, Hist. Drogues, 7 ed. iii, 596.—Tippel & Bollovar, Ausland. Cult. Pfl., Atlas, i, t. 2, f. 1.—C. De Candolle, Suites, i, 723.—Hemsley, Bot. Am.-Cent. i, 183.

S. Senegalensis, Desrousseaux in Lamarck, Dict. iii, 678.

Cedrus Mahogoni, Miller, Dict. No. 2.

MAHOGANY. MADEIRA.

Semi-tropical Florida, on the southern keys (Key Largo, Elliott's Key); through the West Indies, and in Central America.

A large tree, on the Florida keys rarely exceeding 15 meters in height, with a trunk sometimes 0.90 meter in diameter.

Wood heavy, exceedingly hard, very strong, brittle, very close-grained, compact, very durable, susceptible of a high polish; medullary rays numerous, obscure; color, rich reddish-brown, turning darker with age, the thin sap-wood yellow; specific gravity, 0.7282; ash, 1.09; varying greatly in quality in different regions; largely used and preferred to all other woods for cabinet-making of all sorts, interior finish, etc.; formerly somewhat employed in ship-building.

OLACINEÆ.

32.—Ximenia Americana, Linnæus,

Spec. 1 ed. Appx. 1193.—Bartram, Travels, 2 ed. 112.—Lamarck, Ill. ii, 435, t. 297.—Willdenow, Spec. ii, 338.—Aiton, Hort. Kew. 2 ed. ii, 352.—De Candolle, Prodr. i, 533.—Nuttall, Sylva, i, 124, t. 36; 2 ed. i, 138, t. 36.—Schnizlein, Icon. t. 223, f. 1-9, 30, 31.—Cambessedes in St. Hilaire, Fl. Brasil. i, 341.—Wight & Walker-Arnott, Prodr. Fl. Penins. Or. i, 89.—Walpers, Rep. i, 377; Ann. vi, 565.—Richard, Fl. Cuba, 304.—Cooper in Smithsonian Rep. 1858, 264.—Grisebach, Fl. British West Indies, 310.—Baillon, Adansonia, ii, t. 9, f. 5, 6.—Chapman, Fl. S. States, 61.—Engler in Martius, Fl. Brasil. xii, 9, t. 2, f. 1.—Vasey, Cat. Forest Trees, 8.—Hemsley, Bot. Am.-Cent. i, 185.

Heymassoli spinosa, Aublet, Guian. i, 324, t. 125.—Lamarck, Ill. ii, 435.

X. multiflora, Jacquin, Stirp. Am. 106, t. 177, f. 31.—Lamarck, Ill. ii, 435, t. 297, f. 1, 2.—Spach, Hist. Veg. xiii, 264.

X. montana, Macfadyen, Fl. Jamaica, i, 121.

WILD LIME. TALLOW NUT. HOG PLUM. MOUNTAIN PLUM.

Florida, east coast from the Saint John's river to the southern keys, west coast Caloosa river to Caximbas bay; through the West Indies to Brazil, and on the coast of the Indian peninsula (introduced?, *A. De Candolle, Geog. Bot.* ii, 1027).

A small, low, wide-spreading tree, rarely exceeding 4 meters in height, with a trunk 0.15 meter in diameter, or in pine-barren soil and toward its northern limits reduced to a low shrub; common and reaching its greatest development in Florida on the west coast.

Wood very heavy, tough, hard, close-grained, compact, containing numerous regularly-distributed open ducts; medullary rays few, thin; color, brown, tinged with red, the sap-wood lighter; specific gravity, 0.9196; ash, 0.73.

Hydrocyanic acid has been obtained from the edible plum-shaped fruit (*Flückiger & Hanbury, Pharmacographia,* 222).

ILICINEÆ.

33.—Ilex opaca, Aiton,

Hort. Kew. i, 169; 2 ed. i, 277.—Willdenow, Spec. i, 708; Enum. 172; Berl. Baumz. 190.—Nouveau Duhamel, i, 8.—Michaux, Fl. Bor.-Am. ii, 228.—Persoon, Syn. i, 151.—Poiret, Suppl. iii, 65.—Michaux f. Hist. Arb. Am. ii, 191, t. 11; N. American Sylva, 3 ed. ii, 122, t. 84.—Barton, Prodr. Fl. Philadelph. 95; Compend. Fl. Philadelph. 94.—Pursh, Fl. Am. Sept. i, 117.—Rafinesque, Fl. Ludoviciana, 111; Med. Bot. ii, 7, t. 53.—Nuttall, Genera, i, 109.—Rœmer & Schultes, Syst. iii, 487.—Link, Enum. 147.—James, Cat. 176; Long's Exped. ii, 294.—Hayne, Dend. Fl. 10.—Torrey in Ann. Lyc. N. York, ii, 173; Fl. U. S. 194; Compend. Fl. N. States, 87; Fl. N. York, ii, 2.—Elliott, Sk. ii, 679.—De Candolle, Prodr. ii, 14.—Sprengel, Syst. i, 495.—Watson, Dend. Brit. i, t. 3.—Beck, Bot. 230.—Eaton, Manual, 6 ed. 186.—Loudon, Arboretum, ii, 516 & t.—Hooker, Fl. Bor.-Am. i, 121; Jour. Bot. i, 201.—Eaton & Wright, Bot. 282.—Bigelow, Fl. Boston. 3 ed. 64.—Don, Miller's Dict. ii, 17.—Spach, Hist. Veg. ii, 427.—Dietrich, Syn. i, 554.—Griffith, Med. Bot. 432.—Emerson, Trees Massachusetts, 341; 2 ed. ii, 385 & t.—Browne, Trees of America, 167.—Darby, Bot. S. States, 426.—Darlington, Fl. Cestrica, 3 ed. 17.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 269.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 58.—Lesquereux in Owen's 2d Rep. Arkansas, 373.—Wood, Cl. Book, 496; Bot. & Fl. 207.—Gray, Manual N. States, 5 ed. 306.—Young, Bot. Texas, 372.—Vasey, Cat. Forest Trees, 8.—Maximowicz in Mem. Acad. St. Petersburg, xxix, No. 3, 29.—Mellichamp in Bull. Torrey Bot. Club, viii, 113.

I. aquifolium, Marshall, Arbustum, 63 [not Linnæus].—Walter, Fl. Caroliniana, 241.

I. Canadensis, Marshall, Arbustum, 64.

I. laxiflora, Lamarck, Dict. iii, 147; Ill. i, 355.—Pursh, Fl. Am. Sept. i, 117.—Rœmer & Schultes, Syst. iii, 494; Mant. 334.—De Candolle, Prodr. ii, 14.—Sprengel, Syst. i, 495.—Don, Miller's Dict. ii, 17.—Spach, Hist. Veg. ii, 427.—Dietrich, Syn. i, 555.—Loudon, Arboretum, ii, 517.—Eaton, Manual, 6 ed. 186.—Eaton & Wright, Bot. 282.

I. quercifolia, Meerburgh. Icon. ii, t. 5.

Ageria opaca, Rafinesque, Sylva Telluriana, 47.

AMERICAN HOLLY.

Quincy, Massachusetts, southward, near the coast, to Mosquito inlet and Charlotte harbor, Florida, valley of the Mississippi river, southern Indiana southward to the gulf of Mexico, and southwest through Missouri, Arkansas, and eastern Texas to the valley of the Colorado river.

An evergreen tree, sometimes 15 meters in height, with a trunk 0.30 to 1.20 meter in diameter, or toward its northern limits reduced to a shrub; generally in low, rather moist soil; most common and reaching its greatest development in the rich bottoms of southern Arkansas and eastern Texas.

Wood light, soft, not strong, tough, rather hard, close-grained, very compact, easily worked; medullary rays numerous, inconspicuous; color, nearly white, turning to light brown with exposure, the sap-wood still lighter; specific gravity, 0.5818; ash, 0.76; used and admirably adapted for cabinet work, interior finish, and turnery of the highest class.

A bitter principle (*Ilicin*), common to other species of the genus, has been obtained from the fruit of this tree (*Am. Jour. Pharm.* xxviii, 314.—*U. S. Dispensatory*, 14 ed. 1670.—*Nat. Dispensatory*, 2 ed. 754).

34.—Ilex Dahoon, Walter,

Fl. Caroliniana, 241.—Michaux, Fl. Bor.-Am. ii, 228.—Pursh, Fl. Am. Sept. i, 117.—Nuttall, Genera, i, 109.—Rœmer & Schultes, Syst. iii, 489; Mant. 332.—De Candolle, Prodr. ii, 14.—Elliott, Sk. ii, 680.—Watson, Dend. Brit. ii, t. 114.—Sprengel, Syst. i, 495.—Audubon, Birds, t. 48.—Don, Miller's Dict. ii, 19.—Hooker, Jour. Bot. i, 202.—Eaton, Manual, 6 ed. 186.—Eaton & Wright, Bot. 282.—Spach, Hist. Veg. ii, 428.—Dietrich, Syn. i, 554.—Loudon, Arboretum, ii, 519.—Griffith, Med. Bot. 433.—Darby, Bot. S. States, 426.—Chapman, Fl. S. States, 269.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 58.—Wood, Bot. & Fl. 207.—Gray, Manual N. States, 5 ed. 306.—Vasey, Cat. Forest Trees, 8.—Maximowicz in Mem. Acad. St. Petersburg, xxix, No. 3, 29.—Nat. Dispensatory, 2 ed. 755.

I. Cassine, Linnæus, Spec. 125, in part.—Marshall, Arbustum, 64.—Aiton, Hort. Kew. i, 170, in part; 2 ed. i, 279.—Lamarck, Dict. iii, 147; Ill. i, 355.—Willdenow, Spec. i, 709; Enum. i, 172; Hort. Berol. i, t. 31.—Nouveau Duhamel, i, 9.—Persoon, Syn. 151.—Desfontaines, Hist. Arb. ii, 362.—Poiret, Suppl. iii, 65.—Pursh, Fl. Am. Sept. i, 117.—Rœmer & Schultes, Syst. iii, 490.—Hayne, Dend. Fl. 10.—De Candolle, Prodr. ii, 14.—Sprengel, Syst. i, 495.—Don, Miller's Dict. ii, 17.—Spach, Hist. Veg. ii, 428.—Dietrich, Syn. i, 544—Loudon, Arboretum, ii, 517, f. 184.—Eaton & Wright, Bot. 282.—Gœppert in Del. Sem. Vratisl. 1855 (*Linnæa*, xxvi, 746).

I. Cassine, var. *latifolia*, Aiton, Hort. Kew. 2 ed. i, 278.

I. cassinoides, Link, Enum. i, 148.—Rœmer & Schultes, Syst. iii; Mant. 332.

I. laurifolia, Nuttall in Am. Jour. Sci. 1 ser. v, 289.—Eaton, Manual, 6 ed. 186.—Eaton & Wright, Bot. 282.

Ageria palustris, Rafinesque, Sylva Telluriana, 47.

Ageria obovata, Rafinesque, Sylva Telluriana, 47.

Ageria heterophylla, Rafinesque, Sylva Telluriana, 48.

DAHOON. DAHOON HOLLY.

Southern Virginia, southward near the coast to Mosquito inlet and Tampa bay, Florida, west along the Gulf coast to the prairie region of western Louisiana.

A small tree, sometimes 8 meters in height, with a trunk from 0.20 to 0.30 meter in diameter; low, wet soil; not common, and running into numerous forms, of which the best marked are—

var. angustifolia, Torrey & Gray, Fl. N. America, *ined.*

I. Cassine, var. *angustifolia*, Willdenow, Spec. i, 709.—Aiton, Hort. Kew, 2 ed. i, 278.—Nouveau Duhamel, i, 9, t. 3.

I. angustifolia, Willdenow, Enum. i, 172.—Pursh, Fl. Am. Sept. i, 118.—Nuttall, Genera, i, 109.—Rœmer & Schultes, Syst. iii. 489.—De Candolle, Prodr. ii, 14.—Watson, Dend. Brit. i, t. 4.—Sprengel, Syst. i, 495.—Don, Miller's Dict. ii, 17.—Hooker, Jour. Bot. i, 201.—Spach, Hist. Veg. ii, 428.—Dietrich, Syn. i, 554.—Loudon, Arboretum, ii, 517, f. 185.

I. ligustrina, Elliott, Sk. ii, 708 [not Jacquin].—Spach, Hist. Veg. ii, 429.—Eaton, Manual, 6 ed. 187.—Eaton & Wright, Bot. 282.—Darby, Bot. S. States, 123.

? *I. Watsoniana*, Spach, Hist. Veg. ii, 429.

var. **myrtifolia** (only in low cypress swamps and ponds), Chapman, Fl. S. States, 269.—Nat. Dispensatory, 2 ed. 755.

I. myrtifolia, Walter, Fl. Caroliniana, 214.—Nouveau Duhamel, i, 10, t. 4.—Michaux, Fl. Bor.-Am. ii, 229.—Poiret, Suppl. iii, 65.—Willdenow, Enum. Suppl. 8.—Rœmer & Schultes, Syst. iii, 489.—Link, Enum. 148.—Spach, Hist. Veg. ii, 429.—Eaton, Manual, 6 ed. 187.—Eaton & Wright, Bot. 282.—Darby, Bot. S. States, 426.—Gray, Manual N. States, 5 ed. 306.—Maximowicz in Mem. Acad. St. Petersburg, xxix, No. 3, 26.

I. rosmarifolia, Lamarck, Ill. i, 356.—Persoon, Syn. i, 151.—Poiret, Suppl. iii, 65.

I. ligustrifolia, Don, Miller's Dict. ii, 19.—Eaton, Manual, 6 ed. 187.—Wood, Cl. Book, 497; Bot. & Fl. 207.

Wood light, soft, not strong, close-grained, compact; medullary rays numerous, thin; color, light brown, the sap-wood nearly white; specific gravity, 0.4806; ash, 0.91; that of var. *myrtifolia* heavier, nearly white; specific gravity, 0.5873; ash, 0.90.

35.—Ilex Cassine, Walter,

Fl. Caroliniana, 241.—Aiton, Hort. Kew. i, 170, in part.—James, Cat. 176; Long's Exped. ii, 294.—Hooker, Jour. Bot. i, 202.—Eaton, Manual, 6 ed. 186.—Chapman, Fl. S. States, 269.—Curtis in Rep. Geologisal Surv. N. Carolina, 1860, iii, 59.—Lesquereux in Owen's 2d Rep. Arkansas, 373.—Wood, Bot. & Fl. 208.—Gray, Manual N. States, 5 ed. 306.—Young, Bot. Texas, 373.—Maximowicz in Mem. Acad. St. Petersburg, xxix, No. 3, 22.

I. Cassine, *β*. Linnæus, Spec. 1 ed. 125.

Cassine Peragua, Linnæus, Mant. ii, 220.—Marshall, Arbustum, 26.—Plenck, Icon. t. 239.

Cassine Caroliniana, Lamarck, Dict. i, 652

I. vomitoria, Aiton, Hort. Kew. i, 170; 2 ed. i, 278.—Salisbury, Prodr. 70.—Willdenow, Spec. i, 709.—Enum. Suppl. 8.—B. S. Barton, Coll. i, 36, 56.—Nouveau Duhamel, i, 10.—Persoon, Syn. i, 151.—Desfontaines, Hist. Arb. ii, 362.—Titford, Hort. Bot. Am. 41.—Pursh, Fl. Am. Sept. i, 118.—Nuttall, Genera, i, 109.—Rœmer & Schultes, Syst. iii, 491; Mant. 333.—De Candolle, Prodr. ii, 14.—Sprengel, Syst. i, 495.—Torrey in Ann. Lyc. N. York, ii, 173.—Don, Miller's Dict. ii, 17.—Hooker, Jour. Bot. i, 202.—Spach, Hist. Veg. ii, 430.—Lindley, Fl. Med. 393.—Dietrich, Syn. i, 555.—London, Arboretum, ii, 518, f. 186.—Eaton, Manual, 6 ed. 187.—Eaton & Wright, Bot. 282.—Griffith, Med. Bot. 433.—Browne, Trees of America, 169.—Guibourt, Hist. Drogues, 7 ed. iii, 544.

I. ligustrina, Jacquin, Coll. iv, 105; Icon. Rar. ii, 9, t. 310 [not Elliott].—Lamarck, Ill. i, 356.

I. Floridana, Lamarck, Ill. i, 356.

I. Cassena, Michaux, Fl. Bor.-Am. ii, 229.—Poiret, Suppl. iii, 65.—Rœmer & Schultes, Syst. iii, 490.—Elliott, Sk. ii, 681.—Darby, Bot. S. States 426.—Wood, Cl. Book, 497.

I. religiosa, Barton, Fl. Virginica, 66.

Cassine ramulosa, Rafinesque, Fl. Ludoviciana, 363.

Hierophyllus Cassine, Rafinesque, Med. Bot. ii, 8.

Emetila ramulosa, Rafinesque, Sylva Telluriana, 45.

Ageria Cassena, Rafinesque, Sylva Telluriana, 47.

Ageria geminata, Rafinesque, Sylva Telluriana, 48.

CASSENA. YAUPON. YOPON.

Southern Virginia, southward, near the coast, to the Saint John's river and Cedar Keys, Florida, west along the Gulf coast to southern Arkansas, and the valley of the Colorado river, Texas.

A small tree, 6 to 8 meters in height, with a trunk 0.10 to 0.15 meter in diameter, or more often a shrub, sending up many slender stems and forming dense thickets; sandy, moist soil, along ponds and streams, reaching its greatest development in the river bottoms of eastern Texas.

Wood heavy, hard, close-grained, liable to check in drying; medullary rays numerous, conspicuous; color, nearly white, becoming yellow with exposure, the sap-wood lighter; specific gravity, 0.7270; ash, 0.87.

The leaves possess powerful emetic properties, and were employed by the southern Indians, together perhaps with those of *I. Dahoon*, in the preparation of their "black drink" (*Am. Jour. Pharm.* xliv, 217.—*U. S. Dispensatory*, 14 ed. 1670.—*Nat. Dispensatory*, 2 ed. 754).

36.—Ilex decidua, Walter,

Fl. Caroliniana, 241.—Poiret, Suppl. iii, 65.—Chapman, Fl. S. States, 269.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 59.—Lesquereux in Owen's 2d Rep. Arkansas, 373.—Wood, Cl. Book, 497; Bot. & Fl. 208.—Gray, Manual N. States, 5 ed. 306.—Young, Bot. Texas, 373.—Vasey, Cat. Forest Trees, 8.—Maximowicz in Mem. Acad. St. Petersburg, xxix, No. 3, 30.—Watson in Proc. Am. Acad. xvii, 335.

I. prinoides, Aiton, Hort. Kew. i, 169; 2 ed. i, 278.—Lamarck, Ill. i, 355.—Willdenow, Spec. i, 709.—Nouveau Duhamel, i, 11.—Michaux, Fl. Bor.-Am., ii, 229.—Persoon, Syn. i, 151.—Desfontaines, Hist. Arb. ii, 362.—Pursh, Fl. Am. Sept. i, 118.—Nuttall, Genera, i, 109.—Rœmer & Schultes, Syst. iii, 488; Mant. 332.—Watson, Dend. Brit. i, t. 15.—Sprengel, Syst. i, 495.—Audubon, Birds, t. 89.—Eaton, Manual, 6 ed. 187.—Eaton & Wright, Bot. 282.—Darby, Bot. S. States, 426.

I. æstivalis, Lamarck, Dict. iii, 147; Ill. i, 356.

Prinos deciduus, De Candolle, Prodr. ii, 16.—Don, Miller's Dict. ii, 20.—Hooker, Jour. Bot. i, 202.—Loudon, Arboretum, ii, 520.

I. ambiguus, Elliott, Sk. ii, 705.

Southern Virginia, southward, through the middle districts, to western Florida, valley of the Mississippi river, southern Illinois southward to the Gulf of Mexico, and through southeastern Missouri, Arkansas, and eastern Texas to the valley of the Colorado river.

A small tree, 8 to 9 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or in the Atlantic states a tall, straggling shrub; low, wet woods along streams, reaching its greatest development in the Iron Mountain region of Missouri and in southern Arkansas.

Wood heavy, hard, close-grained, compact; medullary rays numerous, thin; color, creamy-white, the sap-wood lighter; specific gravity, 0.7420; ash, 0.70.

CYRILLACEÆ.

37.—Cyrilla racemiflora, Linnæus,

Mant. i, 50; Syst. 14 ed. 241.—Jacquin, Icon. Rar. t. 47; Coll. i, 162.—Walter, Fl. Caroliniana, 103.—Lamarck, Dict. ii, 245; Ill. ii, 144, t. 147, f. 2.—Nouveau Duhamel, i, 215, t. 46.—Desfontaines, Hist. Arb. i, 255.—Elliott, Sk. i, 294.—Eaton, Manual, 6 ed. 119.—Eaton & Wright, Bot. 218.—Torrey & Gray, Fl. N. America, i, 256.—Nuttall, Sylva, ii, 96, t. 74; 2 ed. ii, 43, t. 74.—Planchon in Hooker's Jour. Bot. v, 254.—Schnizlein, Icon. t. 240, f. 1–4, 6, 17, 19, 21.—Darby, Bot. S. States, 417.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 272.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 105.—Porcher, Resources S. Forests, 130.—Maout & Decaisne, Bot. English ed. 540 & f.—Baillon, Adansonia, i, 203, t. 4.—Wood, Cl. Book, 493; Bot. & Fl. 205.—Vasey, Cat. Forest Trees, 18.

Andromeda plumata, Bartram, Cat.—Marshall, Arbustum, 9.

C. Caroliniana, Michaux, Fl. Bor.-Am. i, 158.—Gærtner, f. Fruct. Suppl. 147, t. 209, f. 8.—Persoon, Syn. i, 175.—Pursh, Fl. Am. Sept. i, 170.—Nuttall, Genera, i, 145.—Poiret, Suppl. ii, 436.—Rœmer & Schultes, Syst. v, 408.—Bot. Mag. t. 2456.—Walpers, Rep. vi, 421.—Dietrich, Syn. i, 805.

Itea Cyrilla, L'Heritier, Stirp. i, 137, t. 66.—Swartz, Prodr. 50; Fl. Ind. Occ. i, 506; Obs. 94, t. 4.—Willdenow, Spec. i, 1146.—Aiton, Hort. Kew. 2 ed. ii, 37.

C. racemosa, Loudon, Arboretum, iv, 2577, f. 2503.

C. polystachia, *C. parvifolia*, *C. fuscata*, Rafinesque, Autikon Botanikon, 8.

IRON WOOD.

North Carolina southward, near the coast, to middle Florida (latitude 30°), westward, along the Gulf coast, to the valley of the Pearl river, Mississippi.

A small tree, sometimes 8 to 10 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or often a tall shrub, sending up many stems from the root; open swamps and low thickets; a variety (*Chapman*, *Curtiss*) with narrower, persistent leaves, and thicker spongy bark, in pond holes and wet depressions of the pine barrens of the Apalachicola region of western Florida, forms dense, impenetrable thickets.

Wood heavy, weak, hard, close-grained, compact; medullary rays thin, not conspicuous; color, brown tinged with red, the sap-wood a little lighter; specific gravity, 0.6784; ash, 0.42.

38.—Cliftonia ligustrina, Banks,

Ex. Gærtner f. Fruct. Suppl. 246, t. 225.—Bartram, Travels, 2 ed. 31.—Torrey & Gray, Fl. N. America, i, 256.—Nuttall, Sylva, ii, 92, t. 73; 2 ed. ii, 39, t. 73.—Planchon in Hooker's Jour. Bot. v, 255.—Walpers, Rep. vi, 422.—Dietrich, Syn. ii, 1412.—Schnizlein. Icon. t. 240**, f. 5, 7-10, 20.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 273.—Porcher, Resources S. Forests, 130.—Baillon in Adansonia, i, 202, t. 4, f. 3-6.—Vasey, Cat. Forest Trees, 18.

Mylocaryum ligustrinum, Willdenow, Enum. i, 454.—Bot. Mag. t. 1625.—Lamarck, Ill. iii, 616, t. 952, f. 1.—Pursh, Fl. Am. Sept. i, 302, t. 14.—Poiret, Suppl. iv, 41.—Elliott, Sk. i, 508.—Eaton, Manual, 6 ed. 231.—Eaton & Wright, Bot. 323.—Darby, Fl. S. States, 417.—Wood, Cl. Book, 493; Bot. & Fl. 205.

TITI. IRON WOOD. BUCKWHEAT TREE.

Valley of the Savannah river, Georgia, southward to the Chattahoochee region of west Florida, westward along the Gulf coast to the valley of the Pearl river, Louisiana.

A small tree, sometimes 12 meters in height, with a trunk 0.30 to 0.40 meter in diameter, or toward its southern limits in Florida reduced to a shrub; margins of pine-barren ponds and streams.

Wood heavy, soft, not strong, close-grained, compact; medullary rays numerous, thin; color, brown tinged with red, the sap-wood lighter; specific gravity, 0.6249; ash, 0.42; largely used as fuel, burning with a clear flame.

CELASTRACEÆ.

39.—Euonymus atropurpureus, Jacquin,

Hort. Vind. ii, 155, t. 120.—Lamarck, Dict. ii, 573; Ill. ii, 98.—Aiton, Hort. Kew. i, 274; 2 ed. ii, 29.—Willdenow, Spec. i, 1132; Enum. i, 256.—Michaux, Fl. Bor.-Am. i, 155.—Persoon, Syn. i, 243.—Nouveau Duhamel, iii, 26.—Desfontaines, Hist. Arb. ii, 356.—Pursh, Fl. Am. Sept. i, 168.—Turpin, Dict. Sci. Nat. xvii, 532, t. 272.—Eaton, Manual, 28; 6 ed. 140.—Nuttall, Genera, 155.—Rœmer & Schultes, Syst. v, 466.—Hayne, Dend. Fl. 24.—Elliott, Sk. i, 293.—De Candolle, Prodr. ii, 4.—Torrey in Ann. Lyc. N. York, ii, 173; Fl. U. S. 261; Compend. Fl. N. States, 120; Fl. N. York, i, 141; Nicollet's Rep. 147.—Sprengel, Syst. i, 788.—Don, Miller's Dict. ii, 5.—Beck, Bot. 72.—Hooker, Jour. Bot. i, 201.—Spach, Hist. Veg. ii, 405.—Rafinesque, New Fl. 60.—Loudon, Arboretum, ii, 499, f. 167.—Torrey & Gray, Fl. N. America, i, 257.—Dietrich, Syn. i, 819.—Eaton & Wright, Bot. 240.—Griffith, Med. Bot. 219, f. 112.—Gray, Genera, ii, 188; Manual N. States, 5 ed. 116.—Richardson, Arctic Exped. 423.—Parry in Owen's Rep. 610.—Darby, Bot. S. States, 268.—Darlington, Fl. Cestrica, 3 ed. 48.—Baillon in Bull. Soc. Bot. France, v, 314.—Chapman, Fl. S. States, 76.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 102.—Lesquereux in Owen's 2d Rep. Arkansas, 354.—Wood, Cl. Book, 289; Bot. & Fl. 76.—Porcher, Resources S. Forests, 129.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 187.—Koch, Dendrologie, i, 629.—Young, Bot. Texas, 205.—Vasey, Cat. Forest Trees, 9.

E. Carolinensis, Marshall, Arbustum, 43.

E. latifolius, Marshall, Arbustum, 44 [not Aiton].—Agardh, Theor. & Syst. Pl. t. 22, f. 4.

BURNING BUSH. WAHOO. SPINDLE TREE. ARROW WOOD.

Western New York, west to the valley of the upper Missouri river (*Fort Union*), Montana, southward to northern Florida, southern Arkansas, and eastern Kansas.

A small tree, rarely 6 to 8 meters in height, with a trunk 0.15 meter in diameter, or more often a shrub 2 to 3 meters in height; low, rich woods, reaching its greatest development west of the Mississippi river.

Wood heavy, very close-grained, liable to check badly in seasoning; medullary rays hardly discernible; color, white tinged with orange; specific gravity, 0.6592; ash, 0.58.

Wahoo bark, a mild but rather uncertain purgative, is used by herbalists in the form of decoctions, tinctures, fluid extracts, etc. (*Am. Jour. Pharmacy*, xx, 80.—*U. S. Dispensatory*, 14 ed. 402.—*Nat. Dispensatory*, 2 ed. 559).

40.—Myginda pallens, Smith,

Rees' Cycl. xxv, No. 4.—De Candolle, Prodr. ii, 13.—Dietrich, Syn. i, 554.—Grisebach, Fl. British West Indies, 146.—Chapman in Coulter's Bot. Gazette, iii, 3; Fl. S. States, Suppl. 612.

Semi-tropical Florida, Upper Metacombe Key; in the West Indies.

A small tree, rarely exceeding 4 meters in height, with a trunk 0.15 meter in diameter.

Wood very heavy, hard, very close-grained, compact, satiny; layers of annual growth and numerous medullary rays hardly distinguishable; color, dark brown or nearly black, the thick sap-wood lighter brown tinged with red; specific gravity, 0.9048; ash, 3.42.

41.—Schæfferia frutescens, Jacquin,

Stirp. Am. 259.—Gærtner f. Fruct. Suppl. 249, t. 225, f. 7.—Lamarck, Ill. iii, 402, t. 809.—Poiret in Lamarck, Dict. vi, 727.—De Candolle, Prodr. ii, 41.—Karsten, Fl. Columbiæ, i, t. 91.—Chapman, Fl. S. States, 76.—Grisebach, Fl. British West Indies, 146.—Walpers, Ann. vii, 581.

S. completa, Swartz, Fl. Ind. Occ. i, 327, t. 7, f. A.—Willdenow, Spec. iv, 741.—Aiton, Hort. Kew. 2 ed. v, 371.—Macfadyen, Fl. Jamaica, 207.

S. buxifolia, Nuttall, Sylva, ii, 42, t. 56; 2 ed. i, 190, t. 56.—Cooper in Smithsonian Rep. 1858, 264.

YELLOW WOOD. BOX WOOD.

Semi-tropical Florida, southern keys from Metacombe Key eastward, Caloosa river and sparingly on the Reef Keys; in the West Indies.

A small tree, occasionally 10 meters in height, with a trunk 0.15 to 0.20 meter in diameter, generally hollow and defective.

Wood heavy, hard, close-grained, compact, susceptible of a high polish; medullary rays numerous, obscure; color, light bright yellow, the sap-wood a little lighter; specific gravity, 0.7745; ash, 2.54.

RHAMNACEÆ.

42.—Reynosia latifolia, Grisebach,

Cat. Pl. Cuba, 34.—Eggers, Videnskab, Medd. fra. Nat. For. 173 & t.; Bull. U. S. Nat. Mus. xiii, 40.—Gray in Coulter's Bot. Gazette, iv, 208.—Chapman, Fl. S. States, Suppl. 612.

? *Rhamnus lævigatus*, Vahl, Symbelæ, iii, 41.

Ceanothus lævigatus, De Candolle, Prodr. ii, 30.

Scutia ferrea, Chapman, Fl. S. States, 72 [not Brongniart].

? *Rhamindium revolutum*, Chapman, Fl. S. States, Suppl. 612.

RED IRON WOOD. DARLING PLUM.

Semi-tropical Florida, Miami (*Garber*), bay Biscayne, and on the southern keys (*Curtiss*); in the West Indies.

A small tree, sometimes 8 meters in height, with a trunk 0.15 to 0.20 meter in diameter.

Wood heavy, exceedingly hard, strong, close-grained, compact; medullary rays numerous, thin; color, rich dark brown, the sap-wood light brown; specific gravity, 1.0715; ash, 3.20.

The edible fruit, ripening in April and May, of agreeable flavor.

43.—Condalia ferrea, Grisebach,

Fl. British West Indies, 100.—Walpers, Ann. vii, 588.—Gray in Coulter's Bot. Gazette, iv, 208.—Chapman, Fl. S. States, Suppl. 612.

Rhamnus ferrea, Vahl, Symbelæ, iii, 41, t. 58.

Zizyphus emarginatus, Swartz, Fl. Ind. Occ. iii, 1954.

Ceanothus ferreus, De Candolle, Prodr. ii, 30.

Scutia ferrea, Brongniart in Ann. Sci. Nat. 1 ser. x, 363 [not Chapman, Fl. S. States, 72].—Vasey, Cat. Forest Trees, 9.

BLACK IRON WOOD.

Semi-tropical Florida, cape Canaveral to bay Biscayne, on the southern keys; in the West Indies.

A small tree, sometimes 11 meters in height, with a trunk 0.25 to 0.38 meter in diameter, generally hollow and defective; common.

Wood exceedingly heavy and hard, strong, brittle, close-grained, compact, difficult to work; remarkable for the large percentage of ash; medullary rays very numerous, thin; color, rich orange-brown, the sap-wood lighter; specific gravity, 1.3020; ash, 8.31.

44.—Condalia obovata, Hooker,

Icon. t. 287.—Torrey & Gray, Fl. i, 685.—Gray in Jour. Boston Soc. Nat. Hist. vi, 169; Genera, ii, 172, t. 164; Smithsonian Contrib. iii, 32; v, 27; Hall's Pl. Texas, 5.—Torrey, Bot. Mex. Boundary Survey, 47.—Watson in Proc. Am. Acad. xvii, 336.

BLUE WOOD. LOGWOOD. PURPLE HAW.

Eastern and southwestern Texas, westward through southern New Mexico to southern Arizona; probably extending into northern Mexico.

A small tree, 6 to 10 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or often a shrub; reaching its greatest development along the streams of eastern Texas; one of the common "chaparral" plants of western Texas, here forming dense, impenetrable thickets.

Wood very heavy, hard, close-grained, liable to check in seasoning, containing many groups of large irregularly-arranged open ducts; medullary rays numerous, obscure; color, light red, the sap-wood light yellow; specific gravity, 1.1999; ash, 7.03.

45.—Rhamnus Caroliniana, Walter,

Fl. Caroliniana, 101.—Lamarck, Ill. ii, 88; Dict. iv, 476.—Michaux, Fl. Bor.-Am. i, 153.—Nouveau Duhamel, iii, 47.—Persoon, Syn. i, 239.—Pursh, Fl. Am. Sept. i, 166.—Nuttall, Genera, i, 153.—Rœmer & Schultes, Syst. v, 285.—Elliott, Sk. i, 289.—De Candolle, Prodr. ii, 26.—Sprengel, Syst. i, 768.—Torrey in Ann. Lyc. N. York, ii, 174.—Don, Miller's Dict. ii, 32.—Hooker, Jour. Bot. i, 202.—Torrey & Gray, Fl. N. America, i, 262.—Dietrich, Syn. i, 807.—Loudon, Arboretum, ii, 537.—Eaton, Manual, 6 ed. 300.—Eaton & Wright, Bot. 390.—Scheele in Rœmer, Texas, 432.—Nuttall, Sylva, ii, 50, t. 59; 2 ed. i, 198, t. 59.—Darby, Bot. S. States, 269.—Lesquereux in Owen's 2d Rep. Arkansas, 354.—Wood, Cl. Book, 219; Bot. & Fl. 77.—Koch, Dendrologie, i, 610.—Gray, Hall's Pl. Texas, 5.

? Frangula fragillis, Rafinesque, Fl. Ludoviciana, 320; Sylva Telluriana, 27.

Sarcomphalus Carolinianus, Rafinesque, Sylva Telluriana, 29.

Frangula Caroliniana, Gray, Genera, ii, 178, t. 167; Manual N. States, 5 ed. 115.—Torrey, Bot. Mex. Boundary Survey, 46.—Cooper in Smithsonian Rep. 1858, 251.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 92.—Chapman, Fl. S. States, 73.—Vasey, Cat. Forest Trees, 9.

INDIAN CHERRY.

Long Island, New York, west along the valley of the Ohio river to southern Illinois, Missouri south of the Meramec river, eastern Kansas, and the Indian territory, south to northern Florida (latitude 30°), and through the Gulf states to western Texas.

A small tree, 6 to 10 meters in height, with a trunk 0.20 to 0.30 meter in diameter, or in the Atlantic states generally a tall shrub; rich woods along streams and river bottoms, reaching its greatest development in southern Arkansas and eastern Texas.

Wood light, hard, not strong, coarse-grained, compact; medullary rays numerous, thin; color, light brown, the sap-wood lighter; specific gravity, 0.5462; ash, 0.64.

The edible fruit sweet and agreeable.

46.—Rhamnus Californica, Eschscholtz,

Mem. Acad. St. Petersburg, x, 281 (*Linnæa* Litt.-Ber. 1828, 149.—Presl, Rep. Bot. i, 197).—Don, Miller's Dict. ii, 32.—Torrey & Gray, Fl. N. America, i, 263.—Dietrich, Syn. i, 806.—Eaton & Wright, Bot. 390.—Brewer & Watson, Bot. California, i, 101.—Hemsley, Bot. Am.-Cent. i, 197.

R. oleifolius, Hooker, Fl. Bor.-Am. i, 123, t. 44.—Hooker & Arnott, Bot. Beechey, 136, 328.—Torrey & Gray, Fl. N. America, i, 260.—Eaton & Wright, Bot. 390.—Bentham, Bot. Sulphur, 10; Pl. Hartweg. 302.—Durand in Jour. Philadelphia Acad. 1855, 85.—Carrière in Rev. Hort. xlvi, 354, f. 47–49.

Endotropis oleifolia, Rafinesque, Sylva Telluriana, 31.

R. laurifolius, Nuttall in Torrey & Gray, Fl. N. America, i, 260.—Eaton & Wright, Bot. 390.

Frangula Californica, Gray, Genera, ii, 178; Jour. Boston Soc. Nat. Hist. vi, 146.—Torrey in Sitgreaves' Rep. 157. Pacific R. R. Rep. iv, 74; Bot. Mex. Boundary Survey, 46; Bot. Wilkes Exped. 261.—Newberry in Pacific R. R. Rep. vi, 69.—Bolander in Proc. California Acad. iii, 78.

California, west of the Sierra Nevadas, from the valley of the upper Sacramento river southward to Santa Barbara and fort Tejon.

A small tree, rarely 7 to 9 meters in height, with a trunk 0.30 to 0.37 meter in diameter (*Pringle*), or commonly a shrub, along the sea-coast and at high elevations often prostrate; common and reaching its greatest development in the valleys of the Santa Cruz mountains. A low shrubby form, densely white-tomentose, especially on the under side of the leaves, of southern California, Arizona, and New Mexico, is—

var. **tomentella**, Brewer & Watson, Bot. California, i, 101.

R. tomentellus, Bentham, Pl. Hartweg. 303.—Seemann, Bot. Herald, 275.—Walpers, Ann. ii, 267.

Frangula Californica, var. *tomentella*, Gray in Smithsonian Contrib. vi, 28.—Torrey in Pacific R. R. Rep. iv, 74; vii, 9.

Wood light, soft, rather coarse-grained, checking in drying; layers of annual growth marked by many rows of open ducts; medullary rays narrow, obscure; color, brown or light yellow, the sap-wood lighter; specific gravity, 0.6000; ash, 0.58.

47.—Rhamnus Purshiana, De Candolle,

Prodr. ii, 25.—London, Arboretum, ii, 538, f. 211.—Hooker, Fl. Bor.-Am. i, 123, t. 43; London Jour. Bot. vi, 78.—Don, Miller's Dict. ii, 32.—Torrey & Gray, Fl. N. America, i, 262.—Dietrich, Syn. i, 807.—Nuttall, Sylva, ii, 52; 2 ed. i, 200.—Richardson, Arctic Exped. 423.—Newberry in Pacific R. R. Rep. vi, 69.—Koch, Dendrologie, i, 610.—Gray in Proc. Am. Acad. viii, 379.—Brewer & Watson, Bot. California, i, 101.—Hall in Coulter's Bot. Gazette, ii, 86.

R. alnifolius, Pursh, Fl. Am. Sept. i, 166 [not L'Heritier].

Cardiolepis obtusa, Rafinesque, Sylva Telluriana, 28.

Frangula Purshiana, Cooper in Smithsonian Rep. 1858, 259; Pacific R. R. Rep. xii², 29, 57.—Vasey, Cat. Forest Trees, 9.—Torrey, Bot. Wilkes Exped. 262.

BEARBERRY. BEAR WOOD. SHITTIM WOOD.

Puget sound, east along the mountain ranges of northern Washington territory to the Bitter Root mountain, Idaho (Mullan pass, *Watson*), and the shores of Flathead lake, Montana (*Canby & Sargent*), southward through western Washington territory, Oregon, and California, west of the Sierra Nevada, to about latitude 40°.

A small tree, often 12 meters in height, with a trunk 0.30 to 0.45 meter in diameter; depressions and along the sides and bottoms of cañons in the coniferous forests, reaching its greatest development along the western slope of the Coast Range of southern Oregon.

Wood light, very hard, not strong, close-grained, compact, satiny; medullary rays numerous, thin; color, light brown tinged with yellow, the sap-wood somewhat lighter; specific gravity, 0.5672; ash, 0.67.

The bark, like that of other species of the genus, possesses powerful cathartic properties, and, under the name of *Cascara sagrada*, has recently been introduced by herbalists in the form of fluid extracts, tinctures, etc., immense quantities being gathered for this purpose in the Oregon forests (*Nat. Dispensatory*, 2 ed. 659).

48.—Ceanothus thyrsiflorus, Eschscholtz,

Mem. Acad. St. Petersburg, x, 285.—Hooker, Fl. Bor.-Am. i, 125.—Don, Miller's Dict. ii, 37.—Hooker & Arnott, Bot. Beechey, 136, 328.—Torrey & Gray, Fl. N. America, i, 266.—Dietrich, Syn. i, 813.—London, Arboretum, ii, 540.—Eaton & Wright, Bot. 185.—Lindley, Bot. Reg. xxx, t. 38.—Nuttall, Sylva, ii, 44, t. 57; 2 ed. i, 193, t. 57.—Bentham, Bot. Sulphur, 10; Pl. Hartweg. 302.—Ann. Gand. 1847, t. 107.—Torrey in Pacific R. R. Rep. iv, 14; Bot. Mex. Boundary Survey, 45; Bot. Wilkes Exped. 263.—Newberry in Pacific R. R. Rep. vi, 69.—Cooper in Pacific R. R. Rep. xii², 57.—Bolander in Proc. California Acad. iii, 78.—Koch, Dendrologie, i, 621.—Watson in Proc. Am. Acad. x, 334.—Brewer & Watson, Bot. California, i, 102.—Vasey, Cat. Forest Trees, 9.

BLUE MYRTLE.

California Coast ranges, from Mendicino county south to the valley of the San Louis Rey river (Pala, *Parish Brothers*).

A small tree, 8 to 10 meters in height, with a trunk 0.10 to 0.15 meter in diameter, or toward the southern limits reduced to a low shrub; common and reaching its greatest development in the *Sequoia* forests near Santa Cruz.

Wood light, soft, close-grained, compact; medullary rays very obscure; color, light brown, the sap-wood darker; specific gravity, 0.5750; ash, 0.69.

The bark of the root may be expected to possess similar astringent properties to that of the shrubby *C. Americana*, used with advantage in cases of diarrhea and dysentery, and as a domestic remedy in throat troubles (*U. S. Dispensatory*, 14 ed. 1609.—*Nat. Dispensatory*, 2 ed. 373).

49.—Colubrina reclinata, Brongniart,

Ann. Sci. Nat. 1 ser. x, 369.—Richard, Fl. Cuba, 359.—Grisebach, Fl. British West Indies, 101.—Eggers in Bull. U. S. Nat. Mus. No. 13, 40.

Rhamnus ellipticus, Aiton, Hort. Kew. i, 265; 2 ed. ii, 17.—Willdenow, Spec. i, 1098.—Swartz, Prodr. 50; Fl. Ind. Occ. i, 497.

Zizyphus Dominigensis, Nouveau Duhamel, iii, 56.

Ceanothus reclinatus, L'Heritier, Sert. 6.—Rœmer & Schultes, Syst. v, 288.—De Candolle, Prodr. ii, 31.—Macfadyen, Fl. Jamaica, 211.

NAKED WOOD.

Semi-tropical Florida, Umbrella Key, on the north end of Key Largo, and sparingly on the small islands south of Elliott's Key; through the West Indies.

One of the largest trees of the region, deciduous, 12 to 18 meters in height, with a trunk 0.60 to 1.25 meter in diameter; reaching its greatest development within the United States on Umbrella Key, here forming a dense forest.

Wood heavy, hard, very strong, brittle, close-grained, compact, satiny, susceptible of a good polish, containing many small open ducts; medullary rays numerous, thin; color, dark brown tinged with yellow, the sap-wood light yellow; specific gravity, 0.8208; ash, 1.75.

"The trunk attains a size of over 1 meter and is most extraordinary. When 0.152 meter thick it becomes furrowed, and the furrows and ridges multiply and extend in all directions; trunks 0.75 to 1 meter in diameter appear like a mass of braided serpents. On small trunks the bark breaks up into flakes which curl up and drop off. Between the ridges where the bark persists the edges of dozens of papery layers may be seen" (*Curtiss in let*).

SAPINDACEÆ.

50.—Æsculus glabra, Willdenow,

Enum. 405.—Pursh, Fl. Am. Sept. i, 255.—Nuttall, Genera, i, 241.—De Candolle, Prodr. i, 597.—Torrey, Fl. U. S. 384; Compend. Fl. N. States, 164.—Guimpel, Otto & Hayne, Abb. Holz. 28, t. 24.—Hayne, Dend. Fl. 44.—Sprengel, Syst. ii, 166.—Don, Miller's Dict. i, 652.—Beck, Bot. 65.—Loudon, Arboretum, i, 467, f. 133.—Torrey & Gray, Fl. N. America, i, 251.—Dietrich, Syn. ii, 1225.—Eaton & Wright, Bot. 115.—Walpers, Rep. i, 424.—Gray, Genera, ii, 207, t. 176, 177; Manuel N. States, 5 ed. 118.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 79.—Wood, Cl. Book, 288; Bot. & Fl. 85.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 187.—Koch, Dendrologie, i, 508.—Vasey, Cat. Forest Trees, 9.—Ridgway in Proc. U. S. Nat. Mus. 1882, 61.

Æ. pallida, Willdenow, Enum. 406.—Nuttall, Genera, i, 242.—De Candolle, Prodr. i, 597.—Guimpel, Otto & Hayne, Abb. Holz. 29, t. 25.—Sprengel, Syst. ii, 166.—Don, Miller's Dict. i, 650.—Eaton, Manual, 6 ed. 6.—Lindley, Bot. Reg. xxiv, t. 51.—Loudon, Arboretum, i, 468, f. 134.

Æ. echinata, Muhlenberg, Cat. 38.

Æ. Ohioensis, Michaux f. Hist. Arb. Am. iii, 242; N. American Sylva, 3 ed. ii, 156, t. 92.—Poiret, Suppl. iii, 593.—De Candolle, Prodr. i, 597.—Don, Miller's Dict. i, 652.—Eaton, Manual, 6 ed. 6.—Riddell, Syn. Fl. W. States, 34.—Lindley, Bot. Reg. xxiv, 51, t. 51.—Nuttall, Sylva, ii, 71; 2 ed. ii, 17.

? *Æ. carnea*, Guimpel, Otto & Hayne, Abb. Holz. 25, t. 22.—Hayne, Dend. Fl. 43.—Lindley, Bot. Reg. xiii, t. 1056.—Watson, Dend. Brit. ii, t. 121.—Don, Miller's Dict. i, 652.—Torrey & Gray, Fl. N. America, i, 253.—Walpers, Rep. i, 425.

Pavia glabra, Spach in Ann. Sci. Nat. 2 ser. ii, 54; Hist. Veg. iii, 23.

Pavia pallida, Spach in Ann. Sci. Nat. 2 ser. ii, 54; Hist. Veg. iii, 23.

? *Pavia carnea*, Spach in Ann. Sci. Nat. 2 ser. ii, 54; Hist. Veg. iii, 23.—Don in Sweet's Brit. Fl. Gard. 2 ser. t. 301.

? *Pavia Watsoniana*, Spach in Ann. Sci. Nat. 2 ser. ii, 54; Hist. Veg. iii, 23.—Torrey & Gray, Fl. N. America, i, 253.

? *Æ. Watsoniana*, Dietrich, Syn. ii, 1225.—Walpers, Rep. i, 425.

Æ. Hippocastanum, var. *Ohioensis*, Loudon, Arboretum, i, 467.—Browne, Trees of America, 110.

Æ. Hippocastanum, var. *glabra*, Loudon, Arboretum, i, 467.—Browne, Trees of America, 111.

Æ. Hippocastanum, var. *pallida*, Loudon, Arboretum, i, 468.—Browne, Trees of America, 111.

OHIO BUCKEYE. FETID BUCKEYE.

Western slopes of the Alleghany mountains, Pennsylvania to northern Alabama, westward through southern Michigan (rare) to southern Iowa, eastern Kansas to about longitude 97° west, and the Indian territory.

A small tree, 8 to 15 meters in height, with a trunk 0.30 to 0.60 meter in diameter; rich soil along streams and river bottoms, reaching its greatest development in the high valleys of the southern Alleghany mountains.

Wood light, soft, not strong, close-grained, compact, difficult to split, often blemished by dark lines of decay; medullary rays obscure; color, white, the sap-wood darker; specific gravity, 0.4542; ash, 0.86; largely used in common with that of the other species of the genus in the manufacture of woodenware, artificial limbs (for which the wood of *Æsculus* is preferred to that of all other American trees), paper-pulp, wooden hats, less commonly for the bearings of shafting and machinery, and occasionally manufactured into lumber.

The bark of the allied old world species *Æ. Hippocastanum* occasionally has been found efficacious as a substitute for *cinchona* bark in the treatment of intermittent fevers (*U. S. Dispensatory*, 14 ed. 1565.—*Nat. Dispensatory*, 2 ed. 712), and similar properties may be looked for in the bark of *Æ. glabra*.

51.—Æsculus flava, Aiton,

Hort. Kew. i, 494; 2 ed. ii, 335.—B. S. Barton, Coll. i, 13; Bot. Appx. 26, t. 15, f. 2.—Willdenow, Spec. ii, 286; Enum. i, 405; Berl. Baumz. 13.—Desfontaines, Hist. Arb. i, 385.—Pursh, Fl. Am. Sept. i, 255.—Nuttall, Genera, i, 242.—James in Long's Exped. i, 22.—Guimpel, Otto & Hayne, Abb. Holz. 27, t. 23.—Hayne, Dend. Fl. 44.—Elliott, Sk. i, 436.—Watson, Dend. Brit. ii, t. 163.—Loddiges, Bot. Cab. t. 1280.—Torrey & Gray, Fl. N. America, i, 252.—Dietrich, Syn. ii, 1225.—Eaton, Manual, 6 ed. 7.—Eaton & Wright, Bot. 116.—Walpers, Rep. i, 424.—Darby, Bot. S. States, 266.—Torrey in Pacific R. R. Rep. iv, 74.—Browne, Trees of America, 118.—Schnizlein, Icon. t. 230^{xx}, *f.* 3.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 80.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 48.—Lesquereux in Owen's 2d Rep. Arkansas, 354.—Wood, Cl. Book, 288; Bot. & Fl. 75.—Gray, Manual N. States, 5 ed. 118.—Vasey, Cat. Forest Trees, 9.

Æ. octandra, Marshall, Arbustum, 4.—Miller's Dict. No. 1.

Pavia flava, Mœnch, Meth. 66.—De Candolle, Prodr. i, 598.—Don, Miller's Dict. i, 653.—Spach in Ann. Sci. Nat. 2 ser. ii, 55; Hist. Veg. iii, 25.—Loudon, Arboretum, i, 471 & t.

Æ. lutea, Wangenheim in Schrift. Gesell. Nat. Fr. Berlin, viii, 133, t. 6.—Michaux, Fl. Bor.-Am. i, 219.—Persoon, Syn. i, 403.—Koch, Dendrologie, i, 509.

Pavia lutea, Poiret in Lamarck, Dict. v, 94.—Nouveau Duhamel, iii, 155, t. 38.—Michaux f. Hist. Arb. Am. iii, 237, t. 11; N. American Sylva, 3 ed. ii, 153, t. 91.

Æ. neglecta, Lindley, Bot. Reg. xii, t. 1009.

Pavia neglecta, Don, Miller's Dict. i, 653.—Spach in Ann. Sci. Nat. 2 ser. ii, 55; Hist. Veg. iii, 24.—Loudon, Arboretum, i. 472.

SWEET BUCKEYE.

Allegheny county, Pennsylvania (*T. C. Porter*), southward along the Alleghany mountains to northern Georgia (Augusta) and Alabama, west along the valley of the Ohio river to southern Iowa, the Indian territory, and the valley of the Brazos river, eastern Texas.

A tree 18 to 28 meters in height, with a trunk 0.60 to 0.90 meter in diameter, or toward its southwestern limits reduced to a shrub; rich woods and along streams, reaching its greatest development on the slopes of the Alleghany mountains of North Carolina and Tennessee.

A variety with purple or flesh-colored flowers, the leaflets pubescent beneath, is—

var. purpurascens, Gray, Manual N. States, 5 ed. 118.

Æ. hybrida, De Candolle, Hort. Monsp. 1813, 75.—Poiret, Suppl. iv, 334.

Æ. discolor, Pursh, Fl. Am. Sept. i, 255.—Nuttall, Genera, i, 242.—Bot. Reg. iv, t. 310.—Elliott, Sk. i, 436.—Sprengel, Syst. ii, 167.—Sertum Botanicum, iv & t.—Eaton & Wright, Bot. 116.—Walpers, Ann. iv, 381.

Pavia discolor, Poiret, Suppl. v, 769.—Don, Miller's Dict. i, 653.—Eaton, Manual, 6 ed. 7.—Spach in Ann. Sci. Nat. 2 ser. ii, 57; Hist. Veg. iii, 28.—London, Arboretum, i, 472.

Pavia hybrida, De Candolle, Prodr. i, 598.—Don, Miller's Dict. i, 653.—Eaton, Manual, 6 ed. 6.—Spach in Ann. Sci. Nat. 2 ser. ii, 56; Hist. Veg. iii, 27.—London, Arboretum, i, 472.—Eaton & Wright, Bot. 116.—Koch, Dendrologie, i, 512.

Æ. Pavia, var. *discolor*, Torrey & Gray, Fl. N. America, i, 252.—Walpers, Rep. i, 424.—Gray in Jour. Boston Soc. Nat. Hist. vi, 167.

Wood light, soft, close-grained, compact, difficult to split; medullary rays numerous, obscure; color, creamy-white, the sap-wood hardly distinguishable; specific gravity, 0.4274; ash, 1.00.

52.—Æsculus Californica, Nuttall;

Torrey & Gray, Fl. N. America, i, 251; Sylva, ii, 69, t. 64; 2 ed. ii, 16, t. 64.—Hooker & Arnott, Bot. Beechey, 327.—Dietrich, Syn. ii, 1225.—Eaton & Wright, Bot. 116.—Walpers, Rep. i, 424.—Bentham, Bot. Sulphur, 9; Pl. Hartweg. 301.—Durand in Jour. Philadelphia Acad. 1855, 85.—Rev. Hort. iv, 150, f. 10, 11.—Torrey in Pacific R. R. Rep. iv, 74; Bot. Mex. Boundary Survey, 48; Bot. Wilkes Exped. 260.—Newberry in Pacific R. R. Rep. vi, 20, 69, f. 1.—Bot. Mag. t. 5077.—Fl. des Serres, xiii, 39, t. 1312.—London Gard. Chronicle, 1858, 844.—Belge, Hort. ix, 121 & t.—Gray in Proc. Boston Soc. Nat. Hist. vii, 146.—Bolander in Proc. California Acad. iii, 78.—Walpers, Ann. 624.—Koch, Dendrologie, i, 513.—Brewer & Watson, Bot. California, i, 106.—Vasey, Cat. Forest Trees, 9.

Calothyrsus Californica, Spach in Ann. Sci. Nat. 2 ser. ii, 62; Hist. Veg. iii, 35.

Pavia Californica, Hartweg in Jour. Hort. Soc. London, ii, 123.—Carrière in Rev. Hort. 1862, 369 & f.

CALIFORNIA BUCKEYE.

California, valley of the upper Sacramento river and Mendocino county, southward along the Coast ranges to San Luis Obispo, and along the western foot-hills of the Sierra Nevada to the San Bernardino mountains.

A low, widely-branching tree, 8 to 12 meters in height, with a short trunk 0.60 to 0.90 meter in diameter, often greatly expanded at the base, or more often a much-branched shrub 3 to 5 meters in height; borders of streams, reaching its greatest development in the cañons of the Coast Range, north of San Francisco bay.

Wood light, soft, not strong, very close-grained, compact; medullary rays numerous, obscure; color, white slightly tinged with yellow, the sap-wood hardly distinguishable; specific gravity, 0.4980; ash, 0.70.

53.—Ungnadia speciosa, Endlicher,

Atacta Bot. t. 36; Nov. Stirp. Desc. ix, 75.—Torrey & Gray, Fl. N. America, i, 684; Pacific R. R. Rep. ii, 162.—Walpers, Rep. i, 423; v, 371; Ann. vii, 625.—Gray in Jour. Boston Soc. Nat. Hist. vi, 167; Genera, ii, 211, t. 178, 179; Smithsonian Contrib. iii, 38; v, 30; Mem. Am. Acad. new ser. v, 299; Hall's Pl. Texas, 5.—Fl. des Serres, x, 217, t. 1059.—Torrey, Bot. Mex. Boundary Survey, 48.—Schnizlein, Icon. t. 230, f. 2, 8.—Cooper in Smithsonian Rep. 1858, 265.—Koch, Dendrologie, i, 515.—Baillon, Hist. Pl. v, 423.—Vasey, Cat. Forest Trees, 9.—Watson in Proc. Am. Acad. xvii, 337.

U. heterophylla, Scheele in Linnæa, xxi, 589; Rœmer, Texas, 589.

U. heptaphylla, Scheele in Linnæa, xxii, 352; Rœmer, Texas, 432.

SPANISH BUCKEYE.

Valley of the Trinity river (Dallas, *Reverchon*) through western Texas to the cañons of the Organ mountains, New Mexico (*Bigelow*); southward into Mexico.

A small tree, sometimes 6 to 8 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or toward its eastern and western limits reduced to a low shrub; common west of the Colorado river; bottoms and rich hillsides, reaching its greatest development in the valley of the Guadalupe river, between New Braunfels and the coast.

Wood heavy, soft, not strong, close-grained, compact, satiny, containing numerous evenly-distributed open ducts; medullary rays numerous, inconspicuous; color, red tinged with brown, the sap-wood lighter; specific gravity, 0.6332; ash, 1.17.

Fruit reputed poisonous.

54.—Sapindus marginatus, Willdenow,

Enum. i, 432.—Muhlenberg, Cat. 41.—De Candolle, Prodr. i, 607.—Sprengel, Syst. ii, 250.—Don, Miller's Dict. i, 665.—Spach, Hist. Veg. iii, 54.—Torrey & Gray, Fl. N. America, i, 255, 685; Pacific R. R. Rep. ii, 162.—Eaton, Manual, 6 ed. 323.—Eaton & Wright, Bot. 411.—Nuttall, Sylva, ii, 72, t. 65; 2 ed. ii, 19, t. 65.—Leavenworth in Am. Jour. Sci. i, 49, 130.—Engelmann & Gray in Jour. Boston Soc. Nat. Hist. v, 241.—Gray in Jour. Boston Soc. Nat. Hist. vi, 169; Genera, ii, 214, t. 180; Smithsonian Contrib. iii, 38; Hall's Pl. Texas, 5.—Engelmann in Wislizenus' Rep. 12.—Torrey in Emory's Rep. 138; Marcy's Rep. 282; Pacific R. R. Rep. iv, 2, 74; Bot. Mex. Boundary Survey, 47.—Scheele in Rœmer, Texas, 433.—Schnizlein, Icon. t. 230, f. 22.—Chapman, Fl. S. States, 79.—Lesquereux in Owen's 2d Rep. Arkansas, 354.—Wood, Cl. Book, 288; Bot. & Fl. 75.—Porcher, Resources S. Forests, 85.—Young, Bot. Texas, 208.—Vasey, Cat. Forest Trees, 9.—Hemsley, Bot. Am.-Cent. i, 214.—Watson in Proc. Am. Acad. xvii, 337.

S. saponaria, Lamarck, Ill. ii, 441, t. 307 [not Linnæus].—Michaux, Fl. Bor.-Am. i, 242.—Poiret in Lamarck, Dict. vi, 663, in part.—Persoon, Syn. i, 444.—Pursh, Fl. Am. Sept. i, 274.—Nuttall, Genera, i, 257.—Elliott, Sk. i, 460.—Torrey in Ann. Lyc. N. York, ii, 172.—Darby, Bot. S. States, 267.

? *S. inæqualis*, De Candolle, Prodr. i, 608.

S. falcatus, Rafinesque, Med. Bot. ii, 261.

S. acuminata, Rafinesque, New Fl. 22.

S. Drummondi, Hooker & Arnott, Bot. Beechey, 281 (excl. var.).—Walpers, Rep. i, 417.

WILD CHINA. SOAPBERRY.

Atlantic coast, Savannah river to the Saint John's river, Florida, and on Cedar Keys; southern Arkansas, valley of the Washita river (Prescott, *Letterman*) through western Louisiana and Texas to the mountain valleys of southern New Mexico and Arizona; southward into Mexico, and in the West Indies (? *S. inæqualis*).

A tree, sometimes 15 to 18 meters in height, with a trunk rarely 0.60 meter in diameter; west of the Colorado river much smaller, rarely 9 meters in height; along streams or toward the western limits of its distribution only in mountain valleys, reaching its greatest development along the river bottoms of eastern Texas.

Wood heavy, strong, hard, close-grained, compact, easily split into thin strips; layers of annual growth clearly marked by several rows of large open ducts; medullary rays thin, obscure; color, light brown tinged with yellow, the sap-wood lighter; specific gravity, 0.8126; ash, 1.50; largely used in Texas in the manufacture of cotton-baskets, and in New Mexico for the frames of pack-saddles.

Saponin, common in several species of the genus, and affording a substitute for soap, may be looked for in the fruit and roots of this tree.

55.—Sapindus Saponaria, Linnæus,

Spec. 1 ed. 367; Swartz, Obs. 152.—Lamarck, Ill. ii, 441, t. 307.—Willdenow, Spec. ii, 468.—Aiton, Hort. Kew. 2 ed. ii, 424.—Titford, Hort. Bot. Am. 61.—Poiret in Lamarck, Dict. vi, 663.—Descourtilz, Fl. Med. Antilles, iv, 121, t. 261.—De Candolle, Prodr. i, 607.—Spach. Hist. Veg. iii, 53.—Eaton, Manual, 6 ed. 323.—Macfadyen, Fl. Jamaica, 159.—Rafinesque, New Fl. 22.—Nuttall, Sylva, ii, 72; 2 ed. 20.—Richard, Fl. Cuba, 280.—Grisebach, Fl. British West Indies, 126.—Baillon, Hist. Pl. v, 349, f. 353.—Vasey, Cat. Forest Trees, 10.—Chapman in Coulter's Bot. Gazette, iii, 3; Fl. S. States, Suppl. 613.

SOAPBERRY.

Semi-tropical Florida, bay Biscayne, cape Sable, Caximbas bay, Thousand Islands, Key Largo, Elliott's Key; in the West Indies.

A small tree, 6 to 10 meters in height, with a trunk sometimes 0.38 meter in diameter; common on cape Sable, and reaching its greatest development within the United States on the Thousand Islands and along the shores of Caximbas bay.

Wood heavy, rather hard, close-grained, compact; medullary rays numerous, thin; color, light brown tinged with yellow, the sap-wood yellow; specific gravity, 0.8367; ash, 4.34.

The fruit and roots rich in *saponin* and used in the West Indies as a substitute for soap (*Guibourt, Hist. Drogues*, 7 ed. iii, 598.—*U. S. Dispensatory*, 14 ed. 1751); the round, black seeds for beads, buttons, and small ornaments.

56.—Hypelate paniculata, Cambessedes,

Mem. Mus. xviii, 32.—Don, Miller's Dict. i, 671.—Richard, Fl. Cuba, 295.—Grisebach, Fl. British West Indies, 127.—Chapman, Fl. S. States, 79.—Vasey, Cat. Forest Trees, 10.

Melicocca paniculata, Jussieu in Mem. Mus. iii, 187, t. 5.—De Candolle, Prodr. i, 615.—Nuttall, Sylva, ii, 74, t. 66; 2 ed. ii, 21, t. 66.

Exothea oblongifolia, Macfadyen, Fl. Jamaica, 232.

H. oblongifolia, Hooker in London Jour. Bot. iii, 226, t. 7.

INK WOOD. IRON WOOD.

Semi-tropical Florida, east coast, Mosquito inlet to the southern keys; in the West Indies.

A tree often 12 meters in height, with a trunk 0.45 meter in diameter.

Wood very heavy, exceedingly hard, very strong, close-grained, susceptible of a good polish, checking in drying; medullary rays obscure; color, bright reddish-brown, the sap-wood lighter; specific gravity, 0.9533; ash, 1.25; used in ship-building, for the handles of tools, and piles; resisting the attacks of the teredo.

57.—Hypelate trifoliata, Swartz,

Fl. Ind. Occ. ii, 655, t. 14.—Delessert, Icon. iii, t. 39.—De Candolle, Prodr. i, 614.—Chapman, Fl. S. States, 78.—Grisebach, Fl. British West Indies, 127; Cat. Pl. Cuba, 46.

WHITE IRON WOOD.

Semi-tropical Florida, Upper Metacombe and Umbrella Keys; in the West Indies.

A tree sometimes 12 meters in height, with a trunk 0.45 to 0.60 meter in diameter.

Wood very heavy, hard, close-grained, compact, susceptible of a fine polish, durable in contact with the soil; medullary rays thin, obscure; color, rich light brown, the sap-wood darker; specific gravity, 0.9102; ash, 1.38; used in ship-building, for the handles of tools, posts, etc.

58.—Acer Pennsylvanicum, Linnæus,

Spec. 1 ed. 1055.—Aiton, Hort. Kew. iii, 435.—Michaux, Fl. Bor.-Am. ii, 252.—Willdenow, Spec. iv, 989; Enum. i, 1045.—Desfontaines, Hist. Arb. i, 391.—Nouveau Duhamel, iv, 32.—Trattinick, Archiv. i, t. 11.—Hayne, Dend. Fl. 210.—Elliott, Sk. i, 451.—Torrey, Fl. U. S. 397; Compend. Fl. N. States, 170; Fl. N. York, i, 135.—Sprengel, Syst. ii, 224.—Eaton, Manual, 6 ed. 2.—Torrey & Gray, Fl. N. America, i, 246.—Hooker, Fl. Bor.-Am. i, 111.—Emerson, Trees Massachusetts, 496; 2 ed. ii, 566 & t.—Gray, Genera, ii, 200, t. 174, f. 1-3; Manual N. States, 5 ed. 119.—Richardson, Arctic Exped. 422.—Darby, Bot. S. States, 265.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 80.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 52.—Buchenau in Bot. Zeit. xix, 285, t. 2, f. 24.—Wood, Cl. Book, 286; Bot. & Fl. 74.—Koch, Dendrologie, i, 521.—Baillon, Hist. Pl. v, 373, f. 418-420.—Vasey, Cat. Forest Trees, 10.—Sears in Bull. Essex Inst. xiii, 175.—Bell in Geological Rep. Canada, 1879-'80, 53[c].

A. Canadense, Marshall, Arbustum, 4.

A. striatum, Du Roi, Diss. 58; Harbk. i, 8, t. 1.—Wangenheim, Amer. 29, t. 12, f. 2.—Lamarck, Dict. ii, 381.—Ehrhart, Beitr iv, 25.—Mœnch, Meth. 56.—Persoon, Syn. i 417.—Michaux f. Hist. Arb. Am. ii, 242, t. 17; N. American Sylva, 3 ed. ii, 175, t. 47.—Pursh, Fl. Am. Sept. i, 267.—Nuttall, Genera, i, 258.—De Candolle, Prodr. i, 593.—Watson, Dend. Brit. i, t. 70.—Don, Miller's Dict. i, 648.—Beck, Bot. 64.—Loudon, Arboretum, i, 407 & t.—Spach, Hist. Veg. iii, 85; Ann. Sci. Nat. 2 ser. ii, 162.—Dietrich, Syn. 1281.—Eaton & Wright, Bot. 112.—Bigelow, Fl. Boston. 3 ed. 407.—Browne, Trees of America, 76.

STRIPED MAPLE. MOOSE WOOD. STRIPED DOGWOOD. GOOSE-FOOT MAPLE. WHISTLE WOOD.

Valley of the Saint Lawrence river (Ha-Ha bay), northern shores of lake Ontario, islands of lake Huron, south through the northern Atlantic states, and along the Alleghany mountains to northern Georgia, west through the lake region to northeastern Minnesota.

A small tree, 6 to 10 meters in height, with a trunk 0.15 to 0.20 meter in diameter; cool ravines and mountain sides.

Wood light, soft, close-grained, compact, satiny; medullary rays numerous, thin; color, light brown, the sap-wood lighter; specific gravity, 0.5299; ash, 0.36.

59.—Acer spicatum, Lamarck,

Dict. ii, 381.—Aiton, Hort. Kew. iii, 485.—Persoon, Syn. i, 417.—De Candolle, Prodr. i, 593.—Don, Miller's Dict. i, 648.—Audubon, Birds, t. 134.—Penn. Cycl. i, 77.—Eaton, Manual, 6 ed. 2.—Beck, Bot. 64.—Spach, Hist. Veg. 87; Ann. Sci. Nat. 2 ser. ii, 163.—Loudon, Arboretum, i, 406, t. 26.—Torrey & Gray, Fl. N. America, i, 246.—Dietrich, Syn. ii, 1281.—Eaton & Wright, Bot. 112.—Torrey, Fl. N. York, i, 185.—Browne, Trees of America, 74.—Emerson, Trees Massachusetts, 497; 2 ed. ii, 567 & t.—Parry in Owen's Rep. 610.—Richardson, Arctic Exped. 422.—Chapman, Fl. S. States, 80.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 52.—Wood, Cl. Book, 287; Bot. & Fl. 74.—Gray, Manual N. States, 5 ed. 119.—Koch, Dendrologie, i, 522.—Macoun in Geological Rep. Canada, 1875-'76, 192.—Sears in Bull. Essex Inst. xiii, 175.—Bell in Geological Rep. Canada, 1879-'80, 54[c].—Nicholson in London Gard. Chronicle, 1881, 172.

A. Pennsylvanicum, Du Roi, Diss. 61; Harbk. i, 22, t. 1 [not Linnæus].—Wangenheim, Amer. 82, t. 12, f. 30.—Marshall, Arbustum, 2.

A. parviflorum, Ehrhart, Beitr. iv, 25; vi, 40.—Mœnch, Meth. 56.

A. montanum, Aiton, Hort. Kew. iii, 435; 2 ed. v, 447 (excl. syn. *striatum*).—Michaux, Fl. Bor.-Am. ii, 253.—Willdenow, Spec. iv, 988; Enum. i, 1045.—Desfontaines, Hist. Arb. i, 391.—Nouveau Duhamel, iv, 33.—Trattinick, Archiv. i, t. 13.—Pursh, Fl. Am. Sept. i, 267.—Nuttall, Genera, i, 253.—Guimpel, Otto & Hayne, Abb. Holz. 59, t. 48.—Hayne, Dend. Fl. 213.—Elliott, Sk. i, 452.—Torrey, Fl. U. S. 398; Compend. Fl. N. States, 170.—Sprengel, Syst. ii, 224.—Hooker, Fl. Bor.-Am. i, 111.—Bigelow, Fl. Boston. 3 ed. 408.—Darby, Bot. S. States, 265.

MOUNTAIN MAPLE.

Valley of the Saint Lawrence river, west along the northern shores of the great lakes to northern Minnesota and the Saskatchewan region, south through the northern states, and along the Alleghany mountains to northern Georgia.

A small tree, sometimes 8 to 10 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or often a tall shrub; cool woods and mountain ravines, reaching its greatest development on the western slopes of the Alleghany mountains of North Carolina and Tennessee.

Wood light, soft, close-grained, compact; medullary rays inconspicuous; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.5330; ash, 0.43.

60.—Acer macrophyllum, Pursh,

Fl. Am. Sept. i, 267.—Poiret, Suppl. v, 669.—Nuttall, Genera, i, 253; Sylva, ii, 77, t. 67; 2 ed. ii, 24, t. 67.—De Candolle, Prodr. i, 594.—Sprengel, Syst. ii, 225.—Penn. Cycl. i, 78.—Eaton, Manual, 6 ed. 2.—Hooker, Fl. Bor.-Am. i, 112, t. 38.—Don, Miller's Dict. i, 648.—Spach in Ann. Sci. Nat. 2 ser. ii, 165.—Torrey & Gray, Fl. N. America, i, 246.—Hooker & Arnott, Bot. Beechey, 327.—Dietrich, Syn. ii, 1281.—London, Arboretum, i, 408, t. 28, f. 117, 118.—Eaton & Wright, Bot. 112.—Bentham, Pl. Hartweg. 301.—Browne, Trees of America, 78.—Richardson, Arctic Exped. 423.—Durand in Jour. Philadelphia Acad. 1855, 84.—Torrey in Pacific R. R. Rep. iv, 74; Bot. Mex. Boundary Survey, 47; Bot. Wilkes Exped. 258.—Newberry in Pacific R. R. Rep. vi, 21, 67.—Cooper in Pacific R. R. Rep. xii, 28, 57; Smithsonian Rep. 1858, 258.—Lyall in Jour. Linnæan Soc. vii, 134, 144.—Bolander in Proc. California Acad. iii, 78.—Wood, Cl. Book, 287; Bot. & Fl. 74.—Rothrock in Smithsonian Rep. 1867, 334.—Koch, Dendrologie, i, 528.—Gray in Proc. Am. Acad. viii, 379.—Brower & Watson, Bot. California, i, 107.—Vasey, Cat. Forest Trees, 10.—Macoun in Geological Rep. Canada, 1875–'76, 192.—G. M. Dawson in Canadian Nat. new ser. ix, 330.—Nicholson in London Gard. Chronicle, 1881, 10.

A. palmatum, Rafinesque, New Fl. & Bot. i, 48 [not Thunberg].

BROAD-LEAVED MAPLE.

Coast of Alaska, from latitude 55° south along the islands and coast of British Columbia, through western Washington territory and Oregon, and along the California Coast ranges and western slopes of the Sierra Nevada to the San Bernardino mountains and Hot Spring valley, San Diego county (*Parish Brothers*), not ascending above 4,000 feet altitude.

A tree 24 to 30 meters in height, with a trunk 1.20 to 1.50 meter in diameter; along streams and river bottoms, reaching its greatest development on the rich bottom lands of the Coquille and other rivers of southern Oregon, where, with the California laurel, it forms dense, heavy forests.

Wood light, soft, not strong, close-grained, compact, easily worked, susceptible of a good polish; medullary rays numerous, thin; color, rich light brown tinged with red, the sap-wood lighter, often nearly white; specific gravity, 0.4909; ash, 0.54; largely used in Oregon in the manufacture of furniture, for ax and broom handles, frames of snow-shoes, etc.; specimens with the grain beautifully curled and contorted are common and valued in cabinet-making.

61.—Acer circinatum, Pursh.

Fl. Am. Sept. i, 266.—Poiret, Suppl. v, 669.—Nuttall, Genera, i, 253; Jour. Philadelphia Acad. vii, 16 (excl. syn.); Sylva, ii, 80, t. 67; 2 ed. ii, 27, t. 67.—De Candolle, Prodr. i, 595.—Sprengel, Syst. ii, 225.—Penn. Cycl. i, 79.—Eaton, Manual, 6 ed. 2.—Don, Miller's Dict. i, 651.—Spach in Ann. Sci. Nat. 2 ser. ii, 166; Hist. Veg. iii, 97.—Loudon, Arboretum, i, 422, f. 112, 127.—Torrey & Gray, Fl. N. America, i, 247.—Hooker, Fl. Bor.-Am. i, 112, t. 39.—Eaton & Wright, Bot. 112.—Dietrich, Syn. ii, 1282.—Browne, Trees of America, 91.—Richardson, Arctic Exped. 422.—Lindley in Paxton's Fl. Gard. ii, 156, f. 210 (London Gard. Chronicle, 1851, 791, f. 211).—Newberry in Pacific R. R. Rep. vi, 21, 69.—Cooper in Pacific R. R. Rep. xii, 28, 57; Smithsonian Rep. 1858, 258.—Lyall in Jour. Linnæan Soc. vii, 134.—Gray in Proc. Am. Acad. viii, 379.—Wood, Cl. Book, 287, Bot. & Fl. 74.—Koch, Dendrologie, i, 523.—Torrey, Bot. Wilkes Exped. 258.—Brewer & Watson, Bot. California, i, 107.—Vasey, Cat. Forest Trees, 10.—Hall in Coulter's Bot. Gazette, ii, 85.—Macoun in Geological Rep. Canada, 1875–'76, 192.—G. M. Dawson, Canadian Nat. new ser. ix, 330.—Nicholson in London Gard. Chronicle, 1881, 10.

A. virgatum, Rafinesque, New Fl. & Bot. i, 48.

VINE MAPLE.

British Columbia, valley of the Fraser river (Yale) and probably farther north, southward through Washington territory and Oregon, west of the Cascade mountains to the Mount Shasta region of northern California, rarely ascending to 4,000 feet altitude.

A small tree, sometimes 8 to 12 meters in height, with a trunk 0.20 to 0.30 meter in diameter; along streams; the stems often prostrate and forming dense, impenetrable thickets.

Wood heavy, hard, not strong, close-grained, compact; medullary rays numerous, thin; color, light brown or often nearly white, the sap-wood lighter; specific gravity, 0.6660; ash, 0.39; used as fuel; by lumbermen for ax and shovel handles, and by the coast Indians for the bows of fishing nets.

62.—Acer glabrum, Torrey,

Ann. Lyc. N. York, ii, 172; Bot. Wilkes Exped. 259.—Don, Miller's Dict. i, 650.—Eaton, Manual, 6 ed. 2.—Torrey & Gray, Fl. N. America, i, 247, 684.—Eaton & Wright, Bot. 112.—Walpers, Rep. i, 409.—Nuttall, Sylva, ii, 86; 2. ed., ii, 33.—Newberry in Pacific R. R. Rep. vi. 69.—Cooper in Smithsonian Rep. 1858, 258; Pacific R. R. Rep. xii, 51, 57; Am. Nat. iii, 406.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 187.—Gray in Am. Jour. Sci. 2 ser. xxxiv, 259; Proc. Philadelphia Acad. 1863, 59.—Porter in Hayden's Rep. 1870. 474; 1871, 480.—Watson in King's Rep. v, 52.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 19.—Coulter in Hayden's Rep. 1872, 763.—Macoun in Geological Rep. Canada, 1875–'76, 192.—Brewer & Watson, Bot. California, i, 107.—Rothrock in Wheeler's Rep. vi, 83.—Nicholson in London Gard. Chronicle, 1881, 750.

A. barbatum, Douglas in Hooker, Fl. Bor.-Am. i, 113.—Loudon, Arboretum, i, 420, f. 125 (excl. syn.).

A. Douglasii, Hooker in London Jour. Bot. vi, 77, t. 6.

A. tripartitum, Nuttall in Torrey & Gray, Fl. N. America, i, 247.—Dietrich, Syn. ii, 1281.—Eaton & Wright, Bot. 112.—Walpers, Rep. i, 409.—Nuttall, Sylva, ii, 85, t. 71; 2 ed. ii, 33, t. 71.—Gray in Mem. Am. Acad. new ser. iv[1], 28; Pacific R. R. Rep. iv, 73.—Newberry in Pacific R. R. Rep. vi, 69.

DWARF MAPLE.

British Columbia, valley of the Fraser river and probably farther north, south through Washington territory, Oregon, and along the Sierra Nevada of California to the Yosemite valley; east along the mountain ranges of Idaho and Montana to the eastern base of the Rocky mountains, south through Colorado and Utah, in the east Humboldt Range, Nevada, and in the mountain ranges of western New Mexico and eastern Arizona.

A small tree, 8 to 12 meters in height, with a trunk sometimes 0.30 meter in diameter, or more often reduced to a low shrub 1 to 2 meters in height; borders of streams, reaching its greatest development in the mountain cañons of western New Mexico and eastern Arizona.

Wood heavy, hard, close-grained, compact; medullary rays numerous, thin; color, light brown, or often nearly white, the sap-wood lighter; specific gravity, 0.6028; ash, 0.30.

63.—Acer grandidentatum, Nuttall;

Torrey & Gray, Fl. N. America, i, 247.—Dietrich, Syn. ii, 1283.—Eaton & Wright, Bot. 112.—Walpers, Rep. i, 409.—Nuttall, Sylva, ii, 82, t. 69; 2 ed. ii, 29, t. 69.—Watson in King's Rep. v, 52; Pl. Wheeler, 7.—Porter in Hayden's Rep. 1871, 480.—Vasey, Cat. Forest Trees, 10.—Parry in Am. Nat. ix, 201, 268.—Rothrock in Wheeler's Rep. vi, 83.—Rusby in Bull. Torrey Bot. Club, ix, 106.—Watson in Proc. Am. Acad. xvii, 338.—Nicholson in London Gard. Chronicle, 1881, 172.

Western Montana, headwaters of the Columbia river (*Nuttall*), cañons of the Wahsatch mountains, Utah, and south through eastern Arizona to southwestern New Mexico (Mogollon mountains, *E. L. Greene*), and reported in the ranges east of the Rio Grande; southward into Coahuila (*Palmer*).

A small tree, rarely exceeding 10 meters in height, with a trunk 0.20 to 0.25 meter in diameter; along streams; not common.

Wood heavy, hard, close-grained, compact; medullary rays numerous, thin, distinct; color, light brown, or often nearly white; specific gravity, 0.6902; ash, 0.64.

64.—Acer saccharinum, Wangenheim,

Amer. 36, t. 11, f. 26.—Lamarck, Dict. ii, 379.—Walter, Fl. Caroliniana, 251.—Aiton, Hort. Kew. iii, 434; 2 ed. v, 447.—Ehrhart, Beitr. iv, 24.—Persoon, Syn. i, 417.—Nouveau Duhamel, iv, 29, t. 8.—Willdenow, Spec. iv, 985; Enum. ii, 1044.—Desfontaines, Hist. Arb. i, 392.—Trattinick, Archiv. i, t. 3.—Michaux f. Hist. Arb. Am. ii, 218, t. 15; N. American Sylva, 3 ed. i, 153, t. 42.—Titford, Hort. Bot. Am. 105.—Pursh, Fl. Am. Sept. i, 266.—Eaton, Manual, 44; 6 ed. 2.—Nuttall, Genera, i, 253.—Hayne, Dend. Fl. 214.—Elliott, Sk. i, 450.—Richardson, Franklin Jour. 26; Arctic Exped. 422.—De Candolle, Prodr. i, 595.—Torrey, Fl. U. S. 396; Compend. Fl. N. States, 170; Fl. N. York, i, 135.—Sprengel, Syst. ii, 225.—Penn. Cycl. i, 79.—Hooker, Fl. Bor.-Am. i, 113.—Don, Miller's Dict. i, 650.—Beck, Bot. 63.—Bigelow, Fl. Boston. 3 ed. 406.—Spach, Hist. Veg. iii, 170; Ann. Sci. Nat. 2 ser. ii, 99.—Loudon, Arboretum, i, 411, t. 31, f. 122.—Torrey & Gray, Fl. N. America, i, 248.—Eaton & Wright, Bot. 112.—Dietrich, Syn. ii, 1282.—Walpers, Rep. i, 410.—Nees, Pl. Med. 5.—Nuttall, Sylva, ii, 88; 2 ed. ii, 35.—Browne, Trees of America, 83.—Emerson, Trees Massachusetts, 489; 2 ed. ii, 258 & t.—Gray, Genera, ii, 200, t. 174; Manual N. States, 5 ed. 119.—Darlington, Fl. Cestrica, 3 ed. 45.—Darby, Bot. S. States, 265.—Parry in Owen's Rep. 610.—Chapman, Fl. S. States, 80.—Lesquereux in Owen's 2d Rep. Arkansas, 354.—Wood, Cl. Book, 286; Bot. & Fl. 74.—Porcher, Resources S. Forests, 80.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 187.—Young, Bot. Texas, 206.—Vasey, Cat. Forest Trees, 10.—Guibourt, Hist. Drogues, 7 ed. iii, 606.—Ward in Bull. U. S. Nat. Mus. No. 22, 73.—Sears in Bull. Essex Inst. xiii, 175.—Bell in Geological Rep. Canada, 1879-'80, 51[c].—Ridgway in Proc. U. S. Nat. Mus. 1882, 62.

A. saccharum, Marshall, Arbustum, 4.

A. barbatum, Michaux, Fl. Bor.-Am. ii, 253.—Willdenow, Spec. iv, 989.—Poiret, Suppl. ii, 575.—Pursh, Fl. Am. Sept. i, 266.—Nuttall, Genera, i, 255.—Elliott, Sk. i, 451.—De Candolle, Prodr. i, 595.—Torrey, Fl. U. S. 396; Compend. Fl. N. States, 169.—Eaton, Manual, 6 ed. 2.—Sprengel, Syst. ii, 224.—Don, Miller's Dict. i, 649.—Beck, Bot. 63.—Spach, Hist. Veg. iii, 178; Ann. Sci. Nat. 2 sér. ii, 118.—Torrey & Gray, Fl. N. America, i, 249, 684.—Eaton & Wright, Bot. 112.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii. 51.

SUGAR MAPLE. SUGAR TREE. HARD MAPLE. ROCK MAPLE.

Southern Newfoundland, valleys of the Saint Lawrence and Saguenay rivers, shores of lake Saint John, west along the northern shores of the great lakes to Lake of the Woods; south through the northern states and along the Alleghany mountains to northern Alabama and the Chattahoochee region of west Florida (var. *Floridanum*, *Chapman*, *l. c.*); west to Minnesota, eastern Nebraska, eastern Kansas (rare), and eastern Texas.

A tree of great economic value, 24 to 36 meters in height, with a trunk 0.60 to 1.20 meter in diameter, or toward its southwestern limits greatly reduced in size; rich woods, often forming extensive forests, and reaching its greatest development in region of the great lakes.

Wood heavy, hard, strong, tough, close-grained, compact, susceptible of a good polish; medullary rays numerous, thin; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.6912; ash, 0.54; largely used in the manufacture of furniture, shoe lasts and pegs, saddle-trees, in turnery, for interior finish, and flooring; in ship-building for keels, keelsons, shoes, etc., and furnishing valuable fuel; "curled" maple and "bird's-eye" maple, accidental forms in which the grain is beautifully curled and contorted, are common and highly prized in cabinet-making.

Maple sugar is principally made from this species; the ashes of the wood, rich in alkali, yield large quantities of potash.

Var. nigrum, Torrey & Gray,

Fl. N. America, i, 248.—Torrey, Fl. N. York, i, 136.—London, Arboretum, i, 411.—Browne, Trees of America, 84.—Gray, Manual N. States, 5 ed. 119.—Vasey, Cat. Forest Trees, 10.—Bell in Geological Rep. Canada, 1879–'80, 54c.

A. saccharinum, Michaux, Fl. Bor.-Am. ii, 252 [not Wangenheim].

A. nigrum, Michaux f. Hist. Arb. Am. ii, 238, t. 16; N. American Sylva, 3 ed. i, 163, t. 43.—Pursh, Fl. Am. Sept. i, 266.—Poiret, Suppl. v, 669.—Nuttall, Genera, i, 253.—Elliott, Sk. i, 450.—De Candolle, Prodr. i, 595.—Torrey, Fl. U. S. 397; Compend. Fl. N. States, 170.—Sprengel, Syst. ii, 225.—Don, Miller's Dict. i, 650.—Beck, Bot. 63.—Eaton, Manual, 6 ed. 2.—Spach, Hist. Veg. iii, 104; Ann. Sci. Nat. 2 ser. ii, 170.—Dietrich, Syn. ii, 1282.—Eaton & Wright, Bot. 112.—Koch, Dendrologie, i, 532.—Gray in Am. Nat. vi, 767; vii, 422.—Wood, Cl. Book, 286; Bot. & Fl. 74.

BLACK SUGAR MAPLE.

Western Vermont, shores of lake Champlain, westward to southern Missouri, south through Tennessee to northern Alabama, the valley of the Chickasaw river, Mississippi (*Mohr*), and southwestern Arkansas (Fulton, *Letterman*).

A large tree along streams and river bottoms, in lower ground than the species with which it is connected by numerous intermediate forms.

Wood heavier than that of the species; specific gravity, 0.6915; ash, 0.71.

65.—Acer dasycarpum, Ehrhart,

Beitr. iv, 24.—Mœnch, Meth. 56.—Persoon, Syn. i, 417.—Willdenow, Spec. iv, 985; Enum. ii, 1044.—Aiton, Hort. Kew. 2 ed. v, 446.—Pursh, Fl. Am. Sept. i, 266.—Nuttall, Genera, i, 252; Sylva, ii, 87; 2 ed. ii, 35.—Hayne, Dend. Fl. 213.—Elliott, Sk. i, 449.—Torrey, Fl. U. S. 396; Compend. Fl. N. States, 169; Fl. N. York, i, 136, t. 18; Nicollet's Rep. 147.—Sprengel, Syst. ii, 225.—Tausch, Regensb. Fl. xii², 553.—Eaton, Manual, 6 ed. 2.—London, Arboretum, i, 423, fig. 129 & t.—Hooker, Fl. Bor.-Am. i, 113; Jour. Bot. i, 200.—Bigelow, Fl. Boston. 3 ed. 407.—Torrey & Gray, Fl. N. America, i, 248.—Eaton & Wright, Bot. 112.—Emerson, Trees Massachusetts, 487; 2 ed. ii, 556 & t.—Parry in Owen's Rep. 610.—Darlington, Fl. Cestrica, 3 ed. 46.—Richardson, Arctic Exped. 423.—Darby, Bot. S. States, 265.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 81.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 51.—Lesquereux in Owen's 2d Rep. Arkansas, 354.—Wood, Cl. Book, 286; Bot. & Fl. 74.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 187.—Buchenau in Bot. Zeit. xix, 285, t. 11.—Gray, Manual N. States, 5 ed. 119.—Vasey, Cat. Forest Trees, 10.—Coulter's Bot. Gazette, v, 88.—Koch, Dendrologie, i, 541.—Sears in Bull. Essex Inst. xiii, 3.—Bell in Geological Rep. Canada, 1879–'80, 53c.—Nicholson in London Gard. Chronicle, 1881, 136, f. 24.—Ridgway in Proc. U. S. Nat. Mus. 1882, 62.

A. saccharinum, Linnæus, Spec. 1 ed. 1055.

A. rubrum, var. *pallidum*, Aiton, Hort. Kew. iii, 434.

A. eriocarpum, Michaux, Fl. Bor.-Am. ii, 253.—Desfontaines in Ann. Mus. vii, 412, t. 25, f. 1; Hist. Arb. i, 392.—Poiret, Suppl. ii, 573.—Trattinick, Archiv. i, t. 8.—Michaux f. Hist. Arb. Am. ii, 205, t. 13; N. American Sylva, 3 ed. i, 146, t. 40.—Nouveau Duhamel, iv, 30.—De Candolle, Prodr. i, 595.—Don, Miller's Dict. i, 650.—Penn. Cycl. i, 79.—Beck, Bot. 63.—Spach, Hist. Veg. iii, 116; Ann. Sci. Nat. 2 ser. ii, 177.—Darlington, Fl. Cestrica, 2 ed. 245.—Dietrich, Syn. ii, 1282.—Browne, Trees of America, 95.—Meehan in Proc. Philadelphia Acad. 1868, 140.

SOFT MAPLE. WHITE MAPLE. SILVER MAPLE.

Valley of the Saint John's river, New Brunswick, to Ontario, south of latitude 45°, south to western Florida; west to eastern Dakota, eastern Nebraska, the valley of the Blue river, Kansas, and the Indian territory.

A large tree, 18 to 30 or, exceptionally, 36 meters in height, with a trunk 1.20 to 1.80 meter in diameter; along streams and intervales, in rich soil; most common west of the Alleghany mountains, and reaching its greatest development in the basin of the lower Ohio river.

Wood light, hard, strong, brittle, close-grained, compact, easily worked; medullary rays numerous, thin; specific gravity, 0.5269; ash, 0.33; somewhat used in the manufacture of cheap furniture, for flooring, etc.; maple sugar is occasionally made from this species.

66.—Acer rubrum, Linnæus.

Spec. 1 ed. 1055.—Du Roi, Diss. 59.—Marshall, Arbustum, 3.—Lamarck, Dict. ii, 300; Ill. iii, 438, t. 844, f. 3.—Ehrhart, Beitr. iv, 23.—Abbot, Insects Georgia, ii, 93.—Aiton, Hort. Kew. iii, 434 (excl. var.); 2 ed. v, 446.—Mœnch, Meth. 56.—Michaux, Fl. Bor.-Am. ii, 253.—Persoon, Syn. i, 417.—Robin, Voyages, iii, 471.—Nouveau Duhamel, iv, 31.—Willdenow, Spec. iv, 984; Enum. ii, 1044.—Desfontaines in Ann. Mus. vii, 413, t. 25, f. 2; Hist. Arb. i, 391.—Poiret, Suppl. ii, 574.—Trattinick, Archiv. i, t. 9.—Michaux f. Hist. Arb. Am. ii, 210, t. 14; N. American Sylva, 3 ed. i 149, t. 41.—Pursh, Fl. Am. Sept. i, 265.—Bigelow, Fl. Boston. 377.—Nuttall, Genera, i, 252.—Eaton, Manual, 44; 6 ed. 2.—Hayne, Dend. Fl. 213.—Elliott, Sk. i, 449.—Torrey, Fl. U. S. 395; Compend. Fl. N. States, 160; Fl. N. York, i, 137.—Watson, Dend. Brit. ii, t. 169.—Sprengel, Syst. ii, 225.—Audubon, Birds, t. 54, 67.—Tausch, Regensb. Fl. xii², 552.—Penn. Cycl. i, 79.—Hooker, Fl. Bor.-Am. i, 114; Jour. Bot. i, 199.—Don, Miller's Dict. i, 650.—Beck, Bot. 63.—Spach, Hist. Veg. iii, 113; Ann. Sci. Nat. 2 ser. ii, 176.—Loudon, Arboretum, i, 424, f. 130 & t.—Torrey & Gray, Fl. N. America, i, 249, 684.—Dietrich, Syn. ii, 1282.—Eaton & Wright, Bot. 112.—Bigelow, Fl. Boston. 3 ed. 405.—Walpers, Rep. i, 409.—Reid in London Gard. Chronicle, 1844, 276.—Emerson, Trees Massachusetts, 483; 2 ed. ii, 551 & t.—Parry in Owen's Rep. 610.—Richardson, Arctic Exped. 422.—Nuttall, Sylva, ii, 87; 2 ed. ii, 34.—Darlington, Fl. Cestrica, 3 ed. 46.—Darby, Bot. S. States, 265.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 81.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 50.—Lesquereux in Owen's 2d Rep. Arkansas, 354.—Wood, Cl. Book, 286; Bot. & Fl. 74.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 187.—Porcher, Resources S. Forests, 79.—Buchenau in Bot. Zeit. xix, 285, t. 11.—Gray, Manual N. States, 5 ed. 119.—Koch, Dendrologie, i, 542.—Young, Bot. Texas, 206.—Vasey, Cat. Forest Trees, 10.—Macoun in Geological Rep. Canada, 1875–'76, 192.—Sears in Bull. Essex Inst. xiii, 176.—Bell in Geological Rep. Canada, 1879–'80, 54ᶜ.—Nicholson in London Gard. Chronicle, 1881, 172, f. 30, 31.—Ridgway in Proc. U. S. Nat. Mus. 1882, 62.

? *A. glaucum*, Marshall, Arbustum, 2.

? *A. Caroliniana*, Walter, Fl. Caroliniana, 251.

A. coccineum, Michaux f. Hist. Arb. Am. ii, 203; N. American Sylva, 3 ed. i, 142.

A. sanguineum, Spach, Hist. Veg. iii, 115; Ann. Sci. Nat. 2 ser. ii, 176.—Dietrich, Syn. ii, 1282.

RED MAPLE. SWAMP MAPLE. SOFT MAPLE. WATER MAPLE.

New Brunswick, Quebec and Ontario, south of latitude 49°, north and west to the Lake of the Woods, south to Indian and Caloosa rivers, Florida, west to eastern Dakota, eastern Nebraska, the Indian territory, and the valley of the Trinity river, Texas.

A large tree, 20 to 30 or, exceptionally, 32 meters in height, with a trunk 0.90 to 1.50 meter in diameter; borders of streams and low, wet swamps, reaching its greatest development in the valleys of the lower Wabash and Yazoo rivers.

Wood heavy, hard, not strong, close-grained, compact, easily worked; medullary rays numerous, obscure; color, brown, often tinged with red, the sap-wood lighter; specific gravity, 0.6178; ash, 0.37; largely used in cabinet-making, turnery, and for woodenware, gun stocks, etc.; an accidental variety with undulating grain is highly valued.

Ink is occasionally made, domestically, by boiling the bark of this species in soft water and combining the tannin with sulphate of iron; formerly somewhat used in dyeing.

Var. Drummondii.

A. Drummondii, Hooker & Arnott in Hooker, Jour. Bot. i, 199.—Nuttall, Sylva, ii, 83, t. 70; 2 ed. ii, 30, t. 70.

Southern Arkansas, eastern Texas, western Louisiana, and sparingly through the Gulf states to southern Georgia.

Well characterized by its obovate or truncate leaves, the base entire or slightly crenulate-toothed, densely covered, as well as the petioles and young shoots, with a thick white tomentum; fruit convergent, the wings bright red, even when fully ripe.

A large tree, in deep, wet swamps, connected with the species by numerous intermediate forms of Georgia, Florida, and Alabama.

Wood lighter than that of the species; specific gravity, 0.5459; ash, 0.34.

67.—Negundo aceroides, Mœnch,

Meth. 334.—Torrey & Gray, Fl. N. America, i, 250.—Eaton & Wright, Bot. 327.—Torrey in Nicollet's Rep. 147; Fremont's Rep. 88; Pacific R. R. Rep. iv, 73.—Nuttall, Sylva, ii, 92; 2 ed. ii, 38.—Gray in Jour. Boston Soc. Nat. Hist. vi, 166; Mem. Am. Acad. new ser. iv, 29; v, 309; Genera, ii, 202, t. 175; Pacific R. R. Rep. xii, 41; Manual N. States, 5 ed. 120.—Richardson, Arctic Exped. 423.—Parry in Owen's Rep. 610.—Darlington, Fl. Cestrica, 3 ed. 46.—Cooper in Smithsonian Rep. 1858, 251; Am. Nat. iii, 306.—Chapman, Fl. S. States, 81.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 53.—Wood, Cl. Book, 287; Bot. & Fl. 74.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 188.—Porter in Hayden's Rep. 1870, 474.—Watson in King's Rep. v, 52; Pl. Wheeler, 7.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 19.—Macoun & Gibson in Trans. Bot Soc. Edinburgh, xii, 319.—Young, Bot. Texas, 207.—Vasey, Cat. Forest Trees, 10.—Macoun in Geological Rep. Canada, 1875–'76, 192.—Brower & Watson, Bot. California, i, 108.—Rothrock in Wheeler's Rep. vi, 84.—Hemsley, Bot. Am.-Cent. i, 214.—Sears in Bull. Essex Inst. xiii, 176.—Bell in Geological Rep. Canada, 1879–'80, 48ᶜ.—Nicholson in London Gard. Chronicle, 1881, 815.—Ridgway in Proc. U. S. Nat. Mus. 1882, 63.—Watson in Proc. Am. Acad. xvii, 338.

Acer Negundo, Linnæus, Spec. 1 ed. 1056.—Wangenheim, Amer. 30, t. 12, f. 29.—Marshall, Arbustum, 2.—Lamarck, Dict. ii, 380.—Walter, Fl. Caroliniana, 250.—Aiton, Hort. Kew. iii, 436; 2 ed. v, 448.—Michaux, Fl. Bor.-Am. ii, 253.—Persoon, Syn. i, 418.—Desfontaines, Hist. Arb. i, 391.—Willdenow, Spec. iv, 992; Enum. ii, 1046.—Nouveau Duhamel, iv. 27, t. 7.—Trattinick, Archiv. i, t. 40.—Michaux f. Hist. Arb. Am. ii, 247, t. 18; N. American Sylva, 3 ed. i, 172, t. 46.—Pursh, Fl. Am. Sept. i, 268.—Hayne, Dend. Fl. 216.—Elliott, Sk. i, 452.—James in Long's Exped. ii, 69.—Torrey, Fl. U. S. 298; Compend. Fl. N. States, 170; Ann. Lyc. N. York, ii, 172; Emory's Rep. 407.—Sprengel, Syst. ii, 225.—Guimpel, Otto & Hayne, Abb. Holz. 119, t. 95.—Eaton, Manual, 6 ed., 2.—Dietrich, Syn. ii, 1283.—Loudon, Arboretum, i, 460, t. 46, 47.—Darby, Bot. S. States, 265.—Buchenau in Bot. Zeit. xiv, 285, t. 11 & figs.—Koch, Dendrologie, i, 544.—Baillon, Hist. Pl. v, 374, f. 426.

Negundium fraxinifolium, Rafinesque, Méd. Rep. v, 354.—Desvaux, Jour. Bot. v, 170.

Negundo fraxinifolium, Nuttall, Genera, i, 253.—De Candolle, Prodr. i, 596.—Hooker, Fl. Bor.-Am. i, 114; Jour. Bot. i, 200.—Don, Miller's Dict. i, 651.—Beck, Bot. 64.—Spach, Hist. Veg. iii, 119.—Rafinesque, New Fl. & Bot. i, 48.—Browne, Trees of America, 106.—Scheele in Rœmer, Texas, 433.—Schnizlein, Icon. t. 227, f. 2, 18.

? *N. Mexicanum*, De Candolle, Prodr. i, 596.—Hemsley, Bot. Am.-Cent. i, 214.

N. trifoliatum, Rafinesque, New Fl. & Bot. i, 48.

N. lobatum, Rafinesque, New Fl. & Bot. i, 48.

N. Californicum, Scheele in Rœmer, Texas, 433 [not Torrey & Gray].

BOX ELDER. ASH-LEAVED MAPLE.

Shores of the Winooski river and lake Champlain, Vermont, near Ithaca, New York, eastern Pennsylvania, and south to Hernando county, Florida (not detected in northeastern Florida); northwest through the lake region of the United States and Manitoba to the Dog's Head, lake Winnipeg, and along the southern branch of the Saskatchewan to the eastern base of the Rocky mountains; west in the United States to the eastern slopes of the Rocky mountains of Montana, through Colorado to the Wahsatch mountains, Utah; southwest through the basin of the Mississippi river, western Texas, and New Mexico to the Mogollon mountains, eastern Arizona; southward into Mexico.

A tree 15 to 22 meters in height, with a trunk 0.60 to 0.90 or, exceptionally, 1.20 meter in diameter; moist soil, borders of streams, etc.; in the Rocky Mountain region in high valleys, between 5,000 and 6,000 feet elevation; one of the most widely distributed trees of the American forest, reaching its greatest development in the valleys of the Wabash and Cumberland rivers.

Wood light, soft, not strong, close-grained, compact; medullary rays numerous, thin; color, creamy-white, the sap-wood hardly distinguishable; specific gravity, 0.4328; ash, 1.07; occasionally used in the interior finish of houses, for woodenware, cooperage, and paper-pulp.

Small quantities of maple sugar are sometimes obtained from this species.

68.—Negundo Californicum, Torrey & Gray,

Fl. N. America, i, 250, 684.—Hooker & Arnott, Bot. Beechey, 327, t. 77.—Eaton & Wright, Bot. 327.—Walpers, Rep. i, 410.—Bentham, Pl. Hartweg. 301.—Nuttall, Sylva, ii, 90, t. 72; 2 ed. ii, 37, t. 72.—Cooper in Smithsonian Rep. 1858, 258, in part.—Koch, Dendrologie, i, 545.—Brewer & Watson, Bot. California, i, 108.—Vasey, Cat. Forest Trees, 10.—Nicholson in London Gard. Chronicle, 1881, 815.

Acer Californicum, Dietrich, Syn. ii, 1283.

N. aceroides, Torrey in Pacific R. R. Rep. iv, 74; Bot. Mex. Boundary Survey, 47; Bot. Wilkes Exped. 259 [not Mœnch].—Bolander in Proc. California Acad. iii, 78.

BOX ELDER.

California, valley of the lower Sacramento river (Sacramento, and in Marin and Contra Costa counties), southward in the interior valleys of the Coast ranges to about latitude 35°, cañons of the western slopes of the San Bernardino mountains (*Parish Brothers*).

A small tree, 6 to 12 meters in height, with a trunk 0.30 to 0.60 meter in diameter; borders of streams.

Wood light, soft, not strong, close-grained, compact; medullary rays numerous, thin; color, nearly white, or slightly tinged with yellow; specific gravity, 0.4821; ash, 0.54; occasionally used in the manufacture of cheap furniture.

ANACARDIACEÆ.

69.—Rhus cotinoides, Nuttall,

Mss. in Herb. Philadelphia Acad.; Travels, 177.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 70.—Wood, Cl. Book, 285; Bot. & Fl. 73.—Buckley in Proc. Philadelphia Acad. 1881, 125.—Mohr in Proc. Philadelphia Acad. 1881, 217.

R. cotinus? Torrey & Gray, Fl. N. America, i, 216.—Wood, Cl. Book, 285.

Cotinus Americanus, Nuttall, Sylva, iii, 1, t. 81; 2 ed. ii, 71, t. 81.

Cotinus coggygria, Engler in De Candolle, Suites, iv, 351, in part.

Indian territory, "on the light, broken, calcareous, rocky banks of the Grand river, a large tributary of the Arkansas, at a place then known as the Eagle's Nest," (*Nuttall, l. c.*); Alabama, north of the Tennessee river on southern slopes of the Cumberland mountains (on a hill near Bailie's farm, twelve miles from Huntsville, on the Madison road, *Buckley*, *Mohr*), and doubtfully reported north of the Alabama line, in Tennessee.

CHITTAM WOOD.

In Alabama, a small wide-branching tree, 9 to 10 meters in height, with a trunk sometimes 0.30 meter in diameter; on limestone benches from 700 to 900 feet elevation, in dense forests of oak, ash, maple, etc.; local and very rare; not rediscovered in Arkansas or the Indian territory; in Alabama nearly exterminated.

Wood light, soft, rather coarse-grained, checking badly in drying, very durable in contact with the soil; layers of annual growth marked by several rows of large open ducts; medullary rays, numerous, very obscure; color, bright, clear, rich orange, the thin sap-wood nearly white; specific gravity, 0.6425; ash, 0.50; largely used locally for fencing, and yielding a clear orange dye.

70.—Rhus typhina, Linnæus,

Amœn. iv, 311.—Medicus, Bot. Beobacht. 1782, 228.—Wangenheim, Amer. 95.—Marshall, Arbustum, 129.—Walter, Fl. Caroliniana, 255.—Aiton, Hort. Kew. i, 365; 2 ed. ii, 162.—Ehrhart, Beitr. vi, 89.—Mœnch, Meth. 72.—Willdenow, Spec. i, 1478; Enum. i, 323.—B. S. Barton, Coll. i, 51.—Schkuhr, Handb. 237.—Michaux, Fl. Bor.-Am. i, 182.—Nouveau Duhamel, ii, 164, t. 47.—Persoon, Syn. i, 324.—Desfontaines, Hist. Arb. ii, 325.—Poiret in Lamarck, Dict. vii, 503.—Barton, Prodr. Fl. Philadelph. 39; Compend. Fl. Philadelph. i, 153.—Pursh, Fl. Am. Sept. i, 204.—Eaton, Manual, 35; 6 ed. 302.—Nuttall, Genera, i, 203.—Rœmer & Schultes, Syst. vi, 643.—Hayne, Dend. Fl. 33.—Elliott, Sk. i, 360.—Torrey, Fl. U. S. 322; Compend. Fl. N. States, 140; Fl. N. York, i, 128.—De Candolle, Prodr. ii, 67.—Sprengel, Syst. i, 936.—Watson, Dend. Brit. i, t. 17, 18.—Hooker, Fl. Bor.-Am. i, 126.—Don, Miller's Dict. ii, 70.—Beck, Bot. 76.—Spach, Hist. Veg. ii, 212.—Bonnett, Pl. Jav. Rar. 80.—Loudon, Arboretum, ii, 550, f. 224.—Torrey & Gray, Fl. N. America, i, 217, 680.—Eaton & Wright, Bot. 392.—Bigelow, Fl. Boston. 3 ed. 126.—Dietrich, Syn. ii, 1002.—Emerson, Trees Massachusetts, 501; 2 ed. ii, 571 & t.—Browne, Trees of America, 184.—Griffith, Med. Bot. 186.—Parry in Owen's Rep. 610.—Darlington, Fl. Cestrica, 3 ed. 43.—Richardson, Arctic Exped. 424.—Darby, Bot. S. States, 254.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 69.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 93.—Lesquereux in Owen's 2d Rep. Arkansas, 353.—Wood, Cl. Book, 384; Bot. & Fl. 73.—Porcher, Resources S. Forests, 208.—Gray, Manual N. States, 5 ed. 111.—Koch, Dendrologie, i, 576.—Young, Bot. Texas, 197.—Vasey, Cat. Forest Trees, 10.—Guibourt, Hist. Drogues, 7 ed. iii, 488.—Nat. Dispensatory, 2 ed. 1230.—Ridgway in Proc. U. S. Nat. Mus. 1882, 63.—Engler in De Candolle, Suites, iv, 377.

Datisca hirta, Linnæus, Spec. 1 ed. 1037.—Don, Miller's Dict. i, 290.

R. hypselodendron, Mœnch, Meth. 73.

R. Canadense, Miller, Dict. No. 5.—Nouveau Duhamel, ii, 163.

R. viridiflora, Nouveau Duhamel, ii, 163.—Poiret in Lamarck, Dict. vii, 504.—De Candolle, Prodr. ii, 67.—Nuttall, Genera, i, 203.—Don, Miller's Dict. ii, 70.—Dietrich, Syn. ii, 1002.—Loudon, Arboretum, ii, 551.—Browne, Trees of America, 184.

R. typhina, var. *viridiflora*, Engler in De Candolle, Suites, iv, 378.

STAGHORN SUMACH.

New Brunswick, west through the valley of the Saint Lawrence river to southern Ontario and Minnesota, south through the northern states and along the Alleghany mountains to northern Georgia, central Alabama and Mississippi.

A small tree, rarely 9 meters in height, with a trunk 0.15 to 0.30 meter in diameter, or often a shrub; dry hillsides or often along streams in sandy, moist soil. A variety with laciniate leaves occurs near Hanover, New Hampshire, var. laciniata, *Wood, Cl. Book*, 284.—*Bot. & Fl.* 73).

Wood light, brittle, soft, coarse-grained, compact, satiny, susceptible of a good polish; layers of annual growth clearly marked by four to six rows of large open ducts; medullary rays numerous, obscure; color, yellow streaked with green, the sap-wood nearly white; specific gravity, 0.4357; ash, 0.50; occasionally used for inlaying cabinet work; the young shoots for "sap quills" in drawing the sap of the sugar maple.

Bark and leaves astringent, rich in tannin, and somewhat used locally as a dye and in dressing skins (*Special Rep. No.* 26, *U. S. Ag. Dep.* 22, t. 3); an infusion of the berries used domestically as a gargle in cases of catarrhal sore throat.

71.—Rhus copallina, Linnæus,

Spec. 1 ed 266.—Medicus, Bot. Beobacht. 1782, 224.—Marshall, Arbustum, 128.—Wangenheim, Amer. 96.—Walter, Fl. Caroliniana, 255.—Gærtner, Fruct. i, 205, t. 44.—Aiton, Hort. Kew. i, 366; 2 ed. ii, 163.—Plenck, Icon. t. 233.—Lamarck, Ill. ii, 346, t. 207, f. 3.—Jacquin, Hort. Schönb. iii, 50, t. 341.—Willdenow, Spec. i, 1480; Enum. i, 324.—Michaux, Fl. Bor.-Am. i, 182.—Schkuhr, Handb. 237.—Nouveau Duhamel, ii, 160.—Persoon, Syn. i, 324.—Desfontaines, Hist. Arb. ii, 325.—Poiret in Lamarck, Dict. vii, 506.—Barton, Prodr. Fl. Philadelph. 39.—Pursh, Fl. Am. Sept. i, 205.—Eaton. Manual, 31; 6 ed. 302.—Nuttall, Genera, i, 203.—Rœmer & Schultes, Syst. vi, 647.—Hayne, Dend. Fl. 34.—Elliott, Sk. i, 362.—Torrey, Fl. U. S. 323; Compend. Fl. N. States, 140; Fl. N. York, 129.—De Candolle, Prodr. ii, 68.—Sprengel, Syst. i, 936.—Don, Miller's Dict. ii, 72.—Beck, Bot. 75.—Hooker in Jour. Bot. i, 202.—Spach, Hist. Veg. ii, 214.—Torrey & Gray, Fl. N. America, i, 217.—Eaton & Wright, Bot. 392.—Bigelow, Fl. Boston. 3 ed. 126.—Dietrich, Syn. ii, 1003.—Loudon, Arboretum, ii, 554.—Emerson, Trees Massachusetts, 503; 2 ed. ii, 574.—Griffith, Med. Bot. 186.—Gray in Mem. Am. Acad. new ser. vi, 28; Manual N. States, 5 ed. 111; Hall's Pl. Texas, 5.—Scheele in Rœmer, Texas, 431.—Darlington, Fl. Cestrica, 3 ed. 43.—Darby, Bot. S. States, 255.—Chapman, Fl. S. States, 69.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 92.—Lesquereux in Owen's 2d Rep. Arkansas, 352.—Wood, Cl. Book, 284; Bot. & Fl. 73.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 187.—Porcher, Resources S. Forests, 207.—Koch, Dendrologie, 575.—Young, Bot. Texas, 197.—Vasey, Cat. Forest Trees, 11.—Nat. Dispensatory, 2 ed. 1236.—Ward in Bull. U. S. Nat. Mus. No. 22, 73.—Ridgway in Proc. U. S. Nat. Mus. 1882, 63.—Engler in De Candolle, Suites, iv, 384.

? *R. copallina*, vars. *latifolia*, *latialata*, *angustifolia*, and *serrata*, Engler in De Candolle, Suites, iv, 384.

DWARF SUMACH.

Northern New England, south to Manatee and Caximbas bay, Florida, west to Missouri, Arkansas, and the valley of the San Antonio river, Texas.

A small tree, 6 to 9 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or at the north a low shrub 1 to 2 meters in height; dry hills and ridges, reaching its greatest development in southern Arkansas and eastern Texas; running into various forms. The best marked is—

var. **leucantha**, De Candolle, Prodr. ii, 68.—Gray in Jour. Boston Soc. Nat. Hist. vi, 158.

R. leucantha, Jacquin, Hort. Schönb. iii, 50, t. 342.—Spach, Hist. Veg. ii, 215.

R. copallina, var. *angustialata*, Engler in De Candolle, Suites, iv, 384.

Shrubby, leaflets lanceolate, flowers white.

Wood light, soft, not strong; coarse-grained, compact, satiny, susceptible of a good polish; layers of annual growth clearly marked by several rows of large open ducts; medullary rays thin, not prominent; color, light brown streaked with green, or often tinged with red; the sap-wood lighter; specific gravity, 0.5273; ash, 0.60.

Leaves and bark astringent, rich in tannin; the leaves largely collected, principally in Maryland, Virginia, West Virginia, and Tennessee, and ground for tanning and dyeing (*Special Rep.* No. 26, *U. S. Ag. Dep.* 26, t. 5); the fruit, acid and astringent, used, as well as that of the shrubby *Rhus glabra*, by herbalists in the form of decoctions, fluid extracts. etc., as a gargle in the treatment of sore throat.

Var. lanceolata, Gray,

Jour. Boston Soc. Nat. Hist. vi, 158.—Torrey, Bot. Mex. Boundary Survey, 44.—Watson in Proc. Am. Acad. xvii, 338.

R. copallina, var. *integrifolia*, Engler in De Candolle, Suites, iv, 384.

Western Texas, Dallas (*Reverchon*) to the Rio Grande.

A small tree, with lanceolate, elongated leaflets, 5 to 6 meters in height, with a trunk 0.12 to 0.15 meter in diameter; calcareous soil; common; specific gravity, 0.5184; ash, 0.85.

72.—Rhus venenata, De Candolle,

Prodr. ii, 68.—Hooker, Fl. Bor.-Am. i, 126.—Don, Miller's Dict. ii, 71.—Beck, Bot. 76.—Spach, Hist. Veg. ii, 215.—Lindley, Fl. Med. 284.—London, Arboretum, ii, 552, f. 226.—Torrey & Gray, Fl. N. America, i, 218, 681.—Eaton & Wright, Bot. 392.—Dietrich, Syn. ii, 1003.—Torrey, Fl. N. York, i, 130.—Browne, Trees of America, 186.—Griffith, Med. Bot. 185.—Emerson, Trees Massachusetts, 504; 2 ed. ii, 575 & t.—Darlington, Fl. Cestrica, 3 ed. 44.—Richardson, Arctic Exped. 424.—Cooper in Smithsonian Rep. 1858, 250.—Chapman, Fl. S. States, 69.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 93.—Lesquereux in Owen's 2d Rep. Arkansas, 353.—Wood, Cl. Book, 284; Bot. & Fl. 73.—Gray, Manual N. States, 5 ed. 111.—Vasey, Cat. Forest Trees, 11.—Bailey in Am. Nat. vii, 5, f. 3.—Ward in Bull. U. S. Nat. Mus. No. 22, 73.—Engler in De Candolle, Suites, iv, 397.

R. vernix, Linnæus, Spec. 1 ed. 265, in part.—Kalm, Travels, English ed. 177.—Medicus, Bot. Beobacht. 1782, 223.—Marshall, Arbustum, 130.—Wangenheim, Amer. 92.—Aiton, Hort. Kew. i, 366; 2 ed. ii, 163.—Plenck, Icon. t. 234.—Lamarck, Ill. ii, 346, t. 207, f. 2.—Willdenow, Spec. i, 1479; Enum. i, 323.—B. S. Barton, Coll. i, 23, 50.—Schkuhr, Handb. 236.—Michaux, Fl. Bor.-Am. i, 183.—Nouveau Duhamel, ii, 165.—Persoon, Syn. i, 324.—Desfontaines, Hist. Arb. ii, 325.—Poiret in Lamarck, Dict. vii, 505.—Nuttall, Genera, i, 203.—Barton, Prodr. Fl. Philadelph. 39; Compend. Fl. Philadelph. 154.—Pursh, Fl. Am. Sept. i, 205.—Eaton, Manual, 34; 6 ed. 302.—Bigelow, Med. Bot. i, 96, t. 10; Fl. Boston. 3 ed. 126.—Rœmer & Schultes, Syst. vi, 646.—Hayne, Dend. Fl. 34.—Elliott, Sk. i, 362.—Torrey, Fl. U. S. 323; Compend. Fl. N. States, 203.—Sprengel, Syst. i, 936.—Hooker, Jour. Bot. i, 202.—Darby, Bot. S. States, 255.—Porcher, Resources S. Forests, 206.

POISON SUMACH. POISON ELDER.

Northern New England, south to northern Georgia, Alabama, and western Louisiana, west to northern Minnesota, Missouri, and Arkansas.

A small tree, 6 to 8 meters in height, with a trunk sometimes 0.15 to 0.20 meter in diameter, or more often a tall shrub; low, wet swamps or, more rarely, on higher ground.

Wood light, soft, coarse-grained, moderately compact; layers of annual growth clearly marked by three or four rows of large open ducts; medullary rays thin, very obscure; color, light yellow streaked with brown, the sap-wood lighter; specific gravity, 0.4382; ash, 0.64.

The whole plant, as well as the allied *R. Toxicodendron*, to most persons exceedingly poisonous to the touch, owing to the presence of a volatile principle, *Toxicodendric acid* (*U. S. Dispensatory*, 14 ed. 908.—*Nat. Dispensatory*, 2 ed. 1464); the white milky sap turning black in drying and yielding a valuable lacquer (*Bigelow*, *Med. Bot. l. c.*)

73.—Rhus Metopium, Linnæus,

Amœn. v, 395.—Titford, Hort. Bot. Am. 51.—Descourtilz, Fl. Med. Antilles, ii, 49, t. 79.—De Candolle, Prodr. ii, 67.—Macfadyen, Fl. Jamaica, 225.—Nuttall, Sylva, ii, 121, t. 80; 2 ed. ii, 68, t. 80.—Richard, Fl. Cuba, 381.—Cooper in Smithsonian Rep. 1858, 264.—Grisebach, Fl. British West Indies, 175.—Chapman, Fl. S. States, 69.—Wood, Bot. & Fl. 73.—Vasey, Cat. Forest Trees, 11.

Metopium Linnæi, Engler in De Candolle, Suites, iv, 367.

POISON WOOD. CORAL SUMACH. MOUNTAIN MANCHINEEL. BUM WOOD. HOG PLUM. DOCTOR GUM.

Semi-tropical Florida, bay Biscayne to the southern keys; in the West Indies.

A tree 12 to 15 meters in height, with a trunk sometimes 0.60 meter in diameter, reaching in the United States its greatest development on the shores of bay Biscayne, near Miami; one of the most common trees of the region, the large specimens generally decayed.

Wood heavy, hard, not strong, close-grained, checking badly in drying, containing many evenly-distributed open ducts; medullary rays numerous, thin; color, rich dark brown streaked with red, the sap-wood light brown or yellow; specific gravity, 0.7917; ash, 2.39; little esteemed.

A resinous gum, emetic, purgative, and diuretic, is obtained from incisions made in the bark of this species (*Pharm. Jour.* vii, 270.—*Guibourt*, *Hist. Drogues*, 7 ed. iii, 489).

74.—Pistacia Mexicana, HBK.

Nov. Gen. & Spec. vii, 22, t. 608.—De Candolle, Prodr. ii, 64.—Gray in Smithsonian Contrib. v, 27.—Torrey, Bot. Mex. Boundary Survey, 44.—Cooper in Smithsonian Rep. 1858, 265.—Brewer & Watson, Bot. California, i, 109.—Vasey, Cat. Forest Trees, 11.—Hemsley, Bot. Am.-Cent. i, 221.—Watson in Proc. Am. Acad. xvii, 338.

Texas, valley of the Rio Grande (near the mouth of the Pecos river, *Bigelow*); southward into Mexico (Saltillo, *Palmer*, etc.).

Wood not collected.

LEGUMINOSÆ.

75.—Eysenhardtia orthocarpa, Watson,

Proc. Am. Acad. xvii, 339.

E. amorphoides, var. *orthocarpa*, Gray in Smithsonian Contrib. iii, 46; v, 237.

E. amorphoides, Torrey, Bot. Mex. Boundary Survey, 51, in part.

Western Texas, valleys of the upper Guadalupe and Rio Grande, west to the Santa Rita and Santa Catalina mountains, Arizona (*Pringle*); southward into northern Mexico.

A small tree, 5 to 6 meters in height, with a trunk 0.09 to 0.15 meter in diameter, or more often a low shrub; dry, gravelly soil, reaching its greatest development near the summit of the Santa Catalina mountains, at 3,000 feet altitude.

Wood heavy, hard, close-grained, very compact; layers of annual growth clearly defined by numerous rows of open ducts; medullary rays numerous, thin; color, light reddish-brown, sap-wood clear yellow; specific gravity, 0.8740; ash, 1.28.

76.—Dalea spinosa, Gray,

Mem. Am. Acad. new ser. v, 315; Ives' Rep. 10.—Torrey, Pacific R. R. Rep. iv, 78; vii, 9, t. 3.—Bot. Mex. Boundary Survey, 53.—Walpers, Ann. iv, 485.—Cooper in Smithsonian Rep. 1858, 266.—Watson in Proc. Am. Acad. xi, 132.—Brewer & Watson, Bot. California, i, 143.—Hemsley, Bot. Am.-Cent. 249.

Asagræa spinosa, Baillon in Adansonia, ix, 232; Hist. Pl. ii, 288.

Colorado desert, southern California (Agua Caliente, Toras, etc.), and eastward to the valley of the lower Gila river, Arizona.

A small tree, sometimes 6 meters in height, with a short, stout trunk 0.45 to 0.50 meter in diameter (*Parry*, *Parish Brothers*), or often a low shrub; dry, gravelly, rocky soil.

Wood light, soft, rather coarse-grained, containing many evenly-distributed open ducts; medullary rays numerous, thin; color, walnut-brown, the sap-wood nearly white; specific gravity, 0.5536; ash, 4.04.

77.—Robinia Pseudacacia, Linnæus,

Spec. 1 ed. 722.—Marshall, Arbustum, 133.—Wangenheim, Amer. 16, t. 7.—L'Heritier, Stirp. Nov. 158.—Walter, Fl. Caroliniana, 186.—Aiton, Hort. Kew. iii, 53; 2 ed. iv, 323.—Gærtner, Fruct. ii, 307, t. 145.—Willdenow, Spec. iii, 1131; Enum. i, 769.—Michaux, Fl. Bor.-Am. ii, 65.—Nouveau Duhamel, ii, 60, t. 16.—Poiret in Lamarck Dict, vi, 222; Ill. iii, 163, t. 606.—Persoon, Syn. ii, 311.—Desfontaines, Hist. Arb. ii, 302.—Michaux f. Hist. Arb. Am. iii, 245, t. 1; N. American Sylva, 3 ed. ii, 92, t. 76.—Pursh, Fl. Am. Sept. ii, 487.—Eaton, Manual, 82; 6 ed. 306.—Thomas in Am. Month. Mag. & Crit. Rev. ii, 90.—Nuttall, Genera, ii, 118.—Hayne, Dend. Fl. 140.—Elliott, Sk. ii, 242.—De Candolle, Prodr. ii, 261.—Sprengel, Syst. iii, 247.—Torrey in Ann. Lyc. N. York, ii, 178; Compend. Fl. N. States, 271; Fl. N. York, i, 165; Emory's Rep. 408.—Hooker, Fl. Bor.-Am. i, 140.—Audubon, Birds, t. 104.—Don, Miller's Dict. ii, 237.—Beck, Bot. 82.—Spach, Hist. Veg. i, 258.—Torrey & Gray, Fl. N. America, i, 294.—London, Arboretum, ii, 609, f. 305 & t.—Eaton & Wright, Bot. 397.—Bigelow, Fl. Boston. 3 ed. 295.—Browne, Trees of America, 197.—Emerson, Trees, Massachusetts, 460; 2 ed. ii, 522 & t.—Griffith, Med. Bot. 238, f. 123.—Dietrich, Syn. iv, 1053.—Darlington, Fl. Cestrica, 3 ed. 65.—Darby Bot. S. States, 280.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 94.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 48.—Lesquereux in Owen's 2d Rep. Arkansas, 356.—Wood, Cl. Book, 319; Bot. & Fl. 95.—Lemaire, Ill. Hort. xii, t. 427.—Porcher, Resources S. Forests, 188.—Gray, Manual N. States, 5 ed. 131.—Koch, Dendrologie, i, 55.—Verlot in Rev. Hort. 1873, 152 & f.—Young, Bot. Texas, 228.—Vasey, Cat. Forest Trees, 11.—Ridgway in Proc. U. S. Nat. Mus. 1882, 65.

Pseudacacia odorata, Mœnch, Meth. 145.

R. fragilis, Salisbury, Prodr. 336.

LOCUST. BLACK LOCUST. YELLOW LOCUST.

Alleghany mountains, Pennsylvania (Locust ridge, Monroe county, *Porter*) to northern Georgia; widely and generally naturalized throughout the United States east of the Rocky mountains, and possibly indigenous in northeastern (Crowley's ridge) and western Arkansas and the prairies of eastern Indian territory.

A tree 22 to 25 meters in height, with a trunk 0.90 to 1.20 meter in diameter; west of the Mississippi river much smaller or often a low shrub 1.80 to 3 meters in height, reaching its greatest development on the western slopes of the mountains of West Virginia.

Wood heavy, exceedingly hard and strong, close-grained, compact, very durable in contact with the ground; layers of annual growth clearly marked by two or three rows of large open ducts; color, brown or, more rarely, light green, the sap-wood yellow; specific gravity, 0.7333; ash, 0.51 (*Trecul in Am. Jour. Sci.* 3 ser. xix, 182, t. 2, f. 1; t. 6, 7, f. 10.); largely used in ship-building, for posts of all sorts, construction, and in turnery; preferred to other American woods for treenails, and in this form largely exported.

The bark of the root tonic, or in large doses purgative and emetic (*U. S. Dispensatory*, 14 ed. 1746.—*Nat. Dispensatory*, 2 ed. 1233); formerly widely planted as a timber tree (*Cobbett, Woodlands*, par. 323); its cultivation in the United States now generally abandoned on account of the destructive attacks of the locust borer (*Cyllene picta, Packard in Bull. U. S. Entomological Com.* No. 7, 95).

78.—Robinia viscosa, Ventenat,

Hort. Cels. 4, t. 4.—Bot. Mag. t. 560.—Willdenow, Spec. iii, 1131; Enum. ii, 769.—Michaux, Fl. Bor.-Am. ii, 65.—Nouveau Duhamel, ii, 64, t. 17.—Poiret in Lamarck, Dict. vi, 222.—B. S. Barton, Bot. Appx. 29, t. 21.—Persoon, Syn. ii, 311.—Desfontaines, Hist. Arb. ii, 302.—Aiton, Hort. Kew. 2 ed. iv, 323.—Michaux f. Hist. Arb. Am. iii, 262, t. 2; N. American Sylva, ii, 104, t 77.—Pursh, Fl. Am. Sept. ii, 488.—Nuttall, Genera, ii, 118.—Hayne, Dend. Fl. 140.—Elliott, Sk. ii, 242.—De Candolle, Prodr. ii, 262.—Guimpel, Otto & Hayne, Abb. Holz. 81, t. 65.—Sprengel, Syst. iii, 247.—Don, Miller's Dict. ii, 236.—Eaton, Manual, 6 ed. 306.—Spach, Hist. Veg. i, 260.—Torrey & Gray, Fl. N. America, i, 295.—Loudon, Arboretum, ii, 626, t. 87, f. 306.—Eaton & Wright, Bot. 397.—Browne, Trees of America, 209.—Dietrich, Syn. iv, 1053.—Darby, Bot. S. States, 280.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 94.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 49.—Wood, Cl. Book, 319; Bot. & Fl. 95.—Porcher, Resources S. Forests, 193.—Gray, Manual N. States, 5 ed. 131.—Vasey, Cat. Forest Trees, 11.

R. glutinosa, Curtis, Bot. Mag. t. 560.—Koch, Dendrologie, i, 59.

CLAMMY LOCUST.

"High Alleghany mountains south of latitude 35°" (*Michaux*). "Open woods, slopes of Buzzard ridge, altitude 4,500 feet, near Highland, Macon county, North Carolina" (*J. Donnell Smith*).

A small tree, 9 to 12 meters in height, with a trunk not exceeding 0.30 meter in diameter; very rare, and not rediscovered until 1882 by the numerous botanists who have visited, during the last thirty years, the localities where the Michauxs, father and son, discovered this species; widely cultivated and now occasionally naturalized in the Atlantic states.

Wood (of a cultivated specimen) heavy, hard, close-grained, compact; layers of annual growth clearly marked by many rows of open ducts; medullary rays numerous, thin; color, brown, the sap-wood light yellow; specific gravity, 0.8094; ash, 0.20.

79.—Robinia Neo-Mexicana, Gray,

Mem. Am. Acad. new ser. v, 314.—Torrey in Pacific R. R. Rep. iv, 79; Bot. Mex. Boundary Survey, 53.—Walpers, Ann. iv, 491.—Cooper in Smithsonian Rep. 1858, 265.—Watson in King's Rep. v, 419.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 23.—Vasey, Cat. Forest Trees, 11.

LOCUST.

Colorado, valley of the Purgatory river (near Trinidad), headwaters of the Canadian river, through western and southwestern New Mexico to the Santa Catalina and Santa Rita mountains (*Lemmon, Pringle*), Arizona (4,500 to 7,000 feet altitude), southern Utah, Mount Zion cañon, west fork of the Rio Virgin, and near Kanab.

A small tree, sometimes 6 to 8 meters in height, with a trunk 0.15 to 0.25 meter in diameter, or toward its upper limits of growth reduced to a low shrub; reaching its greatest development in the valley of the Purgatory river, Colorado.

Wood heavy, exceedingly hard, strong, close-grained, compact, satiny, containing many evenly-distributed open ducts; medullary rays, thin, conspicuous; color, yellow streaked with brown, the sap-wood light yellow; specific gravity, 0.8034; ash, 0.60.

80.—Olneya Tesota, Gray,

Mem. Am. Acad. new ser. v, 328; Ives' Rep. 11.—Torrey in Pacific R. R. Rep. iv, 11, 82; vii, 10, t. 5; Bot. Mex. Boundary Survey, 58.—Walpers, Ann. iv, 479, 587.—Cooper in Smithsonian Rep. 1858, 265.—Brewer & Watson, Bot. California, i, 157.—Vasey, Cat. Forest Trees, 11.—Hemsley, Bot. Am.-Cent. i, 260.

IRON WOOD. ARBOL DE HIERRO.

California, valley of the Colorado river south of the Mohave mountains, valley of the lower Gila river, southwestern Arizona; southward in Sonora.

A small tree in the United States, rarely 9 meters in height, with a trunk sometimes 0.45 meter in diameter; dry *arroyos* and cañons; in Sonora more common and of larger size.

Wood very heavy and hard, strong, brittle, close-grained, compact, the grain generally contorted, difficult to cut and work, susceptible of a high polish; medullary rays numerous, thin; color, rich dark brown streaked with red, the sap-wood clear bright yellow; specific gravity, 1.0602; ash, 2.29 (the heart-wood, 1.1486; ash, 2.59; sap-wood, 0.8958; ash, 1.85); occasionally manufactured into canes.

81.—Piscidia Erythrina, Linnæus,

Spec. 2 ed. 993.—Jacquin, Amer. 206.—Swartz, Obs. 277.—Lamarck, Dict. i, 443; Ill. iii, 163, t. 605.—Titford, Hort. Bot. Am. 84.—Lunan, Hort. Jam. i, 269.—Humboldt, Bonpland & Kunth, Nov. Gen. & Spec. vi, 382.—De Candolle, Prodr. ii, 267.—Descourtilz, Fl. Med. Antilles, iii, 203, t. 196.—Macfadyen, Fl. Jamaica, i, 258.—Nuttall, Sylva, ii, 31, t. 52; 2 ed. i, 180.—Bentham in Jour. Linnæan Soc. iv, Suppl. 116; Bot. Sulphur, 81.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 110.—Grisebach, Fl. British West Indies, 200.—Porcher, Resources S. Forests, 175.—Vasey, Cat. Forest Trees, 11.—Hemsley, Bot. Am.-Cent. i, 319.

Erythrina piscipula, Linnæus, Spec. 1 ed. 107.

P. Carthagenensis, De Candolle, Prodr. ii, 267.

JAMAICA DOGWOOD.

Semi-tropical Florida, bay Biscayne, west coast, Pease creek to cape Sable, and on the southern keys; in the West Indies and southern Mexico.

A tree 12 to 15 meters in height, with a trunk 0.45 to 0.75 meter in diameter.

Wood heavy, very hard, not strong, close-grained, compact, susceptible of a high polish, containing few large scattered open ducts; medullary rays thin, not conspicuous; color, yellowish-brown, the sap-wood lighter; specific gravity, 0.8734; ash, 3.38; one of the favorite woods of the region for boat-building, fire-wood, and charcoal.

The bark, especially of the root, narcotic, occasionally administered in the form of tinctures, or used, as well as the young branches and leaves, to poison or stupefy fish.

82.—Cladrastis tinctoria, Rafinesque,

Fl. Kent. 1824; Neog. 1825; Med. Bot. ii, 210; New Sylva, iii, 83.—Torrey & Gray, Fl. N. America, i, 390.—Walpers, Rep. i, 807.—Browne, Trees of America, 192.—Darby, Bot. S. States, 294.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 113.—Porcher Resources S. Forests, 175.—Wood, Cl. Book, 301; Bot. & Fl. 84.—Gray, Manual N. States, 5 ed. 143.—Vasey, Cat. Forest Trees, 11.

Virgilia lutea, Michaux f. Hist. Arb. Am. iii, 266, t. 3; Travels, 289; N. American Sylva, 3 ed. ii, 106, t. 78.—Pursh, Fl. Am. Sept. i, 309.—Nuttall, Genera, i, 284.—Hayne, Dend. Fl. 53.—Loiseleur, Herb. Amat. t. 297.—De Candolle, Prodr. ii, 98.—Sprengel, Syst. iv^2, 1. 171.—Don, Miller's Dict. ii, 112.—Eaton, Manual, 6 ed. 397.—Spach, Hist. Veg. i, 163.—Eaton & Wright, Bot. 480.—Dietrich, Syn. ii, 1501.—Loudon, Arboretum, ii, 565, t. 78.

C. lutea, Koch, Dendrologie, i, 6.

YELLOW WOOD. YELLOW ASH. GOPHER WOOD.

Central Kentucky, cliffs of the Kentucky and Dick's rivers; middle Tennessee, mountains of east Tennessee to Cherokee county, North Carolina.

A tree 9 to 15 meters in height, with a trunk sometimes 0.90 or, exceptionally, 1.20 meter in diameter; rich hillsides; in Kentucky on the Trenton limestones, and reaching its best development in middle Tennessee; rare and very local, the large trees generally hollow or defective.

Wood heavy, very hard, strong, close-grained, compact, susceptible of a good polish; layers of annual growth clearly marked by several rows of open ducts, and containing many evenly-distributed similar ducts; color, bright, clear yellow, changing with exposure to light brown, the sap-wood nearly white; specific gravity, 0.6278; ash, 0.28; used for fuel, occasionally for gunstocks, and yielding a clear yellow dye.

83.—Sophora secundiflora, Lagasca;

De Candolle, Cat. Hort. Monsp. 148; Prodr. ii, 96.—Don, Miller's Dict. ii, 110.—Gray in Smithsonian Contrib. iii, 54.—Rev. Hort. 4 ser. iii, 201, t. 11.—Bentham & Hooker, Genera, i, 555.—Hemsley, Bot. Am.-Cent. i, 321.—Watson in Proc. Am. Acad. xvii, 347.

Broussonetia secundiflora, Ortega, Dec. v, 61, t. 7.

Virgilia secundiflora, Cavanilles, Icon. t. 401.

Agastianis secundiflora, Rafinesque, New Sylva, iii, 86.

Dermatophyllum speciosum, Scheele in Linnæa, xxi, 458.

S. speciosa, Bentham in Jour. Boston Soc. Nat. Hist. vi, 178.—Gray in Mem. Am. Acad. new ser. iv^x, 38; Smithsonian Contrib. iii, 54; Hall's Pl. Texas, 7.—Walpers, Ann. ii, 439.—Torrey, Bot. Mex. Boundary Survey, 58.—Young, Bot. Texas, 242.—Vasey, Cat. Forest Trees, 12.

FRIGOLITO.

Matagorda bay, Texas, west to the mountains of New Mexico (*Havard*).

A small tree, sometimes 9 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or often, especially west of the San Antonio river, a tall shrub, rarely exceeding 2 meters in height, forming dense thickets; borders of streams, generally in a low, rather moist soil.

Wood very heavy, hard, close-grained, compact, susceptible of a high polish; medullary rays numerous, thin; color, orange streaked with red, the heavier sap-wood brown or yellow; specific gravity, 0.9842; ash, 1.59; furnishing valuable fuel.

The seeds contain an exceedingly poisonous alkaloid, *Sophoria* (*H. C. Wood in Philadelphia Med. Times*, August 4, 1877.—*Rothrock in Coulter's Bot. Gazette*, ii, 133.—*Nat. Dispensatory*, 2 ed. 1333).

84.—Sophora affinis, Torrey & Gray,

Fl. N. America, i, 390.—Leavenworth in Am. Jour. Sci. 1 ser. ix, 130.—Gray in Jour. Boston Soc. Nat. Hist. vi, 178; Hall's Pl. Texas, 7.—Scheele in Rœmer, Texas, 428.—Vasey, Cat. Forest Trees, 12.

Styphnolobium affine, Walpers, Rep. i, 807.

Arkansas, valley of the Arkansas river (*Letterman*) to the valley of the San Antonio river, Texas.

A small tree, 5 to 7 meters in height, with a trunk sometimes 0.15 to 0.25 meter in diameter; borders of streams and prairies.

Wood heavy, very hard, strong, coarse-grained, compact; layers of annual growth clearly marked by several rows of large open ducts; medullary rays thin, conspicuous; color, light red, the sap-wood bright, clear yellow; specific gravity, 0.8509; ash, 0.73.

Ink is occasionally made domestically from the resinous exudations of the pod.

85.—Gymnocladus Canadensis, Lamarck,

Dict. i, 733; Ill. iii, 412, t. 823.—Michaux, Fl. Bor.-Am. ii, 241, t. 51.—Willdenow, Spec. iv, 460; Enum. ii, 1019; Berl. Baumz. 169.—Persoon, Syn. ii, 626.—Desfontaines, Hist. Arb. ii, 250.—Aiton, Hort. Kew. 2 ed. v, 400.—Michaux f. Hist. Arb. Am. ii, 272, t. 23; N. American Sylva, 3 ed. i, 182, t. 50.—Pursh, Fl. Am. Sept. i, 304.—Nuttall, Genera, ii, 243.—Hayne, Dend. Fl. 203.—James in Long's Exped. i, 138.—Reichenbach, Mag. Bot. t. 40.—De Candolle, Prodr. ii, 480.—Sprengel, Syst. ii, 327.—Torrey in Ann. Lyc. N. York, ii, 193; Compend. Fl. N. States, 376; Fl. N. York, i, 196; Emory's Rep. 407.—Hooker, Fl. Bor.-Am. i, 166.—Don, Miller's Dict. 429.—Eaton, Manual, 6 ed. 162.—Beck, Bot. 93.—Spach, Hist. Veg. i, 89.—London, Arboretum, ii, 256 & t.—Torrey & Gray, Fl. N. America, i, 398.—Eaton & Wright, Bot. 258.—Richardson, Arctic Exped. 424.—Walpers, Rep. i, 809.—Browne, Trees of America, 218.—Cooper in Smithsonian Rep. 1858, 251.—Lesquereux in Owen's 2d Rep. Arkansas, 358.—Wood, Cl. Book, 300; Bot. & Fl. 83.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 190.—Gray, Manual N. States, 5 ed. 145.—Briot in Rev. Hort. 1870, 436.—Vasey, Cat. Forest Trees, 12.—Bell in Geological Rep. Canada, 1879-'80, 54c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 63.—Chapman, Fl. S. States, Suppl. 618.

Guilandina dioica, Linnæus, Spec. 1 ed. 381.—Marshall, Arbustum, 56.—Aiton, Hort. Kew. ii, 56.—James in Long's Exped. i, 138.

Hyperanthera dioica, Vahl, Symbolæ, i, 31.

G. dioica, Koch, Dendrologie, i, 5.—Baillon, Hist. Pl. ii, 87, f. 52, 53.

KENTUCKY COFFEE TREE. COFFEE NUT.

Conococheague creek, Franklin county, Pennsylvania (*Porter*); western New York, shores of Cayuga and Seneca lakes, west through southern Ontario and southern Michigan to the valley of the Minnesota river, Minnesota, eastern Nebraska, eastern Kansas, southwestern Arkansas, and the Indian territory, to about longitude 96° west, south to middle Tennessee.

A tree 25 to 33 meters in height, with a trunk 0.60 to 0.90 meter in diameter; rich woods and bottoms; not common.

Wood heavy, not hard, strong, coarse-grained, durable in contact with the ground, liable to check in drying, easily worked, susceptible of a high polish; layers of annual growth clearly marked by one or two rows of open ducts; medullary rays numerous, thin; color, rich light brown tinged with red, the thin sap-wood lighter; specific gravity, 0.6934; ash, 0.67; occasionally used in cabinet-making, for posts, rails, &c.

The fresh leaves, macerated and sweetened, are used in Tennessee as a poison for house-flies; the seeds formerly as a domestic substitute for coffee.

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86.—Gleditschia triacanthos, Linnæus,

Spec. 1 ed. 1056 (excl. var.).—Medicus, Bot. Beobacht. 1782, 230.—Lamarck, Dict. ii, 465; Ill. iii, 446, t. 857, f. 1.—Aiton, Hort. Kew. iii, 444 (excl. vars.); 2 ed. v, 474.—Mœnch, Meth. 69.—Abbot, Insects Georgia, ii, t. 285.—Michaux, Fl. Bor.-Am. ii, 257.—Schknhr, Handb. iii, 554, t. 356.—Robin, Voyages, iii, 497.—Persoon, Syn. ii, 123.—Desfontaines, Hist. Arb. ii, 246.—Willdenow, Spec. iv, 1097; Enum. 1058; Berl. Baumz. 163.—Nouveau Duhamel, iv, 100, t. 25.—Michaux f. Hist. Arb. Am. iii, 164, t. 10; N. American Sylva, 3 ed. 108, t. 79.—Pursh, Fl. Am. Sept. i, 221.—Nuttall, Genera, ii, 239.—James in Long's Exped. i, 138.—Hayne, Dend. Fl. 218.—Elliott, Sk. ii, 709.—Guimpel, Otto & Hayne, Abb. Holz. 157, t. 132.—De Candolle, Prodr. ii, 479.—Sprengel, Syst. iii, 918.—Torrey, Compend. Fl. N. States, 375; Fl. N. York, i, 192.—Audubon, Birds, t. 42, 146, 150.—Rœmer & Schultes, Syst. vii, 78.—Don, Miller's Dict. ii, 428.—Beck, Bot. 9?—Eaton, Manual, 6 ed. 158.—Spach, Hist. Veg. i, 92.—Torrey & Gray, Fl. N. America, i, 398.—Loudon, Arboretum, ii, 650, t. 90, 91.—Eaton & Wright, Bot. 254.—Browne, Trees of America, 212.—Dietrich, Syn. iv, 539.—Darby, Bot. S. States, 295.—Cooper in Smithsonian Rep. 1858, 251.—Gray in Pacific R. R. Rep. xii², 42; Manual N. States, 5 ed. 145.—Chapman, Fl. S. States, 115.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 49.—Lesquereux in Owen's 2d Rep. Arkansas, 358.—Wood, Cl. Book, 300; Bot. & Fl. 83.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 190.—Porcher, Resources S. Forests, 195.—Koch, Dendrologie, i, 8.—Hunt in Am. Nat. i, 433.—Young, Bot. Texas, 246.—Vasey, Cat. Forest Trees, 12.—Ridgway in Proc. U. S. Nat. Mus. 1882, 64.—Burgess in Coulter's Bot. Gazette, vii, 95.

G. spinosa, Marshall, Arbustum, 54.

G. Meliloba, Walter, Fl. Caroliniana, 254.

G. macrantha, Willdenow, Berl. Baumz. 164.

G. elegans, Salisbury, Prodr. 323.

Melilobus heterophylla, Rafinesque, Sylva Telluriana, 121.

HONEY LOCUST. BLACK LOCUST. THREE-THORNED ACACIA. SWEET LOCUST. HONEY SHUCKS.

Pennsylvania, western slopes of the Alleghany mountains, west through southern Michigan to eastern Nebraska, eastern Kansas, and the Indian territory to about longitude 96° west; south to Tampa bay, Florida (not detected in eastern Florida), northern Alabama, northern Mississippi, and the valley of the Brazos river, Texas.

A tree, 25 or 30 meters, or exceptionally 40 meters, in height, with a trunk 0.60 to 1.20 meter in diameter; low, rich bottom lands, or more rarely on dry, sterile hills; the characteristic tree of the "barrens" of middle Kentucky and Tennessee, reaching its greatest development in the bottoms of the lower Ohio River basin; widely cultivated for shade and as a hedge plant, and now somewhat naturalized in the Atlantic states east of the Alleghany mountains.

A not uncommon form, nearly destitute of thorns, is—

var. **inermis**, Pursh, Fl. Am. Sept. i, 221.—De Candolle, Mem. Leg. t. 22, f. 109; Prodr. ii, 479.—Eaton, Manual, 6 ed. 158.—Torrey & Gray, Fl. N. America, i, 398.—Loudon Arboretum, ii, 650, t. 92, 93.—Browne, Trees of America, 213.

G. inermis, Linnæus, Spec. 1509, in part.—Nouveau Duhamel, iv, 100.—Bentham in Trans. Linnæan Soc. xxx³, 557.

A form with spines and fruit shorter than those of the type is—

var. **brachycarpos**, Michaux, Fl. Bor.-Am. ii, 257.—Torrey & Gray, Fl. N. America, i, 398.—Browne, Trees of America, 213.

G. brachycarpa, Pursh, Fl. Am. Sept. 221.—De Candolle, Prodr, ii, 479.—Sprengel, Syst. iii, 919.—Don, Miller's Dict. ii, 428.—Eaton, Manual, 6 ed. 158.—Eaton & Wright, Bot. 254.—Loudon, Arboretum, ii, 653.—Dietrich, Syn. iv, 539.

Wood heavy, hard, strong, coarse-grained, moderately compact, very durable in contact with the soil, susceptible of a high polish; layers of annual growth strongly marked by many rows of open ducts; medullary rays numerous, conspicuous; color, bright brown or red, the sap-wood lighter; specific gravity, 0.6740; ash, 0.80; used for fence posts and rails, wagon hubs, construction, etc.; its value hardly appreciated.

Beer is sometimes made domestically by fermenting the sweet, unripe fruit (*Porcher l. c.*).

87.—Gleditschia monosperma, Walter,

Fl. Caroliniana, 254.—Michaux, Fl. Bor.-Am. ii, 257.—Schkuhr, Handb. iii, 555.—Persoon, Syn. ii, 623.—Desfontaines, Hist. Arb. ii, 24.—Willdenow, Spec. iv, 1097; Enum. 1058; Berl. Baumz. 165.—Nouveau Duhamel, iv, 101.—Aiton, Hort. Kew. 2 ed. v, 474.—Michaux f. Hist. Arb. Am. iii, 169, t. 11; N. American Sylva, 3 ed. ii, 111, t. 80.—Pursh, Fl. Am. Sept. 221.—Poiret, Suppl. ii, 641.—Nuttall, Genera, ii, 239.—Hayne, Dend. Fl. 218.—Elliott, Sk. ii, 709.—De Candolle, Prodr. ii, 479.—Sprengel, Syst. iii, 919.—Don, Miller's Dict. 428.—Eaton, Manual, 6 ed. 158.—Spach, Hist. Veg. i, 98.—Torrey & Gray, Fl. N. America, i, 398.—Eaton & Wright, Bot. 254.—Loudon, Arboretum, ii, 653, f. 364.—Browne, Trees of America, 215.—Dietrich, Syn. iv, 539.—Darby, Bot. S. States, 295.—Chapman, Fl. S. States, 115.—Wood, Cl. Book, 300; Bot. & Fl. 83.—Gray. Manual N. States, 5 ed. 145.—Vasey, Cat. Forest Trees, 12—Ridgway in Proc. U. S. Nat. Mus. 1882, 64.

G. triacanthos, var. *monosperma*, Linnæus, Spec. 1 ed. 1057.—Aiton, Hort. Kew. iii, 444.

G. aquatica, Marshall, Arbustum, 54.

G. Carolinensis, Lamarck, Dict. ii, 465; Ill. iii, 447, t. 857, f. 2.—Rœmer & Schultes, Syst. vii, 74.

G. triacantha, Gærtner, Fruct. ii, 311, t. 146, f. 3 [not Linnæus].

G. inermis, Koch, Dendrologie, i, 9 [not Linnæus].

WATER LOCUST.

South Carolina to Matanzas inlet and Tampa bay, Florida, through the Gulf states to the valley of the Brazos river, Texas, and through Arkansas to middle Kentucky and Tennessee, southern Indiana and Illinois.

A tree 12 to 18 meters in height, with a trunk sometimes 0.60 or, exceptionally, 0.90 meter in diameter; deep swamps; rare in the south Atlantic and Gulf states; common and reaching its greatest development in the bottom lands of southern Arkansas, Louisiana, and eastern Texas, here often covering extensive areas.

Wood heavy, very hard, strong, rather coarse-grained, compact, susceptible of a high polish; layers of annual growth clearly marked by one to three rows of open ducts; medullary rays thin, conspicuous; color, rich bright brown tinged with red, the thick heavier sap-wood clear light yellow; specific gravity, 0.7342; ash, 0.73.

88.—Parkinsonia Torreyana, Watson,

Proc. Am. Acad. xi, 135.—Brewer & Watson, Bot. California, i, 162.

Cercidium floridum, Torrey in Pacific R. R. Rep. iv, 11, 82; v, 360, t. 3; Bot. Mex. Boundary Survey, 59.—Gray in Ives' Rep. 11.—Vasey, Cat. Forest Trees, 12.—James in Am. Nat. xv, 982.—Hemsley, Bot. Am.-Cent. i, 327.

GREEN-BARK ACACIA. PALO VERDE.

Colorado desert, southern California (Inio, Toras, etc., *Parish Brothers*), east to the valley of the lower Gila river, Arizona.

A low, much-branched tree, 8 to 10 meters in height, the short trunk sometimes 0.45 to 0.50 meter in diameter; low cañons and depressions in the sandhills of the desert; common and reaching its greatest development in the valleys of the lower Colorado and Gila rivers.

Wood heavy, not strong, soft, close-grained, compact, satiny, susceptible of a beautiful polish, containing many small evenly-distributed open ducts; medullary rays very numerous, thin; color, light brown, the sap-wood clear light yellow; specific gravity, 0.6531; ash, 1.12.

89.—Parkinsonia microphylla, Torrey,

Pacific R. R. Rep. iv, 82; Bot. Mex. Boundary Survey, 59.—Walpers, Ann. vii, 812.—Gray in Ives' Rep. 11.—Bentham in Martius, Fl. Brasil. xv², 78.—Watson, Pl. Wheeler, 8; Proc. Am. Acad. xi, 136.—Brewer & Watson, Bot. California, i, 162.—Hemsley, Bot. Am.-Cent. i, 327.

Valley of the lower Colorado and Bill Williams rivers, eastward through southern Arizona.

A small, much-branched tree, 6 to 7 meters in height, with a trunk 0.25 to 0.30 meter in diameter (Wickenburg, *Pringle*), or often a low shrub 1 to 3 meters in height.

Wood heavy, hard, coarse-grained, compact, containing numerous large, scattered, open ducts; medullary rays numerous, thin, conspicuous; color, rich dark brown streaked with red, the sap-wood light brown or yellow; specific gravity, 0.7449; ash, 3.64.

90.—Parkinsonia aculeata, Linnæus,

Spec. 1 ed. 375.—Jacquin, Stirp. Am. 121, t. 80.—Lamarck, Ill. ii, 475, t. 336.—Willdenow, Spec. ii, 513.—Aiton, Hort. Kew. 2 ed. iii, 24.—De Candolle, Mem. Leg. ii, t. 21; Prodr. ii, 486.—Descourtilz, Fl. Med. Antilles, i, 54, t. 12.—Macfadyen, Fl. Jamaica, 334.—Bentham, Bot. Sulphur, 87; Martius, Fl. Brasil. xv², 78, t. 26.—Cooper in Smithsonian Rep. 1858, 265.—Torrey, Bot. Mex. Boundary Survey, 59.—Grisebach, Fl. British West Indies, 204; Pl. Lorentz. 81.—Gray, Hall's Pl. Texas, 8.—Brewer & Watson, Bot. California, i, 162.—Vasey, Cat. Forest Trees, 12.—Hemsley, Bot. Am.-Cent. i, 327.—Watson in Proc. Am. Acad. xvii, 348.

Corpus Christi, Texas, west along the Mexican boundary to the valley of the Colorado river, Arizona (Yuma); and southward into Mexico; probably of American origin, but now widely naturalized throughout the tropical and warmer regions of the globe (*A. De Candolle, Geog. Bot.* ii, 719, 770, 793).

A small tree, 6 to 12 meters in height, with a trunk sometimes 0.30 meter in diameter.

Wood heavy, hard, very close-grained, inclined to check in drying, containing many evenly-distributed small open ducts; medullary rays very numerous, thin, conspicuous; color, light brown, the very thick sap-wood lighter, often tinged with yellow; specific gravity. 0.6116; ash, 2.32.

91.—Cercis Canadensis, Linnæus,

Spec. 1 ed. 374.—Du Roi, Obs. Bot. 10.—Marshall, Arbustum, 32.—Lamarck, Dict. ii, 586.—Wangenheim, Amer. 84.—Walter, Fl. Caroliniana, 135.—Aiton, Hort. Kew. ii, 47; 2 ed. iii, 22.—Willdenow, Spec. ii, 508; Enum. 439; Berl. Baumz. 84.—Nouveau Duhamel, i, 19.—Michaux, Fl. Bor.-Am. i, 265.—Schkuhr, Handb. 354.—Persoon, Syn. i, 454.—Desfontaines, Hist. Arb. ii, 254.—Pursh, Fl. Am. Sept. i, 308.—Eaton, Manual, 46; 6 ed. 89.—Nuttall, Genera, i, 283.—Hayne, Dend. Fl. 53.—Elliott, Sk. i, 470.—Torrey in Ann. Lyc. N. York, ii, 194; Fl. U. S. 441; Compend. Fl. N. States, 188; Fl. N. York, i, 188; Nicollet's Rep. 149; Emory's Rep. 408.—De Candolle, Prodr. ii, 518.—Sprengel, Syst. ii, 346.—Guimpel, Otto & Hayne, Abb. Holz. 116, t. 92.—Hooker, Fl. Bor.-Am. i, 167; Companion Bot. Mag. i, 24.—Don, Miller's Dict. ii, 468.—Beck, Bot. 94.—Spach, Hist. Veg. i, 129.—Torrey & Gray, Fl. N. America, i, 392.—Loudon, Arboretum, ii, 659 & t.—Eaton & Wright, Bot. 190.—Dietrich, Syn. ii, 155.—Browne, Trees of America, 221.—Gray in Mem. Am. Acad. new ser. iv[1], 38; Manual N. States, 5 ed. 144.—Richardson, Arctic Exped. 424.—Parry in Owen's Rep. 611.—Darlington, Fl. Cestrica, 3 ed. 67.—Darby, Bot. S. States, 294.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 114.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 50.—Lesquereux in Owen's 2d Rep. Arkansas, 357.—Wood, Cl. Book, 301; Bot. & Fl. 84.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 190.—Porcher, Resources S. Forests, 197.—Koch, Dendrologie i, 14.—Baillon, Hist. Pl. ii, 121.—Vasey, Cat. Forest Trees, 12.—Ridgway in Proc. U. S. Nat. Mus. 1882, 65.

Siliquastrum cordatum, Mœnch, Meth. 54.

C. Canadensis, var. *pubescens*, Pursh. Fl. Am. Sept. i, 308.—Loudon, Arboretum, ii, 659.

REDBUD. JUDAS TREE.

Western Pennsylvania, southward to Tampa bay, Florida, northern Alabama and Mississippi, westward through southern Michigan and Minnesota to eastern Nebraska; southwest through Missouri and Arkansas to the eastern portions of the Indian territory, Louisiana, and the valley of the Brazos river, Texas.

A small tree, 12 to 16 meters in height, with a trunk sometimes 0.30 meter in diameter; rich woods, borders of streams and swamps; most common and reaching its greatest development in southern Arkansas, the Indian territory, and eastern Texas, here, when in bloom, a conspicuous feature of the forest.

Wood heavy, hard, not strong, rather coarse-grained, compact, susceptible of a good polish; layers of annual growth clearly marked by one to three rows of open ducts; medullary rays exceedingly numerous, thin; color, rich dark brown tinged with red, the sap-wood lighter; specific gravity, 0.6363; ash, 0.72.

92.—Cercis reniformis, Engelmann;

Scheele in Rœmer, Texas, 428.—Watson in Proc. Am. Acad. xvii, 348.

C. occidentalis, var. Gray in Jour. Boston Soc. Nat. Hist. vi, 177.—Walpers, Ann. ii, 440.—Torrey, Bot. Mex. Boundary Survey, 58.—Brewer & Watson, Bot. California, i, 161.

C. occidentalis, Gray, Hall's Pl. Texas, 7 [not Torrey].—Hemsley, Bot. Am.-Cent. i, 340, in part.

C. occidentalis, var. *Texensis*, Watson, Index. i, 209.

REDBUD.

Middle and western Texas west of the Colorado river; in northern Mexico.

A small tree, 6 to 8 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or often a shrub forming dense thickets; limestone hills; formerly often confounded with the shrubby *C. occidentalis* of the California coast region.

Wood heavy, hard, close-grained, compact; layers of annual growth clearly marked by one to three rows of open ducts; medullary rays numerous, not conspicuous; color, brown streaked with yellow, the sap-wood lighter; specific gravity, 0.7513; ash, 0.77.

93.—Prosopis juliflora, De Candolle,

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Prodr. ii, 447.—Descourtilz, Fl. Med. Antilles, viii, 107, t. 550.—Lindley, Fl. Med. 270.—Walpers, Rep. i, 861.—Bentham, Rev. Mim. in Trans. Linnæan Soc. xxx, 377.—Schnizlein, Icon. t. 277, f. 13.—Brewer & Watson, Bot. California, i, 163.—Rothrock in Wheeler's Rep. vi, 42, 107.—Hemsley, Bot. Am.-Cent. i, 344.

P. glandulosa, Torrey in Ann. Lyc. N. York, ii, 192, t. 2; Emory's Rep. 139; Pacific R. R. Rep. iv, 82.—Don, Miller's Dict. ii, 400.—Dietrich, Syn. ii. 1424.—Eaton & Wright, Bot. 376.—Walpers, Rep. i, 861.—Bentham in Hooker's Jour. Bot. iv, 348; London Jour. Bot. v, 81.—Grisebach, Fl. British West Indies, 217.—Watson in King's Rep. v, 420; Pl. Wheeler, 8.—Gray, Hall's Pl. Texas, 7.—Vasey, Cat. Forest Trees, 12.

Algarobia glandulosa, Torrey & Gray, Fl. N. America, i, 399; Pacific R. R. Rep. ii, 164.—Engelmann & Gray in Jour. Boston Soc. Nat. Hist. v, 242.—Engelmann in Wislizenus' Rep. 10.—Scheele in Rœmer, Texas, 427.—Gray in Jour. Boston Soc. Nat. Hist. vi, 181; Smithsonian Contrib. iii, 60; v, 51; Mem. Am. Acad. new ser. v, 304; Ives' Rep 11.—Torrey in Sitgreaves' Rep. 158; Pacific R. R. Rep. iv, 20, 82; vii, 10; Bot. Mex. Boundary Survey, 60.—Cooper in Smithsonian Rep. 1858, 259; Scientific Press, San Francisco, Nov. 1871, & f.—Palmer in Am. Nat. xii, 594.

P. odorata, Torrey in Fremont's Rep. 313, t. 1 (excl. fruit).

MESQUIT. ALGAROBA. HONEY LOCUST. HONEY POD.

Texas, valley of the Trinity river (Dallas, etc.) to the northern and western limits of the state; west through New Mexico and Arizona to the *mesas* west of the San Bernardino mountains, California, reaching southern Colorado, southern Utah (Saint George), and southern Nevada; southward through southern Mexico; in Jamaica.

A tree of the first economic value, sometimes 9 to 15 meters in height, with a trunk 0.90 meter in diameter, or much smaller, often reduced to a low shrub; on dry prairies and high rocky plains, or west of the Rocky mountains, along desert streams, here often forming open forests, and reaching its greatest development within the United States in the valley of the Santa Cruz and other streams of southern Arizona; in western Texas (Fort Stockton, etc.), on account of the annual burning of the prairies, rarely 1 meter in height, the roots then enormously developed, often weighing several hundred pounds, forming, as they are here locally known, "underground forests" and furnishing the best and cheapest fuel of the region.

Wood heavy, very hard, not strong, close-grained, compact, difficult to work, almost indestructible in contact with the soil, containing many evenly-distributed, rather large, open ducts; medullary rays numerous, distinct; color, rich dark brown or often red, the sap-wood clear yellow; specific gravity, 0.7652; ash, 2.18; of the root, specific gravity, 0.8493; ash, 3.02; exclusively used for the beams and underpinnings of the adobe houses of New Mexico, Arizona, and northern Mexico; for posts and fencing, and occasionally in the manufacture of furniture, the fellies of heavy wheels, etc.; the best and often the only fuel of the region, burning slowly with a clear flame, and producing valuable charcoal, but unsuited for the generation of steam on account of its destructive action upon boilers.

A gum resembling gum arabic is yielded by this species; the unripe and pulpy pods rich in grape sugar, edible, and furnishing valuable and important fodder.

94.—Prosopis pubescens, Bentham,

London Jour. Bot. v, 82; Rev. Mim. in Trans. Linnæan Soc. xxx, 380.—Walpers, Ann. i, 259.—Watson in King's Rep. v, 420; Pl. Wheeler, 8.—Brewer & Watson, Bot. California, i, 163.—Rothrock in Wheeler's Rep. vi, 42, 107.—Hemsley, Bot. Am.-Cent. i, 344.

P. odorata, Torrey in Fremont's Rep. 313, t. 1 (for fruit).

P. Emoryi, Torrey in Emory's Rep. 139.

Strombocarpa pubescens, Gray in Smithsonian Contrib. iii, 60; v, 51; Ives' Rep. 9.—Torrey & Gray in Pacific R. R. Rep. ii, 163.—Torrey in Pacific R. R. Rep. iv, 11, 20, 82; v, 360, t. 4; vii, 10; Bot. Mex. Boundary Survey, 60.—Cooper in Smithsonian Rep. 1858, 259; Scientific Press, San Francisco, Nov. 1871 & f.—Vasey, Cat. Forest Trees, 12.

Strombocarpa odorata, Torrey in Sitgreaves' Rep. 158.

SCREW BEAN. SCREW-POD MESQUIT. TORNILLA.

Valley of the Rio Grande (Presidio), western Texas, westward through New Mexico and Arizona (valley of the Gila and Colorado rivers) to southern California (White Water, *Parish Brothers*, Vallecito, *Thurber*), and southward into Mexico; southern Utah (Saint George), and southern Nevada (Ash Meadows).

A small tree, rarely 9 meters in height, with a trunk sometimes 0.30 to 0.45 meter in diameter, or often a tall, much-branched shrub; sandy or gravelly bottom lands, reaching its greatest development within the United States in the valleys of the lower Colorado and Gila rivers.

Wood heavy, exceedingly hard, not strong, brittle, close-grained, compact, containing many evenly-distributed open ducts; medullary rays numerous, thin; color, light brown, the sap-wood somewhat lighter; specific gravity, 0.7609; ash, 0.95; used for fuel and fencing.

The pods used as fodder, and sometimes made into flour by the Indians.

95.—Leucæna glauca, Bentham,

Hooker's London Jour. Bot. iv, 417; Rev. Mim. in Trans. Linnæan Soc. xxx, 443.—Walpers, Rep. i, 884.—Grisebach, Fl. British West Indies, 220.—Hemsley, Bot. Am.-Cent. i, 351.—Watson in Proc. Am. Acad. xvii, 350.—Chapman, Fl. S. States, Suppl. 619.

Mimosa glauca, Linnæus, Spec. 2 ed. 1504.

Acacia glauca, Willdenow, Spec. iv, 1075.—De Candolle, Prodr. ii, 467.

Acacia frondosa, Willdenow, Spec. iv, 1076.—De Candolle, Prodr. ii, 468.

Acacia biceps, Willdenow, Spec. iv, 1075.—De Candolle, Prodr. ii, 467.

Mimosa leucocephala, Lamarck, Dict. i, 12.

Acacia leucocephala, Link, Enum. Hort. Berl. ii, 444.—De Candolle, Prodr. ii, 467.

Mimosa biceps, Poiret, Suppl. i, 75.

Mimosa frondosa, Klein in Poiret, Suppl. i, 76.

Western Texas, San Saba to Devil's river (*Buckley*); southward into Mexico; semi-tropical Florida (introduced, *Curtiss*), and through the West Indies.

A small tree, 7 to 9 meters in height, with a trunk 0.10 to 0.15 meter in diameter, or often a tall or, in Florida, low shrub, sending up many stems from the ground.

Wood heavy, hard, close-grained, compact, containing many small, regularly-distributed open ducts; layers of annual growth and medullary rays hardly distinguishable; color, rich brown streaked with red, the sap-wood clear yellow; specific gravity, 0.9235; ash, 3.29.

96.—Leucæna pulverulenta, Bentham,

Hooker's London Jour. Bot. iv, 417; Rev. Mim. in Trans. Linnæan Soc. xxx, 443.—Hemsley, Bot. Am.-Cent. i, 351.

Acacia pulverulenta, Schlechtendal in Linnæa, xii, 571.

Acacia esculenta, Martens & Galeotti in Bull. Acad. Brux. x², 312.

Southern Texas, valley of the lower Rio Grande; southward into Mexico.

A small tree, 6 to 8 meters in height, with a trunk 0.10 to 0.15 meter in diameter, often forming dense thickets; rich, sandy loam.

Wood heavy, hard, very close-grained, compact, containing many small, regularly-distributed open ducts; medullary rays very numerous, thin, conspicuous; color, rich dark brown, the sap-wood clear yellow; specific gravity, 0.6732; ash, 1.01.

97.—Acacia Wrightii, Bentham,

Smithsonian Contrib. iii, 64; Rev. Mim. in Trans. Linnæan Soc. xxx, 521.—Gray, Smithsonian Contrib. v, 53.—Walpers, Ann. iv, 626.—Torrey, Bot. Mex. Boundary Survey, 161.—Brewer & Watson, Bot. California, i, 61.—Watson in Proc. Am. Acad. xvii, 351.

CAT'S CLAW.

Western Texas, valley of the Guadalupe river (New Braunfels), westward and southward to the valley of the Rio Grande; in northern Mexico.

A small tree, rarely 9 meters in height, with a trunk sometimes exceeding 0.30 meter in diameter, or often a low, much-branched shrub.

Wood very heavy, hard, very close-grained, compact; layers of annual growth marked by one or two rows of small open ducts, and containing many scattered smaller ducts; medullary rays hardly distinguishable; color, bright, clear brown streaked with red and yellow, the sap-wood clear yellow; specific gravity, 0.9392; ash, 0.63.

98.—Acacia Greggii, Gray,

Smithsonian Contrib. iii, 65; v, 53; Ives' Rep. 11.—Torrey in Sitgreaves' Rep. 158; Pacific R. R. Rep. vii, 10; Bot. Mex. Boundary Survey, 61.—Walpers, Ann. iv, 625.—Bentham, Rev. Mim. in Trans. Linnæan Soc. xxx, 521.—Cooper in Smithsonian Rep. 1860, 442.—Brewer & Watson, Bot. California, i, 164.—Rothrock in Wheeler's Rep. vi, 108.—Hemsley, Bot. Am.-Cent. i, 353.—James in Am. Nat. xv, 981.

CAT'S CLAW.

Western Texas, valley of the Rio Grande, westward through southern New Mexico and Arizona to San Diego, California; southward into northern Mexico.

A low, much-branched tree, sometimes 9 meters in height, with a trunk rarely 0.45 meter in diameter, or often a shrub; dry *mesas* and in low cañons; common; the large specimens generally hollow and defective.

Wood heavy, exceedingly hard, strong, brittle, close-grained, compact; layers of annual growth marked by numerous rows of rather large open ducts; medullary rays numerous, thin; color, rich brown or red, the sap-wood light yellow; specific gravity, 0.8550; ash, 0.91; used for fuel.

A resinous gum resembling gum arabic is produced by this species (*Am. Jour. Pharm.* lii, 419).

99.—Acacia Berlandieri, Bentham,

London Jour. Bot. i, 522; Rev. Mim. in Trans. Linnæan Soc. xxx, 529.—Walpers, Rep. i, 919.—Dietrich, Syn. iv, 500.

A. tephroloba, Gray in Smithsonian Contrib. iii, 65; v, 54.—Walpers, Ann. iv, 625.—Torrey, Bot. Mex. Boundary Survey, 61.—Hemsley, Bot. Am.-Cent. i, 352.—Watson in Proc. Am. Acad. xvii, 351.

Southern Texas, valley of the Nueces (La Salle county) to Devil's river; southward into Mexico.

A small tree, sometimes 6 to 8 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or more often a tall shrub, sending up many stems from the ground; the large specimens usually hollow and defective.

Wood not examined.

100.—Lysiloma latisiliqua, Bentham,

Rev. Mim. in Trans. Linnæan Soc. xxx, 534.—Chapman, Fl. S. States, Suppl. 619.

Mimosa latisiliqua, Linnæus, Spec. 2 ed. 1504.

Acacia latisiliqua, Willdenow, Spec. iv, 1067.—Persoon, Syn. ii, 255.—De Candolle, Prodr. ii, 467.—Macfadyen, Fl. Jamaica, 318.—Nuttall, Sylva, ii, 34, t. 53; 2 ed. i, 183, t. 53.—Cooper in Smithsonian Rep. 1858, 264.

L. Bahamensis, Bentham in Hooker's London Jour. Bot. iii, 82.

Acacia Bahamensis, Grisebach, Fl. British West Indies, 221.

WILD TAMARIND.

Semi-tropical Florida, southern keys (Key Largo, Elliott's, Plantation, and Boca Chica Keys); through the West Indies.

A tree sometimes 15 meters in height, with a trunk 0.60 to 0.90 meter in diameter; bark of the young, vigorous trees smooth; the older trees generally decayed and defective, with rough, dark bark (*Curtiss*).

Wood heavy, hard, not strong, tough, close-grained, compact, susceptible of a fine polish, containing many scattered, open ducts; medullary rays numerous, not conspicuous; color, rich dark brown tinged with red, the sap-wood white; specific gravity, 0.6418; ash, 2.12; somewhat used locally in boat- and ship-building, and considered equal to mahogany for this purpose.

101.—Pithecolobium Unguis-cati, Bentham,

Hooker's London Jour. Bot. iii, 200; Rev. Mim. in Trans. Linnæan Soc. xxx, 572, 648.—Grisebach, Fl. British West Indies, 276.—Chapman, Fl. S. States, 116.—Vasey, Cat. Forest Trees, 13.

Mimosa Unguis-cati, Linnæus, Spec. 2 ed. 1497.—Jacquin, Hort. Schœnb. iii, 74, t. 392.—Descourtilz, Fl. Med. Antilles, i, t. 11.

Inga Unguis-cati, Willdenow, Spec. iv, 1006.—De Candolle, Prodr. ii, 436.—Nuttall, Sylva, ii, 37, t. 54; 2 ed. i, 86, t. 54.

Mimosa rosea, Vahl, Eclogæ, iii, 33, t. 25.

Inga rosea, Steudel in De Candolle, Prodr. ii, 437.

Inga forfex, Kunth, Mim. 12, t. 16.

P. forfex, Bentham in Hooker's London Jour. Bot. iii, 199.

Inga Guadalupensis, Desvaux, Jour. i, 70.

Mimosa Guadalupensis, Persoon, Syn. ii, 262.

Inga microphylla, Humboldt & Bonpland in Willdenow, Spec. iv, 1004.

P. microphyllum, Bentham in Hooker's London Jour. Bot. iii, 200.

P. Guadalupensis, Chapman, Fl. S. States, 116.

CAT'S CLAW.

Semi-tropical Florida, Caximbas bay, and on the southern keys; through the West Indies.

A small tree, sometimes 6 meters in height, with a trunk rarely exceeding 0.15 meter in diameter, or often throwing out many spreading, vine-like stems from the ground.

Wood very heavy, hard, close-grained, checking badly in drying; medullary rays numerous, inconspicuous; color, rich red varying to purple, sap-wood clear yellow; specific gravity, 0.9049; ash, 2.46.

ROSACEÆ.

102.—Chrysobalanus Icaco, Linnæus,

Spec. 1 ed. 513.—Jacquin, Stirp. Am. 154, t. 94.—Lamarck, Dict. iii, 224; Ill. ii, 542, t. 428.—Poiret, Suppl. iii, 135.—Aiton, Hort. Kew. 2 ed. iii, 200.—De Candolle, Prodr. ii, 525.—Lindley in Trans. Hort. Soc. London, v, 98.—Turpin, Dict. Sci. Nat. 236.—Tussac, Fl. Antilles, iv, 91, t. 31.—Spach, Hist. Veg. i, 369, t. 5, f. 4.—Torrey & Gray, Fl. N. America, i, 406.—Walpers, Rep. ii, 1; Ann. iv, 642.—Bentham, Bot. Sulphur, 91; Fl. Nigritiana, 336.—Sprengel, Icon. t. 274, f. 1-13.—Cooper in Smithsonian Rep. 1860, 439.—Chapman, Fl. S. States, 119.—Grisebach, Fl. British West Indies, 229.—Baillon in Adansonia, vii, 221; Hist. Pl. i, 427, f. 486, 487.—Hooker f. in Martius, Fl. Brasil. ii, 7.—Guibourt, Hist. Drogues, 7 ed. iii, 287.—Hemsley, Bot. Am.-Cent. i, 365.

COCOA PLUM.

Semi-tropical Florida, cape Canaveral to bay Biscayne, west coast Caximbas bay, and on the southern keys; through the West Indies and tropical America to Brazil.

A small tree, 7 to 10 meters in height, with a trunk 0.15 to 0.30 meter in diameter, or along sandy beaches a low, prostrate shrub 1.08 to 2.16 meters in height; reaching its greatest development within the United States on the borders and islands of the Everglades, near bay Biscayne.

Wood heavy, hard, strong, close-grained, compact, containing few irregularly-distributed, not large, open ducts; medullary rays numerous, thin; color, light brown often tinged with red, the sap wood lighter; specific gravity, 0.7709; ash, 0.87.

Varieties are distinguished by *A. H. Curtiss* with the skin of the edible fruit white or black, the latter more ovate with narrower, softer stones (? var. *pellocarpa*, *Hooker f. l. c.*—*C. pellocarpa*, *Miquel*, *Prim. Esseq.* 193.—*Grisebach*, *l. c.*).

103.—Prunus Americana, Marshall,

Arbustum, iii.—Darlington in Ann. Lyc. N. York, iii, 87, t. 1; Fl. Cestrica, 3 ed. 72.—Eaton, Manual, 6 ed. 285.—Beck, Bot. 95.—Torrey & Gray, Fl. N. America, i, 407; Pacific R. R. Rep. ii, 164.—Eaton & Wright, Bot. 377.—Nuttall, Sylva, ii, 19, t. 48; 2 ed. i, 169, t. 48.—Torrey, Fl. N. York, i, 194; Emory's Rep. 408; Pacific R. R. Rep. iv, 82.—Emerson, Trees Massachusetts, 449; 2 ed. ii, 511.—Hooker in London Jour. Bot. vi, 217.—Rœmer, Syn. Mon. iii, 59.—Gray in Mem. Am. Acad. new ser. iv[1], 40; Manual N. States, 5 ed. 148.—Scheele in Rœmer, Texas, 430.—Richardson, Arctic Exped. 424.—Parry in Owen's Rep. 611.—Chapman, Fl. S. States, 119.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 56.—Lesquereux in Owen's 2d Rep. Arkansas, 358.—Wood, Cl. Book, 327; Bot. & Fl. 102.—Engelmann in Trans. Am. Phil. Soc. new ser. xiii, 190.—Koch, Drendrologie, i, 101.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 33.—Vasey, Cat. Forest Trees, 13.—Macoun in Geological Rep. Canada, 1875–'76, 194.—Broadhead in Coulter's Bot. Gazette, iii, 52.—Bell in Geological Rep. Canada, 1879–'80, 54[c].—Ridgway in Proc. U. S. Nat. Mus. 1882, 65.

P. Mississippi, Marshall, Arbustum, 112.

P. spinosa, Walter, Fl. Caroliniana, 146 [not Linnæus].

P. nigra, Aiton, Hort. Kew. ii, 165; 2 ed. iii, 198.—Willdenow, Spec. ii, 993; Berl. Baumz, 311.—Poiret in Lamarck, Dict. v, 674.—Persoon, Syn. ii, 35.—Bot. Mag. t. 1117.—Pursh, Fl. Am. Sept. i, 331.—Torrey, Fl. U. S. 469; Compend. Fl. N. States, 199.—Sprengel, Syst. ii, 477.—Rœmer, Syn. Mon. iii, 59.

Cerasus nigra, Loiseleur in Nouveau Duhamel, v, 32.—Seringe in De Candolle, Prodr. ii, 538.—Hooker, Fl. Bor.-Am. i, 167; Companion Bot. Mag. i, 24.—Don, Miller's Dict. ii, 513.—Beck, Bot. 96.—Spach, Hist. Veg. i, 399.—Loudon, Arboretum, ii, 704, f. 411, 412.

P. hiemalis, Elliott, Sk. i, 542 [not Michaux].

P. coccinea, Rafinesque, Fl. Ludoviciana, 135.

WILD PLUM. CANADA PLUM. HORSE PLUM.

Valley of the Saint Lawrence (Quebec) to the valley of Rainy and Assinaboine rivers and southern shores of lake Manitoba; northern Vermont, western New England, and southward through the Atlantic states to the Chattahoochee region of western Florida, west to the valley of the upper Missouri river, Dakota, and Cheyenne cañon, Pike's Peak region, Colorado, southwest through Arkansas, the Indian territory, to about longitude 102°, and the valley of the lower Concho river, Texas.

A small tree, 6 to 12 meters in height, with a trunk rarely exceeding 0.30 meter in diameter; rich woods, or along streams and borders of ponds and swamps, reaching its greatest development on the bottom lands of eastern Texas.

A form with the young leaves and pedicles pubescent is—

var. **mollis**, Torrey & Gray, Fl. N. America, i, 407.

P. hiemalis, Michaux, Fl. Bor.-Am. i, 284.—Poiret in Lamarck, Dict. v, 679.—Persoon, Syn. ii, 35.—Desfontaines, Hist. Arb. ii, 206.—Nouveau Duhamel, v, 184.—Hayne, Dend. Fl. 73.—Sprengel, Syst. ii, 477.—Spach, Hist. Veg. i, 398.—Rœmer, Syn. Mon. iii, 59.

P. mollis, Torrey, Fl. U. S. 470; Compend. Fl. N. States, 199.—Beck, Bot. 95.

Cerasus hiemalis, Seringe in De Candolle, Prodr. ii, 538.—Hooker, Fl. Bor.-Am. i, 168.—Beck, Bot. 96.—Loudon, Arboretum, ii, 704.—Don, Miller's Dict. ii, 504.

Cerasus Americana, Hooker, Companion Bot. Mag. i, 24.

Wood heavy, very hard, strong, very close-grained, compact, satiny, susceptible of a beautiful polish; medullary rays numerous, thin; color, rich bright brown or often red, the sap-wood lighter; specific gravity, 0.7215; ash, 0.18; used for the handles of tools, etc.

Often cultivated for the yellow, red, or rarely nearly black, acid or rarely sweet fruit, and furnishing an excellent stock on which to graft the varieties of the domestic plum.

104.—Prunus angustifolia, Marshall,

Arbustum, iii.—Koch, Dendrologio, i, 103.

P. Chicasa, Michaux, Fl. Bor.-Am. i, 284.—Poiret in Lamarck, Dict. v, 680.—Persoon, Syn. ii, 35.—Nuttall, Genera, i, 302.—Nouveau Duhamel, v, 183.—Elliott, Sk. i, 542.—Torrey in Ann. Lyc. N. York, ii, 194; Pacific R. R. Rep. iv, 82.—Sprengel, Syst. ii, 476.—Audubon, Birds, t. 53.—Eaton, Manual, 6 ed. 285.—Spach, Hist. Veg. i, 397.—Torrey & Gray, Fl. N. America, i, 407; Pacific R. R. Rep. ii, 164.—Eaton & Wright, Bot. 377.—Rœmer, Syn. Mon. iii, 58.—Darlington, Fl. Cestrica, 3 ed. 73.—Darby, Bot. S. States, 299.—Browne, Trees of America, 250.—Cooper in Smithsonian Rep. 1858, 251.—Chapman, Fl. S. States, 119.—Curtis in Rep. Geological Surv. N. Carolina 1860, iii, 56.—Lesquereux in Owen's 2d Rep. Arkansas, 858.—Wood, Cl. Book, 328; Bot. & Fl. 102.—Gray, Manual N. States, 5 ed. 148; Hall's Pl. Texas, 9.—Young, Bot. Texas, 1251.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 33.—Vasey, Cat. Forest Trees, 13.—Ridgway in Proc. U. S. Nat. Mus. 1882, 65.

P. insititia, Walter, Fl. Caroliniana, 146.—Abbot, Insects Georgia, ii, t. 60.

Cerasus Chicasa, Seringe in De Candolle, Prodr. ii, 538.—Hooker, Fl. Bor.-Am. i, 168; Companion Bot. Mag. i, 24.—Don, Miller's Dict. ii, 514.—Loudon, Arboretum, ii, 705.

CHICKASAW PLUM. HOG PLUM.

Probably native of the eastern slopes of the southern Rocky mountains, where it is found at an altitude of 7,000 feet, and of the high plateau east and southeast of them; now widely naturalized by early cultivation throughout the Atlantic forests south of Pennsylvania, and west of the Alleghany mountains extending as far north as southern Michigan.

A small tree, 6 to 8 meters in height, with a trunk, 0.15 to 0.20 meter in diameter, or often a low shrub; generally along streams or borders of prairies, in rich soil.

Wood heavy, soft, not strong, close-grained, compact; medullary rays numerous, thin; color, light brown or red, the sap-wood lighter; specific gravity, 0.6884; ash, 0.28; often cultivated for its globose red or yellow fruit.

105.—Prunus Pennsylvanica, Linnæus f.

Suppl. 252.—Willdenow, Spec. ii, 992; Enum. 518; Berl. Baumz. 310.—Abbot, Insects Georgia, i, t. 45.—Poiret in Lamarck, Dict. v, 673.—Persoon, Syn. ii, 35.—Nouveau Duhamel, v, 9.—Aiton, Hort. Kew. 2 ed. iii, 198.—Pursh, Fl. Am. Sept. i, 331.—Nuttall, Genera, i, 302.—Torrey, Fl. U. S. 468; Compend. Fl. N. States, 198.—Sprengel, Syst. ii, 477.—Hayne, Dend. Fl. 73.—Eaton, Manual, 6 ed., 285.—Beck in Am. Journal Sci. 1 ser. xiv, 112.—Dietrich, Syn. iii, 42.—Chapman, Fl. S. States, 130.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 57.—Wood, Bot. & Fl. 102.—Gray in Proc. Philadelphia Acad. 1863, 61; Manual N. States, 5 ed. 148.—Koch, Dendrologie, i, 117.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 33.—Emerson, Trees Massachusetts, 2 ed. ii, 513.—Vasey, Cat. Forest Trees, 13.—Macoun in Geological Rep. Canada, 1875–'76, 194.—Bell in Geological Rep. Canada, 1879–'80, 54c.—Sears in Bull. Essex Inst. xiii, 176.

? *P. lanceolata*, Willdenow, Berl. Baumz. 240, t. 3, f. 3.

Cerasus borealis, Michaux. Fl. Bor.-Am. i, 286.—Nouveau Duhamel, v, 32.—Michaux f. Hist. Arb. Am. iii, 159, t. 8; N. American Sylva, 3 ed. ii, 152, t. 90.—Seringe in De Candolle, Prodr. ii, 558.—Don, Miller's Dict. ii, 513.—Beck, Bot. 97.—Loudon, Arboretum, ii, 703, f. 410.—Rœmer, Syn. Mon. iii, 78.

P. borealis, Poiret in Lamarck, Dict. v, 674.—Pursh, Fl. Am. Sept. i, 538.—Eaton, Manual, 54.—Barton, Compend. Fl. Philadelph. i, 223.—Nuttall, Genera, i, 302.—Loddiges, Bot. Cab. t. 1598.—Bigelow, Fl. Boston. 3 ed. 205.

? *P. persicifolia*, Desfontaines, Hist. Arb. ii, 205.

? *Cerasus persicifolia*, Loiseleur in Nouveau Duhamel, v, 9.—Seringe in De Candolle, Prodr. ii, 537.—Don, Miller's Dict. ii, 512.—Spach, Hist. Veg. i, 411.—Rœmer, Syn. Mon. iii, 81.

Cerasus Pennsylvanica, Seringe in De Candolle, Prodr. ii, 538.—Hooker, Fl. Bor.-Am. i, 168.—Don, Miller's Dict. ii, 514.—Beck, Bot. 97.—Torrey & Gray, Fl. N. America, i, 409.—Loudon, Arboretum, ii, 705.—Eaton & Wright, Bot. 189.—Torrey, Fl. N. York, i, 196.—Nuttall, Sylva, ii, 15; 2 ed. i, 165.—Browne, Trees of America, 265.—Emerson, Trees Massachusetts, 1 ed. 451.—Rœmer, Syn. Mon. iii, 57.—Gray, Manual N. States, 1 ed. 115.—Parry in Owen's Rep. 611.—Richardson, Arctic Exped. 425.—Cooper in Smithsonian Rep. 1858, 251.—Wood, Cl. Book, 327.

WILD RED CHERRY. PIN CHERRY. PIGEON CHERRY.

Labrador, shores of Hudson's bay, and west through the Saskatchewan region to the valley of the upper Fraser river (Soda creek, *Macoun*); south through the northern states to Pennsylvania, central Michigan, northern Illinois, central Iowa, and along the high Alleghany mountains of North Carolina and Tennessee, and the Rocky mountains of Colorado.

A small tree, rarely exceeding 12 meters in height, with a trunk sometimes 0.60 meter in diameter, or in the Rocky Mountain region reduced to a low shrub; common in all the northern forests, in northern New England taking possession of ground cleared by fire of the coniferous forests.

Wood light, soft, close-grained, compact; medullary rays numerous, thin; color, light brown, sap-wood clear yellow; specific gravity, 0.5023; ash, 0.40.

The small acid fruit used domestically and by herbalists in the preparation of cough mixtures, etc.

106.—Prunus umbellata, Elliott,

Sk. i, 541.—Eaton, Manual, 6 ed. 286.—Dietrich, Syn. iii, 44.—Chapman, Fl. S. States, 119.—Wood, Cl. Book, 328; Bot. & Fl. 102.—Young, Bot. Texas, 251.—Vasey, Cat. Forest Trees, 13.

P. pumila, Walter, Fl. Caroliniana, 146 [not Linnæus].

Cerasus umbellata, Torrey & Gray, Fl. N. America, i, 409.—Eaton & Wright, Bot. 190.—Rœmer, Syn. Mon. iii, 78.

SLOE. BLACK SLOE.

South Carolina, south near the coast to Mosquito inlet and Tampa bay, Florida, and through central Alabama to eastern Mississippi (Holly Springs and Enterprise, *Mohr*).

A small tree, 5 to 6 meters in height, with a trunk 0.25 to 0.38 meter in diameter; dry, sandy soil.

Wood heavy, hard, close-grained, compact; medullary rays numerous, thin; color, dark reddish-brown, the sap-wood much lighter; specific gravity, 0.8202; ash, 0.12.

The black or red pleasantly acid fruit used as a preserve.

107.—Prunus emarginata, Walpers,

Rep. ii, 9.—Dietrich, Syn. iii, 42.—Loudon, Arboretum, ii, 714.—Watson in King's Rep. v, 79.—Torrey, Bot. Wilkes Exped. 284.—Brewer & Watson, Bot. California, i, 167.

Cerasus emarginata, Douglas in Hooker, Fl. Bor.-Am. i, 169.—Don, Miller's Dict. ii, 515.—Torrey & Gray, Fl. N. America, i, 410.—Eaton & Wright, Bot. 189.—Rœmer, Syn. Mon. iii, 79.—Torrey in Pacific R. R. Rep. iv, 83.—Bolander in Proc. California Acad. iii, 79.

Cerasus erecta, Presl, Epimel. Bot. 194.—Walpers, Ann, iii, 854.

Cerasus glandulosa, Kellogg in Proc. California Acad. i, 59.

Vancouver's island and the valley of the lower Fraser river, south through western Washington territory and Oregon, east to the western slopes of the Bitter Root mountain, Idaho (Lolo trail, *Watson*), and the valley of the Jocko river, Montana (*Canby & Sargent*). California along the western slopes of the Sierra Nevadas and on the Coast ranges, from San Francisco bay to the Santa Lucia mountains (*G. R. Vasey*), reaching an elevation of from 3,000 to 4,000 feet.

A tree often 12 to 15 meters in height, with a trunk sometimes exceeding 0.30 meter in diameter; at high elevations and throughout central California reduced to a shrub 2 to 3 meters in height, or in the Santa Lucia mountains 15 to 18 meters in height, with a trunk 0.60 to 0.90 meter in diameter (*Vasey*); generally along streams or in low, rich woods.

The wood of the type not collected.

Var. mollis, Brewer,

Bot. California, i, 167.—Hall in Coulter's Bot. Gazette, ii, 86.

Cerasus mollis, Douglas in Hooker, Fl. Bor.-Am. i, 169.—Hooker, London Jour. Bot. vi, 217.—Don, Miller's Dict. ii, 515.—Torrey & Gray, Fl. N. America, i, 410.—Loudon, Arboretum, ii, 417.—Eaton & Wright, Bot. 189.—Nuttall, Sylva, ii, 14, t. 46; 2 ed. i, 164, t. 46.—Rœmer, Syn. Mon. iii, 79.—Richardson, Arctic Exped, 425.—Newberry in Pacific R. R. Rep. vi, 73.—Cooper in Pacific R. R. Rep. xii, 29, 59; Am. Nat. iii, 406.—Lyall in Jour. Linnæan Soc. vii, 131.—Gray in Proc. Am. Acad. viii, 381.

P. mollis, Walpers, Rep. ii, 9.—Dietrich, Syn. iii, 42.—Torrey, Bot. Wilkes Exped. 284.—Vasey, Cat. Forest Trees, 13.—Macoun in Geological Rep. Canada, 1875–'76, 194.

The common northern and Idaho form, more or less wooly pubescent, especially on the under side of the leaves.

Wood light, soft, not strong, brittle, close-grained, compact; medullary rays numerous, thin; color, brown streaked with green; specific gravity, 0.4502; ash, 0.21.

108.—Prunus serotina, Ehrhart,

Beitr. iii, 20.—Willdenow, Spec. ii, 986; Enum. 517; Berl. Baumz. 301.—Persoon, Syn. ii, 34.—Desfontaines, Hist. Arb. ii, 204.—Aiton, Hort. Kew. 2 ed. iii, 196.—Eaton, Manual, 54; 6 ed. 284.—Nuttall, Genera, i, 302.—Barton, Compend. Fl. Philadelph. 54.—Guimpel, Otto & Hayne, Abb. Holz. 45, t. 37.—Hayne, Dend. Fl. 70.—Sprengel, Syst. ii, 478.—Nees, Pl. Neuwied, 9.—Hooker f. in Trans. Linnæan Soc. xxii², 327.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 56.—Lesquereux in Owen's 2d Rep. Arkansas, 358.—Wood, Bot. & Fl. 102.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 190.—Chapman, Fl. S. States, 120.—Gray, Manual N. States, 5 ed. 149; Hall's Pl. Texas, 9.—Koch, Dendrologie, i, 122.—Torrey, Bot. Wilkes Exped. 284.—Emerson, Trees Massachusetts, 2 ed. ii, 515 & t.—Brewer & Watson, Bot. California, i, 167.—Vasey, Cat. Forest Trees, 13.—Bentley & Trimen, Med. Pl. ii, 97, t. 97.—Sears in Bull. Essex Inst. xiii, 176.—Bell in Geological Rep. Canada, 1879-'80, 54c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 66.

P. Virginiana, Miller, Dict. No. 3 [not Linnæus].—Du Roi, Obs. Bot. 12; Harbk. ii, 191.—Wangenheim, Amer. 34, t. 14.—Medicus, Bot. Beobacht. 1782, 345.—Marshall, Arbustum, 112.—Walter, Fl. Caroliniana, 146.—Aiton, Hort. Kew. ii, 163.—Poiret in Lamarck, Dict. v, 664.—Pursh, Fl. Am. Sept. i, 329.—Elliott, Sk. i, 540.—Torrey, Fl. U. S. 467; Compend. Fl. N. States, 189.—Bigelow, Fl. Boston. 3 ed. 204.

Cerasus Virginiana, Michaux, Fl. Bor.-Am. i, 285.—Michaux f. Hist. Arb. Am. iii, 151, t. 6; N. American Sylva, 3 ed. ii, 147, t. 88.—Hooker, Fl. Bor.-Am. i, 169 (excl. syn.).—Don, Miller's Dict. ii, 515.—Beck, Bot. 97.—Darlington, Fl. Cestrica, 2 ed. 289.—Loudon, Arboretum, ii, 710, f. 418.—Browne, Trees of America, 268.

Cerasus serotina, Loiseleur in Nouveau Duhamel, v, 3.—Seringe in De Candolle, Prodr. ii, 540.—Spach, Hist. Veg. i, 416.—Torrey & Gray, Fl. N. America, i, 410.—Loudon, Arboretum, ii, 712, f. 419 & t.—Eaton & Wright, Bot. 189.—Torrey, Fl. N. York, i, 196; Pacific R. R. Rep. vii, 11.—Penn. Cycl. vi, 432.—Carson, Med. Bot. i, 41, t. 35.—Griffith, Med. Bot. 288.—Emerson, Trees Massachusetts, 1 ed. 453.—Gray, Manual N. States, 1 ed. 115; Jour. Boston Soc. Nat. Hist. vi, 186.—Darlington, Fl. Cestrica, 3 ed. 75.—Darby, Bot. S. States, 299.—Cooper in Smithsonian Rep. 1858, 252.—Porcher, Resources S. Forests, 169.—Richardson, Arctic Exped. 425.—Wood, Cl. Book, 326.—Bolander in Proc. California Acad. iii, 79.

P. cartilaginea, Lehmann, Ind. Sem. Hamburg, 1833.

Padus serotina, Agardh, Theor. & Syst. Pl. t. 14, f. 8.

Padus Virginiana, Rœmer, Syn. Mon. iii, 86.

Padus cartilaginea, Rœmer, Syn. Mon. iii, 86.

WILD BLACK CHERRY. RUM CHERRY.

Southern Ontario, southward through the Atlantic forests to Matanzas inlet and Tampa bay, Florida, west to the valley of the Missouri river, Dakota, eastern Kansas, the Indian territory, and the valley of the upper San Antonio River, Texas.

A tree 18 to 30 meters in height, with a trunk 0.90 to 1.20 or, exceptionally, 1.50 meter in diameter; rich, generally elevated woodlands; common and reaching its greatest development on the western slopes of the Alleghany mountains from West Virginia southward; not common and of small size in the Gulf region and Texas

Wood light, hard, strong, close, straight-grained, compact, easily worked; medullary rays numerous, thin; color, light brown or red, growing darker with exposure, the thin sap-wood yellow; specific gravity, 0.5822; ash, 0.15; largely used and esteemed in cabinet work, interior finish, etc., and now becoming scarce.

The bark contains a bitter tonic principle, and infused with cold water generates a small percentage of hydrocyanic acid; employed as a tonic and sedative in cases of pulmonary consumption in the form of cold infusions, sirups, and fluid extracts (*Proc. Am. Phar. Assoc.* xxiii, 209.—*Globley in Jour. Pharm. et Chimie*, xv, 40.—*Guibourt, Hist. Drogues*, 7 ed. iii, 317.—*Pharm. Jour.* 3 ser. iv, 44.—*Flückiger & Hanbury, Pharmocographia*, 224.—*U. S. Dispensatory*, 14 ed. 749.—*Nat. Dispensatory*, 2 ed. 1177); the bitter fruit used domestically in the preparation of cherry brandy.

NOTE.—The closely-allied *P. Virginiana* of the north Atlantic region, a tall shrub, sometimes 6 to 8 meters in height, does not assume arborescent habit.

109.—Prunus Capuli, Cavanilles,

Sprengel, Syst. ii, 477.—Schlechtendal in Linnæa, xiii, 89, 404.—Koch, Dendrologie, i, 123.—Hemsley, Bot. Am.-Cent. i, 367.—Watson in Proc. Am. Acad. xvii, 352.

Cerasus Capollin, De Candolle, Prodr. ii, 539.—Don, Miller's Dict. ii, 515.—Loudon, Arboretum, ii, 713, f. 420.—Bentham, Pl. Hartweg. 10.—Lindley, Fl. Med. 232.—Penn. Cycl. vi, 432.—Torrey & Gray, Fl. N. America, i, 412.—Gray in Smithsonian Contrib. v, 54.

Cerasus Capuli, Seringe in De Candolle, Prodr. ii, 541.—Don, Miller's Dict. ii, 516.—Spach, Hist. Veg. i, 422.

P. Capollin, Zuccarini in Abhandl. Acad. Munich, ii, 345, t. 8.—Rœmer, Syn. Mon. iii, 87.—Torrey, Bot. Mex. Boundary Survey, 62.—Rusby in Bull. Torrey Bot. Club, ix, 53.

P. Canadensis, Mociño & Sessé, Pl. Mex. Icon. *ined.*

WILD CHERRY.

Apache and Guadalupe mountains, Texas, west through southern New Mexico and Arizona to the southern slopes of the San Francisco mountains; southward through northern New Mexico, and in Peru.

A small tree, in the United States, rarely 12 meters in height, with a trunk often 0.30 meter in diameter; bottoms of cañons and mountain valleys, generally between 5,000 and 7,000 feet elevation.

Wood heavy, moderately hard, close-grained, compact; medullary rays very numerous, thin; color, brown, or often bright, clear red, the sap-wood nearly white; specific gravity, 0.7879; ash, 0.20.

110.—Prunus demissa, Walpers,

Rep. ii, 10.—Dietrich, Syn. iii, 43.—Bentham, Pl. Hartweg. 307.—Torrey, Bot. Mex. Boundary Survey, 63.—Watson in King's Rep. v, 80; Pl. Wheeler, 8.—Porter in Hayden's Rep. 1871, 481.—Coulter in Hayden's Rep. 1872, 764.—Rothrock, Pl. Wheeler, 37.—Brandegee in Hayden's Rep. 1875, 236.—Brewer & Watson, Bot. California, i, 167.—Vasey, Cat. Forest Trees, 13.—Hall in Coulter's Bot. Gazette, ii, 86.—Macoun in Geological Rep. Canada, 1875–'76, 194.—Hemsley, Bot. Am.-Cent. i, 368.

Cerasus serotina, Hooker, Fl. Bor.-Am. i, 169, in part.

Cerasus demissa, Nuttall in Torrey & Gray, Fl. N. America, i, 411.—Gray in Mem. Am. Acad. new ser. iv[1], 40.—Durand in Jour. Philadelphia Acad. 1855, 87.—Torrey in Pacific R. R. Rep. iv, 83.—Newberry in Pacific R. R. Rep. vi, 73.—Cooper in Smithsonian Rep. 1858, 259; Pacific R. R. Rep. xii[2], 59.

Padus demissa, Rœmer, Syn. Mon. iii, 87.

P. Virginiana, var. *demissa*, Torrey, Bot. Wilkes Exped. 284.—Gray in Proc. Am. Acad. viii, 381.

WILD CHERRY.

Vancouver's island east to the western slopes of the Rocky mountains of Montana, south through the Pacific region; in Sonora.

A small tree, sometimes 7 to 10 meters in height, with a trunk 0.30 to 0.45 meter in diameter, or more often a low shrub; reaching its greatest development in the rich valleys of southern Oregon and northern California, near the coast; in southern California, and east of the Cascade and Sierra Nevada ranges, a low shrub confined to high, mountain valleys.

Wood heavy, hard, not strong, close-grained, compact; medullary rays numerous, conspicuous; color, light brown, the sap-wood lighter; specific gravity, 0.6951; ash, 0.50.

111.—Prunus Caroliniana, Aiton,

Hort. Kew. ii, 163; 2 ed. iii, 196.—Willdenow, Spec. ii, 987.—Poiret in Lamarck, Dict. v, 667.—Persoon, Syn. ii, 34.—Desfontaines, Hist. Arb. ii, 203.—Nuttall, Genera, i, 302.—Sprengel, Neue Entdeck. i, 304; Syst. ii, 478.—Hayne, Dend. Fl. 71.—Elliott, Sk. i, 540.—Audubon, Birds, t. 159, 190.—Eaton, Manual, 6 ed. 286.—Schlechtendal in Linnæa, xiii, 89.—Dietrich, Syn. iii, 43.—Chapman, Fl. S. States, 120.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 57.—Wood, Bot. & Fl. 103.—Koch, Dendrologie, i, 124.—Young, Bot. Texas, 252.—Gray, Hall's Pl. Texas, 9.—Vasey, Cat. Forest Trees, 13.

P. Carolina, Miller, Dict.—Du Roi, Harbk. ii, 198.

P. serratifolia, Marshall, Arbustum, 114.

P. Lusitanica, Walter, Fl. Caroliniana, 146.

Cerasus Caroliniana, Michaux, Fl. Bor.-Am. i, 285.—Nouveau Duhamel, v, 5.—Michaux f. Hist. Arb. Am. iii, 156, t. 7; N. American Sylva, 3 ed. ii, 150, t. 89.—Seringe in De Candolle, Prodr. ii, 540.—Don, Miller's Dict. ii, 516.—Spach, Hist. Veg. i, 420.—Penn. Cycl. vi, 432.—Loudon, Arboretum, ii, 720, f. 423.—Torrey & Gray, Fl. N. America, i, 411.—Eaton & Wright, Bot. 190.—Browne, Trees of America, 272.—Darby, Bot. S. States, 299.—Griffith, Med. Bot. 291.—Cooper in Smithsonian Rep. 1858, 252.—Porcher, Resources S. Forests, 171.—Wood, Cl. Book, 326.

P. sempervirens, Willdenow, Enum. Suppl. 33.

? *Bumelia serrata*, Pursh, Fl. Am. Sept. 155.—Rœmer & Schultes, Syst. iv, 498.

? *Achras serrata*, Poiret, Suppl. v, 36.

Leptocarpa Caroliniana, Nuttall, Sylva, ii, 18; 2 ed. i, 167.

Chimanthus amygdalinus, Rafinesque, Fl. Ludoviciana, 159.

Laurocerasus Caroliniana, Rœmer, Syn. Mon. iii, 90.

WILD ORANGE. MOCK ORANGE. WILD PEACH.

North Carolina, south, near the coast, to bay Biscayne, Florida, and southern Alabama, west, along the Gulf coast, to the valley of the Guadalupe river, Texas.

A small tree, evergreen, 10 to 12 meters in height, with a trunk rarely exceeding 0.30 meter in diameter; common and reaching its greatest development in the rich, light, deep soil of the bottoms of eastern Texas, here often covering extensive tracts known as "peach brakes"; not common in the eastern Gulf states.

Wood heavy, hard, strong, close-grained, checking badly in seasoning, susceptible of a good polish; medullary rays numerous, thin; color, light reddish-brown, or, more rarely, rich dark brown, the sap-wood lighter; specific gravity, 0.8688; ash, 0.41.

Generally planted in the southern states as an ornamental and hedge plant; foliage, bark, and fruit contain prussic acid, the leaves, especially when partly withered, often proving fatal to animals browsing upon them.

112.—Prunus sphærocarpa, Swartz,

Prodr. 81; Fl. Ind. Occ. ii, 927 [not Michaux].—Willdenow, Spec. ii, 987.—Poiret in Lamarck, Dict. v, 666.—Persoon, Syn. ii, 34.—Don, Miller's Dict. ii, 516.—Schlechtendal in Linnæa, xiii, 87.—Walpers, Rep. ii, 10.—Grisebach, Fl. British West Indies, 231.—Chapman, Fl. S. States, Suppl. 620.

Cerasus sphærocarpa, Loiseleur in Nouveau Duhamel, v, 4.—Seringe in De Candolle, Prodr. ii, 540.—Loudon, Arboretum ii, 721.—Bot. Mag. t. 3141.—Spach, Hist. Veg. i, 421.

Semi-tropical Florida, western shores of bay Biscayne (*Curtiss*); in the West Indies.

A small tree, in Florida not exceeding 6 meters in height, with a trunk 0.10 to 0.15 meter in diameter; high rocky woods or, more rarely, along the borders of streams and ponds; rare.

Wood heavy, hard, close-grained, checking badly in drying, containing many very small open ducts; layers of annual growth and medullary rays obscure; color, light, clear red, the sap-wood pale yellow; specific gravity, 0.8993; ash, 0.87.

113.—Prunus ilicifolia, Walpers,

Rep. ii, 10.—Dietrich, Syn. iii, 43.—Torrey, Bot. Mex. Boundary Survey, 63; Bot. Wilkes Exped. 285.—Brewer & Watson, Bot. California, i, 168; ii, 443.—Vasey, Cat. Forest Trees, 13.

Cerasus ilicifolia, Nuttall in Hooker & Arnott, Bot. Beechey, 340, t. 83.—Torrey & Gray, Fl. N. America, i, 411.—Nuttall, Sylva, ii, 16, t. 47; 2 ed. i, 165, t. 47.—Torrey in Emory's Rep. 139; Pacific R. R. Rep. iv, 83.—Paxton, Brit Fl. Garden, iii, 44, f. 254.—Walpers, Ann. iv, 654.—Cooper in Smithsonian Rep. 1858, 259.—Kellogg in Proc. California Acad. ii, 22.—Bolander in Proc. California Acad. iii, 79; iv, 22.—London Garden, 1873, 131 & fig.

Laurocerasus ilicifolia, Rœmer, Syn. Mon. iii, 92.

ISLAY.

California, Coast ranges from San Francisco bay south to the southern boundary of the state, extending to the western slopes of the San Bernardino and San Jacinto mountains.

A small tree, evergreen, often 9 to 12 meters in height, with a trunk 0.30 to 0.60 meter in diameter, or when distant from the coast often reduced to a low shrub.

Wood very heavy, hard, strong, close-grained, checking in seasoning, satiny, susceptible of a beautiful polish, containing many regularly-distributed rather small open ducts; medullary rays numerous, thin; color, bright reddish-brown, the sap-wood much lighter; specific gravity, 0.9803; ash, 0.78; furnishing valuable fuel.

114.—Vauquelinia Torreyi, Watson,

Proc. Am. Acad. xi, 147.—Brewer & Watson, Bot. California, i, 169.—Maximowicz in Act. Hort. St. Petersburg, v[2], 237.—Hemsley, Bot. Am.-Cent. i, 370.

Spiræa Californica, Torrey in Emory's Rep. 140.

V. corymbosa, Torrey, Bot. Mex. Boundary Survey, 64 [not Correa].

Arizona, high mountains near the Gila (*Emory*), summits of the Santa Catalina mountains (*Pringle, Lemmon*); in Sonora.

A small tree in the Santa Catalina mountains, 4 to 6 meters in height, with a trunk 0.10 to 0.20 meter in diameter; dry slopes and rocky bluffs at 2,700 to 4,000 feet elevation, granitic soil; generally hollow and decayed.

Wood very heavy, hard, very close-grained, compact, susceptible of a beautiful polish; medullary rays numerous, thin; color, rich dark brown streaked with red, the sap-wood yellow; specific gravity, 1.1374; ash, 1.45.

115.—Cercocarpus ledifolius, Nuttall;

Torrey & Gray, Fl. N. America, i, 427.—Hooker, Icon. t. 324.—Nuttall, Sylva, ii, 28, t. 51; 2 ed. i, 178, t. 51.—Walpers, Rep. ii, 46.—Dietrich, Syn. iii, 119.—Watson in King's Rep. v, 83, 420; Pl. Wheeler, 8.—Porter in Hayden's Rep. 1871, 481.—Coulter in Hayden's Rep. 1872, 765.—Parry in Am. Nat. ix, 201, 270; Proc. Davenport Acad. i, 146.—Engelmann in Simpson's Rep. 435.—Brewer & Watson, Bot. California, i, 174.—Vasey, Cat. Forest Trees, 13.—Sargent in Am. Jour. Sci. 3 ser. xvii, 421.—Rothrock in Wheeler's Rep. vi, 43, 111, 360.

MOUNTAIN MAHOGANY.

Cœur d'Alêne mountains, Idaho, southward along the western slopes of the Rocky mountains of Montana and Wyoming; eastern extremities of the Blue mountains of Washington territory and Oregon, Wahsatch mountains, Utah, and west along the mountain ranges of the Great Basin to the western slope of the Sierra Nevada of California, extending southward into Arizona and New Mexico.

A small, low tree, rarely 12 meters in height, with a trunk sometimes 0.60 to 0.90 meter in diameter, or north of Utah and Nevada reduced to a low shrub; dry, rocky mountain slopes, between 6,000 and 8,000 feet elevation, reaching its greatest development on the high ranges of central Nevada.

A shrubby variety of the Wahşatch mountain and other ranges of Utah, characterized by its rigid, intricately branched growth, short, revolute leaves and smaller flowers and fruit, is—

var. **intricatus**, M. E. Jones in herb.

C. intricatus, Watson in Proc. Am. Acad. x, 346.—Parry in Am. Nat. ix, 270; Proc. Davenport Acad. i, 147.

C. brevifolius, Watson in King's Rep. v, 83 [not Gray].

Wood very heavy, hard, close-grained, compact, brittle, difficult to work, susceptible of a beautiful polish; medullary rays very numerous, thin; color, bright, clear red, or often rich dark brown, the sap-wood clear yellow; specific gravity, 1.0731; ash, 1.04; furnishing the most valuable fuel of the region, and largely manufactured into charcoal.

116.—Cercocarpus parvifolius, Nuttall;

Hooker & Arnott, Bot. Beechey, 337.—Torrey & Gray, Fl. N. America, i, 427; Pacific R. R. Rep. ii, 164.—Hooker, Icon. t. 323.—Walpers, Rep. ii, 45.—Torrey in Fremont's Rep. 89; Emory's Rep. 139; Sitgreaves' Rep. 158; Pacific R. R. Rep. iv, 83; Bot. Mex. Boundary Survey, 63; Bot. Wilkes Exped. 287.—Dietrich, Syn. iii, 119.—Gray in Mem. Am. Acad. new ser. iv[1], 41; Smithsonian Contrib. iii, 68; v, 54; Proc. Boston Soc. Nat. Hist. vii, 146; Am. Jour. Sci. 2 ser. xxxiii, 411; Proc. Philadelphia Acad. 1863, 61.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 190.—Bolander in Proc. California Acad. iii, 79.—Porter in Hayden's Rep. 1870, 475; 1871, 481.—Watson in King's Rep. v, 82.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 34.—Rothrock, Pl. Wheeler, 37; Wheeler's Rep. vi, 111, 359.—Brewer & Watson, Bot. California, i, 174; ii, 444.—Vasey, Cat. Forest Trees, 13.—M. E. Jones, Excur. Bot. 12, 15, 20, 21.—Hemsley, Bot. Am.-Cent. i, 374.—Watson in Proc. Am. Acad. xvii, 353.

MOUNTAIN MAHOGANY.

California, valley of the Klamath river, southward through the Coast ranges to the San Bernardino and San Jacinto mountains, and in Lower California; Rocky mountains of Wyoming, Colorado, and New Mexico, mountains of southern Arizona, and southward into Sonora.

A small tree, rarely 6 to 9 meters in height, with a trunk sometimes 0.30 meter in diameter, or more often a shrub; dry, gravelly soil, reaching its greatest development on the mountains of southern New Mexico and Arizona, at an elevation of 6,000 to 8,000 feet.

A glabrous variety of southern California, with dark green leaves, is—

var. **glaber**, Watson, Bot. California, i, 175.

C. betulæfolius, Nuttall in Hooker, Icon. t. 322.—Walpers, Rep. ii, 46.

C. betuloides, Nuttall in Torrey & Gray, Fl. N. America, i, 427.—Hooker in London Jour. Bot. vi, 218.

A form with small entire or sparingly toothed leaves, of northern Mexico, is—

var. **paucidentatus**, Watson in Proc. Am. Acad. xvii, 353.

Wood very heavy, hard, close-grained, compact, difficult to work, susceptible of a beautiful polish; medullary rays numerous, thin; color, bright reddish-brown, the sap-wood light brown; specific gravity, 0.9365; ash, 0.45; furnishing valuable fuel.

117.—Pyrus coronaria, Linnæus,

Spec. 1 ed. 480.—Kalm, Travels, English ed. ii, 166.—Du Roi, Harbk. i, 229.—Marshall, Arbustum, 118.—Aiton, Hort. Kew. ii, 176; 2 ed. iii, 209.—Willdenow, Spec. ii, 1019; Enum. 527; Berl. Baumz. 330.—Persoon, Syn. ii, 40.—Pursh, Fl. Am. Sept. i, 340.—Eaton, Manual, 56; 6 ed. 291.—Nuttall, Genera, i, 307.—Barton, Compend. Fl. Philadelph. i, 228.—Hayne, Dend. Fl. 86.—Torrey, Fl. U. S. i, 180; Compend. Fl. N. States, 203; Fl. N. York, i, 223.—Bot. Mag. t. 2009.—Elliott, Sk. i, 559.—Bot Reg. viii, 651.—Sprengel, Syst. ii, 510.—De Candolle, Prodr. ii, 635.—Don, Miller's Dict. ii, 647.—Beck, Bot. 113.—Hooker, Companion Bot. Mag. i, 25.—Reichenbach, Fl. Exot. t. 240.—Torrey & Gray, Fl. N. America, i, 223.—Dietrich, Syn. iii, 154.—Loudon, Arboretum, ii, 908 & t.—Browne, Trees of America, 297.—Richardson, Arctic Exped. 428.—Parry in Owen's Rep. 612.—Darby, Bot. S. States, 307.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 128.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 69.—Lesquereux in Owen's 2d Rep. Arkansas, 359.—Wood, Cl. Book, 332; Bot. & Fl. 112.—Porcher, Resources S. Forests, 149.—Gray, Manual N. States, 5 ed. 161.—Koch, Dendrologie, i, 214.—Wenzig in Linnæa, xxxviii, 40 (excl. var.).—Macoun & Gibson in Trans. Bot. Soc. Edinburgh, xii, 325.—Vasey, Cat. Forest Trees, 13.—London Garden, xix, 400, t. 280.—Ward in Bull. U. S. Nat. Mus. No. 22, 78.—Ridgway in Proc. U. S. Nat. Mus. 1882, 66.

Malus coronaria, Miller, Dict. No. 2.—Mœnch, Meth. 682.—Michaux, Fl. Bor.-Am. i, 292.—Poiret in Lamarck, Dict. v, 562.—Desfontaines, Hist. Arb. ii, 140.—Nouveau Duhamel, vi, 139, t. 44, f. 1.—Michaux f. Hist. Arb. Am. iii, 65, t. 10; N. American Sylva, 3 ed. ii, 58, t. 65.—Barton, Prodr. Fl. Philadelph. 55.—Spach, Hist. Veg. ii, 136, t. 8.—Rœmer, Syn. Mon. iii, 191.—Decaisne in Nouv. Arch. Mus. x, 154.—Carrière in Rev. Hort. 1877, 410 & t.

Cratægus coronaria, Salisbury, Prodr. 357.

Malus microcarpa coronaria, Carrière in Rev. Hort. 1884, 104, f. 24.

AMERICAN CRAB. SWEET-SCENTED CRAB.

Ontario, valley of the Humber river, shores of lake Erie, southward through western New York and Pennsylvania to the District of Columbia, and along the Alleghany mountains to central Alabama and northern Mississippi; west to southern Minnesota, Iowa, eastern Kansas, the Indian territory, and northern Louisiana.

A small tree, rarely 6 to 9 meters in height, with a trunk often 0.30 meter in diameter; rich, rather low woods, reaching its greatest development in the valleys of the lower Ohio region.

Wood heavy, rather soft, not strong, very close-grained, checking badly in drying; medullary rays numerous, obscure; color, brown varying to light red, the sap-wood yellow; specific gravity, 0.7048; ash, 0.52; used for levers, handles of tools, and in turnery.

Often planted for ornament on account of its fragrant blossoms; the small, yellow-green austere fruit used for preserves, and occasionally made into cider.

118.—Pyrus angustifolia, Aiton,

Hort. Kew. ii, 176; 2 ed. iii, 209.—Willdenow, Spec. ii, 1020.—Poiret in Lamarck, Dict. v, 455.—Persoon, Syn. ii, 40.—Pursh, Fl, Am. Sept. i, 341.—Elliott, Sk. i, 559.—Torrey, Fl. U. S. 480; Compend. Fl. N. States, 203.—Sprengel, Syst. ii, 509.—De Candolle, Prodr. ii, 635.—Watson, Dend. Brit. ii, t. 132.—Bot. Reg. xiv, 1207.—Don, Miller's Dict. 647.—Beck, Bot. 113.—Hooker, Companion Bot. Mag. i, 25.—Torrey & Gray, Fl. N. America, i, 471.—Loudon, Arboretum, ii, 909 & t.—Eaton & Wright, Bot. 382.—Dietrich, Syn. iii, 154.—Nuttall, Sylva, ii, 24; 2 ed. i, 174.—Darby, Bot. S. States, 307.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 128.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 69.—Lesquereux in Owen's 2d Rep. Arkansas, 359.—Wood, Cl. Book, 333; Bot. & Fl. 112.—Gray, Manual N. States, 5 ed. 161.—Koch, Dendrologie, i, 213.—Vasey, Cat. Forest Trees, 14.—Ridgway in Proc. U. S. Nat. Mus. 1882, 66.

P. coronaria, Wangenheim, Amer. 61, t. 21, f. 47 [not Linnæus].—Walter, Fl. Caroliniana, 148.

Malus angustifolia, Michaux, Fl. Bor.-Am. i, 292.—Decaisne in Nouv. Arch. Mus. x, 155.

Malus sempervirens, Desfontaines, Hist. Arb. ii, 141.—Nouveau Duhamel, vi, 638, t. 43, f. 1.—Poiret, Suppl. iv, 524.—Spach, Hist. Veg. ii, 135, t. 8, figs.—Rœmer, Syn. Mon. iii, 191.

P. coronaria, var. *angustifolia*, Wenzig in Linnæa, xxxviii, 41.

Chloromeles sempervirens, Decaisne in Fl. des Serres, xxiii, 126.

AMERICAN CRAB APPLE. SOUTHERN CRAB APPLE.

Pennsylvania ?, southern Delaware, and the valley of the lower Wabash river, Illinois, south to the Chattahoochee region of western Florida.

A small tree, 6 to 9 meters in height, with a trunk rarely 0.30 meter in diameter; low, rich woods; most common and reaching its greatest development along the river bottoms of the south Atlantic states; less common west of the Alleghany mountains.

Wood heavy, hard, close-grained, checking badly in drying; medullary rays numerous, obscure; color, light brown tinged with red, the sap-wood yellow; specific gravity, 0.6895; ash, 0.33; used for levers, handles of tools, etc.

The austere fruit used for preserves and made into cider.

119.—Pyrus rivularis, Douglas;

Hooker, Fl. Bor.-Am. i, 203, t. 68.—Don, Miller's Dict. ii, 647.—Torrey & Gray, Fl. N. America, i, 471.—Eaton & Wright, Bot. 383.—Walpers, Rep. ii, 53.—Dietrich, Syn. iii, 154.—Ledebour, Fl. Rossica, ii, 99.—Nuttall, Sylva, ii, 22, t. 49; 2 ed. i, 172, t. 49.—Richardson, Arctic Exped. 428.—Torrey in Pacific R. R. Rep. iv, 85; Bot. Wilkes Exped. 292.—Newberry in Pacific R. R. Rep. vi, 73.—Cooper in Smithsonian Rep. 1858, 259; Pacific R. R. Rep. xii, 29, 60.—Rothrock in Smithsonian Rep. 1867, 435, 446.—Koch, Dendrologie, i, 212.—Gray in Proc. Am. Acad. viii, 382.—Wenzig in Linnæa, xxxviii, 38.—Brewer & Watson, Bot. California, i, 188.—Vasey, Cat. Forest Trees, 14.—Hall in Coulter's Bot. Gazette, ii, 87.—Macoun in Geological Rep. Canada, 1875-'76, 195.—Dawson in Canadian Nat. new ser. ix, 330.

P. diversifolia, Bongard in Mem. Acad. Sci. St. Petersburg, 6 ser. ii, 133.

P. fusca, Rafinesque, Med. Bot. ii, 254.

P. subcordata, Ledebour, Fl. Rossica, ii, 95.

Malus rivularis, Rœmer, Syn. Mon. iii, 215.—Decaisne in Nouv. Arch. Mus. x, 155.

Malus diversifolia, Rœmer, Syn. Mon. iii, 215.—Decaisne in Nouv. Arch. Mus. x, 155.

Malus subcordata, Rœmer, Syn. Mon. iii, 192.

OREGON CRAB APPLE.

Coast of Alaska, southward along the coast and islands of British Columbia, through Washington territory and Oregon, west of the Cascade mountains, to Sonoma county, California.

A small tree, sometimes 9 meters in height, with a trunk 0.30 to 0.45 meter in diameter; rich, low woods, generally along streams, often forming dense thickets.

Wood heavy, hard, very close-grained, liable to check badly in drying, susceptible of a beautiful polish; medullary rays numerous, obscure; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.8316; ash, 0.41; used for mallets, mauls, bearings of machinery, etc.

The small, black, pleasantly acid fruit occasionally used as a preserve, and prized by the Indians as food.

120.—Pyrus Americana, De Candolle,

Prodr. ii, 637.—Watson, Dend. Brit. i. t. 54.—Sprengel, Syst. ii, 511.—Hooker, Fl. Bor.-Am. i, 204.—Don, Miller's Dict. ii, 648.—Beck, Bot. 113.—Audubon, Birds, t. 363.—Torrey & Gray, Fl. N. America, i, 472.—Loudon, Arboretum, iii, 920 & t.—Eaton & Wright, Bot. 383.—Torrey, Fl. N. York, i, 224.—Dietrich, Syn. iii, 155.—Nuttall, Sylva, ii, 25, t. 50; 2 ed. i, 175, t. 50.—Browne, Trees of America, 326.—Emerson, Trees Massachusetts, 439; 2 ed. ii, 499.—Parry in Owen's Rep. 612.—Richardson, Arctic Exped. 428.—Lange, Pl. Grœnl. 134.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 129.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 70.—Wood, Cl. Book, 333; Bot. & Fl. 112.—Porcher, Resources S. Forests, 168.—Gray, Manual N. States, 5 ed. 161.—Koch, Dendrologie, i, 190.—Brewer & Watson, Bot. California, i, 189.—Vasey, Cat. Forest Trees, 14.—Macoun in Geological Rep. Canada, 1875-'76, 195.—Sears in Bull. Essex Inst. xiii, 176.—Bell in Geological Rep. Canada, 1879-'80, 54c.

Sorbus Americana, Marshall, Arbustum, 145.—Willdenow, Enum. 520.—Pursh, Fl. Am. Sept. i, 341.—Poiret, Suppl. v, 164.—Eaton, Manual, 55; 6 ed. 351.—Nuttall, Genera, i, 305.—Hayne, Dend. Fl. 75.—Torrey, Fl. U. S. 477; Compend. Fl. N. States, 202.—Spach, Hist. Veg. ii, 95.—Bigelow, Fl. Boston. 3 ed. 207.—Rœmer, Syn. Mon. iii, 138.—Maximowicz in Bull. Acad. St. Petersburg, xix, 174.—Wenzig in Linnæa, xxxviii, 71.—Decaisne in Nouv. Arch. Mus. x, 158.

Sorbus aucuparia, Poiret in Lamarck, Dict. vii, 234, in part.—Bigelow, Fl. Boston. 1. ed. 119.—Decaisne in Nouv. Arch. Mus. x, 158, in part.

Sorbus aucuparia, var. *Americana*, Persoon, Syn. ii, 38 & addend.

P. aucuparia, Meyer, Pl. Labrador, 81, in part.—Schlechtendal in Linnæa, x, 99.—Hooker f. in Trans. Linnæan Soc. xxii[a], 290, 327, in part.

Sorbus humifusa, Rafinesque, Med. Bot. ii, 265.

MOUNTAIN ASH.

Greenland?, Labrador, Newfoundland, Anticosti island, and westward along the southern shore of James' bay to the valley of the Nelson river (White Mud falls), southward through all mountainous regions of the northeastern states, and along the high mountains of Virginia and North Carolina; in northern Michigan, Wisconsin, and Minnesota.

A small tree, 6 to 9 meters in height, with a trunk 0.30 to 0.45 meter in diameter; borders of swamps and in moist, rocky woods, reaching its greatest development on the northern shores of lakes Huron and Superior.

A form with smaller fruit, peculiar to the high southern Alleghany mountains, is—

var. microcarpa, Torrey & Gray, Fl. N. America, i, 472.

Sorbus aucuparia, var. *a.* Michaux, Fl. Bor.-Am. i, 290.

Sorbus microcarpa, Pursh, Fl. Am. Sept. i, 341.—Poiret, Suppl. v, 164.—Elliott, Sk. i, 555.—Torrey, Fl. U. S. 477.—Eaton, Manual, 6 ed. 351.—Spach, Hist. Veg. ii, 95.—Rœmer, Syn. Mon. iii, 138.

P. microcarpa, Sprengel, Syst. ii, 511.—De Candolle, Prodr. ii, 636.—Don, Miller's Dict. ii, 648.—Beck, Bot. 113.—Eaton & Wright, Bot. 383.—Loudon, Arboretum, ii, 921.

Sorbus Americana, var. *microcarpa*, Wenzig in Linnæa, xxxviii, 71.

Sorbus riparia, Rafinesque, New Sylva, 15.

Wood light, soft, close-grained, compact; medullary rays numerous, obscure; color, light brown, the sap-wood lighter; specific gravity, 0.5451; ash, 0.83.
Often planted for ornament.

121.—Pyrus sambucifolia,

Chamisso & Schlechtendal in Linnæa, ii, 36.—Bongard in Mem. Acad. Sci. St. Petersburg, 6 ser. ii, 133.—Don, Miller's Dict. ii, 648.—Torrey & Gray, Fl. N. America, i, 472.—Walpers, Rep. ii, 53.—Dietrich, Syn. iii, 155.—Ledebour, Fl. Rossica, ii, 99.—Trautvetter & Meyer, Fl. Ochot. 37.—Maximowicz, Prim. Fl. Amurensis, 103.—Rothrock in Smithsonian Rep. 1867, 446.—Gray, Manual N. States, 5 ed. 161; Proc. Am. Acad. viii, 382.—Porter in Hayden's Rep. 1870, 475.—Watson in King's Rep. v, 92.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 38.—Brewer & Watson, Bot. California, i, 189.—Macoun in Geological Rep. Canada, 1875–'76, 195.—Hall in Coulter's Bot. Gazette, ii, 87.—G. M. Dawson in Canadian Nat. new ser. ix, 10.—Sears in Bull. Essex Inst. xiii, 176.

Sorbus aucuparia, var. *β.* Michaux, Fl. Bor.-Am. i, 290.

Sorbus aucuparia, Schrank, Pl. Labrador, 25, in part [not Linnæus].

P. Americana, Newberry in Pacific R. R. Rep. vi, 73 [not De Candolle].—Cooper in Pacific R. R. Rep. xii², 60.—Torrey, Bot. Wilkes Exped. 292.

P. aucuparia, Meyer, Pl. Labrador, 81, in part.—Schlechtendal in Linnæa, x, 99, in part.—Hooker in Trans. Linnæan Soc. xxii², 290, 327. in part.

Sorbus sambucifolia, Rœmer, Syn. Mon. iii, 139.—Maximowicz in Bull. Acad. Sci. St. Petersburg, xix, 174.—Wenzig in Linnæa, xxxviii, 73.—Decaisne in Nouv. Arch. Mus. x, 159.

Sorbus Sitchensis, Rœmer, Syn. Mon. iii, 139.

MOUNTAIN ASH.

Labrador to northern New England and the shores of lake Superior; high mountain ranges of the Pacific region from Alaska to southern New Mexico; in Kamtchatka.
A small tree, 9 to 12 meters in height, with a trunk sometimes 0.30 meter in diameter, or in the Pacific forests generally reduced to a low shrub; cold, wet swamps or borders of streams, reaching its greatest development in northern New England and Minnesota.
Wood light, soft, weak, close-grained, compact; medullary rays numerous, obscure; color, light brown, the sap-wood nearly white; specific gravity, 0.5928; ash, 0.35.
The bark and unripe fruit of the American mountain ashes, like those of the nearly-allied *P. aucuparia* of Europe, are extremely astringent, and occasionally used, domestically, in infusions, decoctions, etc., in the treatment of diarrhea (*Nat. Dispensatory*, 2 ed. 1333).

122.—Cratægus rivularis, Nuttall;

Torrey & Gray, Fl. N. America, i, 464.—Dietrich, Syn. iii, 161.—Walpers, Rep. ii, 58.—Nuttall, Sylva, ii, 9; 2 ed. i, 160.—Cooper in Smithsonian Rep. 1858, 258; Am. Nat. iii, 407.—Regel in Act. Hort. St. Petersburg, i, 107.—Watson in King's Rep. v, 92.—Porter in Hayden's Rep. 1871, 482.—Coulter in Hayden's Rep. 1872, 765.—Brandegee in Hayden's Rep. 1875, 236.—Vasey, Cat. Forest Trees, 14.—Macoun in Geological Rep. Canada, 1875–'76, 195.—Engelmann in Coulter's Bot. Gazette, vii, 128.

C. sanguinea, var. *Douglasii*, Coulter in Hayden's Rep. 1872, 765 [not Torrey & Gray].

British Columbia, south through eastern Oregon and Washington territory, east and southeast along the mountain ranges of Idaho, Montana, Utah, and Colorado, to the Pinos Altos mountains, New Mexico (*Greene*).
A small tree, 6 to 8 meters in height, with a trunk rarely exceeding 0.30 meter in diameter, or often a tall, much-branched shrub, forming dense, impenetrable thickets along borders of streams and swamps.
Wood heavy, hard, close-grained, compact; medullary rays numerous, thin; color, bright reddish-brown, the sap-wood nearly white; specific gravity, 0.7703; ash, 0.35.

123.—Cratægus Douglasii, Lindley,

Bot. Reg. xxi, t. 1810.—London, Arboretum, ii, 823, f. 584 & t.—Koch, Dendrologie, i, 147.—Kaleniezenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 26.—Brewer & Watson, Bot. California, i, 189.—Macoun in Geological Rep. Canada, 1875–'76, 195.—Engelmann in Coulter's Bot. Gazette, vii, 128.

? *C. glandulosa*, Pursh, Fl. Am. Sept. i, 337, in part.

C. punctata, var. *brevispina*, Douglas in Hooker, Fl. Bor.-Am. i, 201.

C. sanguinea, var. *Douglasii*, Torrey & Gray, Fl. N. America, i, 464.—Walpers, Rep. ii, 58.—Dietrich, Syn. iii, 160.—Torrey, Bot. Wilkes Exped. 292.—Regel in Act. Hort. St. Petersburg, i, 116.

C. sanguinea, Nuttall, Sylva, ii, 6, t. 44; 2 ed. i, 157, t. 44 [not Pallas].—Cooper in Smithsonian Rep. 1858, 259; Am. Nat. iii, 407.—Vasey, Cat. Forest Trees, 14.

Anthomeles Douglasii, Rœmer, Syn. Mon. iii, 140.

C. rivularis, Brewer & Watson, Bot. California, i, 189 [not Nuttall].

British Columbia, valley of the Parsnip river, in about latitude 55° N., south through Washington territory and Oregon to the valley of the Pitt river, California, extending east through Idaho and Montana to the western base of the Rocky mountains (valley of the Flathead river, *Canby & Sargent*).

A small tree, sometimes 12 meters in height, with a trunk 0.30 to 0.45 meter in diameter, or often a tall shrub throwing up many stems from the ground and forming impenetrable thickets; rather wet, sandy soil along streams, and reaching its greatest development in the valleys west of the Cascade mountains; toward its eastern limits a low shrub.

Wood heavy, hard, tough, close-grained, compact, satiny, susceptible of a beautiful polish; medullary rays numerous, thin; color, nearly white tinged with rose, the sap-wood lighter; specific gravity, 0.6950; ash, 0.33; used for wedges, mauls, etc.

The small, sweet, black fruit, ripening in August, is largely collected by the Indians.

124.—Cratægus brachyacantha, Sargent & Engelmann;

Engelmann in Coulter's Bot. Gazette, vii, 128.

HOGS' HAW.

New Orleans?, (*Drummond* in herb. *Gray*); Minden, Louisiana (*Mohr*); Concord, Texas (*Sargent*); Longview, Texas (in fruit, *Letterman*).

A tree 9 to 12 meters in height, with a trunk sometimes 0.60 meter in diameter; borders of streams in low, very rich soil; the largest North American representative of the genus.

Wood heavy, hard, very close-grained, compact, susceptible of a beautiful polish; medullary rays numerous, very obscure; color, light brown tinged with rose, the sap-wood lighter; specific gravity, 0.6793; ash, 0.42.

The large blue-black fruit greedily eaten by hogs and other animals.

125.—Cratægus arborescens, Elliott,

Sk. i, 550.—Eaton, Manual, 6 ed. 112.—Torrey & Gray, Fl. N. America, i, 466.—Eaton & Wright, Bot. 212.—Dietrich, Syn. iii, 160.—Walpers, Rep. ii, 58.—Nuttall, Sylva, ii, 10, t. 45; 2 ed. i, 160, t. 45.—Darby, Bot. S. States, 306.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 127.—Wood, Cl. Book, 331; Bot. & Fl. 111.—Young, Fl. Texas, 259.—Vasey, Cat. Forest Trees, 14.—Engelmann in Bull. Torrey Bot. Club, ix, 4.

Phænopyrum arborescens, Rœmer, Syn. Mon. iii, 153.

C. Crus-galli, var. *pyracanthifolia*, Regel in Act. Hort. St. Petersburg, i, 109, in part.

Valley of the Savannah river, South Carolina (Aiken, *Ravenel*), south to the Chattahoochee region of western Florida; valley of the Mississippi river, near Saint Louis (*Engelmann*), south and southwest to western Louisiana, and the valley of the lower Colorado river, Texas.

A small tree, 6 to 9 meters in height, with a trunk sometimes 0.45 to 0.60 meter in diameter; borders of streams and in rather low, wet swamps.

Wood heavy, hard, not strong, close-grained, compact, susceptible of a beautiful polish; medullary rays very numerous, obscure; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.6491; ash, 0.57.

The small globular fruit bright red or, more rarely, orange.

126.—Cratægus Crus-galli, Linnæus,

Spec. 1 ed. 476.—Kalm, Travels, English ed. i, 115.—Medicus, Bot. Beobacht. ii, 344.—Walter, Fl. Caroliniana, 147.—Aiton, Hort. Kew. ii, 170; 2 ed. iii, 202.—Willdenow, Spec. ii, 1004.—Micaux, Fl. Bor.-Am. i, 288.—Persoon, Syn. ii, 37.—Pursh, Fl. Am. Sept. i, 338.—Eaton, Manual, 55; 6 ed. 111.—Nuttall, Genera, i, 305.—Barton, Compend. Fl. Philadelph. i, 225; Prodr. Fl. Philadelph. 54.—Elliott, Sk. i, 548.—Torrey, Fl. U. S. 476; Compend. Fl. N. States, 202; Fl. N. York, i, 221.—Watson, Dend. Brit. i, t. 56.—De Candolle, Prodr. ii, 626.—Hooker, Fl. Bor.-Am. i, 200; Companion Bot. Mag. i, 25.—Don, Miller's Dict. ii, 598.—Beck, Bot. 111.—Torrey & Gray, Fl. N. America, i, 463.—Loudon, Arboretum, ii, 820, f. 574, 575 & t.—Eaton & Wright, Bot. 212.—Bigelow, Fl. Boston. 3 ed. 206.—Dietrich, Syn. iii, 158.—Browne, Trees of America, 278.—Emerson, Trees Massachusetts, 433; 2 ed. ii, 492 & t.—Rœmer, Syn. Mon. iii, 117.—Parry in Owen's Rep. 612.—Darlington, Fl. Cestrica, 3 ed. 83.—Darby, Bot. S. States, 305.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 127.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 83.—Lesquereux in Owen's 2d Rep. Arkansas, 359.—Wood, Cl. Book, 331; Bot. & Fl. 111.—Porcher, Resources S. Forests, 148.—Gray, Manual N. States, 5 ed. 160; Hall's Pl. Texas, 9.—Young, Bot. Texas, 258.—Regel in Act. Hort. St. Petersburg, i, 108.—Kaleniczenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 19.—Vasey, Cat. Forest Trees, 14.—Bell in Geological Rep. Canada, 1879-'80, 54c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 66.

C. lucida, Du Roi, Obs. Bot. 13.—Wangenheim, Amer. 53, t. 17, f. 42.—Sprengel, Syst. ii, 506.—De Candolle, Prodr. ii, 629.—Eaton, Manual, 6 ed. 112.—Don, Miller's Dict. ii, 599.—Eaton & Wright, Bot. 212.

Mespilus Crus-galli, Marshall, Arbustum, 88.—Lamarck, Dict. iv, 441.—Desfontaines, Hist. Arb. ii, 157.—Nouveau Duhamel, iv, 149.—Willdenow, Enum. 522; Berl. Baumz. 244.—Hayne, Dend. Fl. 80.—Koch, Dendrologie, i, 142.

? *Mespilus cuneiformis*, Marshall, Arbustum, 88.

Mespilus lucida, Ehrhart, Beitr. iv, 17.—Mœnch, Meth. 685.—Spach, Hist. Veg. ii, 57.

Mespilus cuneifolia, Mœnch, Meth. 684.

C. Crus-galli, var. *splendens*, Aiton, Hort. Kew. 2 ed. iii, 202.

Mespilus Watsoniana, Spach, Hist. Veg. ii, 57.

C. Watsoniana, Rœmer, Syn. Mon. iii, 117.

COCKSPUR THORN. NEWCASTLE THORN.

Valley of the Saint Lawrence river, west through southern Ontario to Manitoba, south through the Atlantic forests to the valley of the Chipola river, western Florida, and the valley of the Colorado river, Texas.

A small tree, 4 to 10 meters in height, with a trunk sometimes 0.30 meter in diameter, running into various forms. The best marked are—

var. pyracanthifolia, Aiton, Hort. Kew. ii, 170; 2 ed. iii, 202.—De Candolle, Prodr. ii, 626.—Torrey & Gray, Fl. N. America, i, 464.—Loudon, Arboretum, ii, 820, t. 128, f. 580.—Browne, Trees of America, 278.—Regel in Act. Hort. St. Petersburg, i, 109, in part.

C. salicifolia, Medicus, Bot. Beobacht. ii, 345.—Rœmer, Syn. Mon. iii, 117.

C. Crus-galli, var. *salicifolia*, Aiton, *l. c.*; 2 ed. *l. c.*—Willdenow, Berl. Baumz. 244.—De Candolle, *l. c.*—Loudon, *l. c.* f. 551-553, 578 & t.—Browne, *l. c.*—Regel, *l. c.* 110.

Mespilus Crus-galli, var. *salicifolia*, Hayne, Dend. Fl. 80.

Mespilus Crus-galli, var. *pyracanthifolia*, Hayne, *l. c.*

Mespilus salicifolia, Koch, Dendrologie, i, 144.

C. Coursetiana, Rœmer, Syn. Mon. iii, 117.

var. ovalifolia, Lindley, Bot. Reg. xxii, t. 1860.—Torrey & Gray, Fl. N. America, i, 464.—Dietrich, Syn. iii, 159.—Loudon, Arboretum, ii, 821, f. 579 & t.—Regel in Act. Hort. St. Petersburg, i, 109.

Mespilus ovalifolia, Hornemann, Hort. Hafn. Suppl. 52.—Koch, Dendrologie, i, 143.

Mespilus prunellifolia, Poiret, Suppl. iv, 72.

C. ovalifolia, De Candolle, Prodr. ii, 627.—Don, Miller's Dict. ii, 598.—Rœmer, Syn. Mon. iii, 117.

C. prunellifolia, De Candolle, *l. c.*—Don, *l. c.*—Rœmer, *l. c.*

Mespilus elliptica, Guimpel, Otto & Hayne, Abb. Holz. 170, t. 144 [not Lamarck].—Spach. Hist. Veg. ii, 68.

var. linearis, De Candolle, Prodr. ii, 626.—Torrey & Gray, Fl. N. America, i, 464.—Dietrich, Syn. iii, 159.—Loudon, Arboretum, ii, 821, f. 577.—Browne, Trees of America, 278.—Regel in Act. Hort. St. Petersburg, i, 110.

Mespilus lucida, var. *angustifolia*, Ehrhart, Beitr. iv, 18.

C. linearis, Persoon, Syn. ii, 37.—Rœmer, Syn. Mon. iii, 118.

Mespilus linearis, Desfontaines, Hist. Arb. ii, 156.—Poiret, Suppl. iv, 70.—Spach, Hist. Veg. ii, 57.

var. **prunifolia**, Torrey & Gray, Fl. N. America, i, 464.—Dietrich, Syn. iii, 159.—Loudon, Arboretum, ii, 821, f. 576 & t.—Regel in Act. Hort. St. Petersburg, i, 110.

Mespilus prunifolia, ? Marshall, Arbustum, 90.—Lamarck, Dict. iv, 443.—Nouveau Duhamel, iv, 150, t. 40.—Sprengel, Syst. ii, 506.

Mespilus rotundifolia, Ehrhart, Beitr. iii, 20.

C. prunifolia, Persoon, Syn. ii, 37.—Bosc in De Candolle, Prodr. ii, 627.—Don, Miller's Dict. ii, 598.—Lindley, Bot. Reg. xxii, t. 1868.—Eaton, Manual, 6 ed. 112.—Eaton & Wright, Bot. 212.

Mespilus Bosciana, Spach, Hist. Veg. ii, 58.

C. Bosciana, Rœmer, Syn. Mon. iii, 118.

Wood heavy, hard, not strong, close-grained, compact, satiny, susceptible of a fine polish; medullary rays numerous, very obscure; color, brown tinged with red, the sap-wood rather lighter; specific gravity, 0.7194; ash, 0.56.

The long, strong spines are occasionally collected and used to fasten sacks and for similar purposes.

127.—Cratægus coccinea, Linnæus,

Spec. 1 ed. 476.—Walter, Fl. Caroliniana, 147.—Aiton, Hort. Kew. ii, 167; 2 ed. iii, 200.—Willdenow, Spec. ii, 1000 (excl. syn.).—Michaux, Fl. Bor.-Am. i, 288.—Persoon, Syn. ii, 36.—Pursh, Fl. Am. Sept. i, 337.—Eaton, Manual, 55; 6 ed. 111.—Nuttall, Genera, i, 305.—Schrank, Pfl. Labrador, 26.—Barton, Compend, Fl. Philadelph. i, 226.—Hayne, Dend. Fl. 77.—Elliott, Sk. i, 553.—Torrey, Fl. U. S. 474; Compend. Bot. N. States, 201; Fl. N. York, i, 221; Emory's Rep. 408.—De Candolle, Prodr. ii, 627.—Hooker, Fl. Bor.-Am. i, 201; Bot. Mag. t. 3432.—Don, Miller's Dict. ii, 599.—Meyer, Pl. Labrador, 82.—Beck, Bot. 112.—Lindley, Bot. Reg. 23, t. 1957.—Torrey & Gray, Fl. N. America, i, 465.—Bigelow, Fl. Boston. 3 ed. 206.—Eaton & Wright, Bot. 211.—Dietrich, Syn. iii, 160.—Walpers, Rep. ii, 58.—Loudon, Arboretum, ii, 816, f. 564–566, t. 121.—Schnizlein, Icon. t. 270, f. 18–20, 22.—Emerson, Trees Massachusetts, 434; 2 ed. ii, 493 & t.—Richardson, Arctic Exped. 427.—Darlington, Fl. Cestrica, 3 ed. 83.—Darby, Bot. S. States, 305.—Cooper in Smithsonian Rep. 1858, 252.—Gray in Pacific R. R. Rep. xii, 43; Manual N. States, 5 ed. 160.—Chapman, Fl. S. States, 127.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 82.—Lesquereux in Owen's 2d Rep. Arkansas, 309.—Wood, Cl. Book, 331; Bot. & Fl. 111.—Kaleniczenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 9.—Vasey, Cat. Forest Trees, 14.—Sears in Bull. Essex Inst. xiii, 177.—Bell in Geological Rep. Canada, 1879–'80, 55c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 66.

Mespilus coccinea, Marshall, Arbustum, 87.—Mœnch, Meth. 684.—Lamarck, Dict. iv, 442.—Desfontaines, Hist. Arb ii, 156.—Willdenow, Enum. 523; Berl. Baumz. 238.—Wendland in Regensb. Fl. 1823, 699.—Sprengel, Syst. ii, 507.—Spach, Hist. Veg. ii, 64.

Mespilus rotundifolia, Ehrhart, Beitr. iii, 20.—Wendland in Regensb. Fl. 1823, 700.—Watson, Dend. Brit. i, t. 58.—Koch, Dendrologie, i, 148.

Pyrus glandulosa, Mœnch, Meth. 680.

C. glandulosa, Willdenow, Spec. ii, 1002 (excl. syn.).—Pursh, Fl. Am. Sept. i, 337, in part.—Torrey, Fl. U. S. 475; Compend. Fl. N. States, 201.—De Candolle, Prodr. ii, 627.—Loddiges, Bot. Cab. t. 1012.—Hooker, Fl. Bor.-Am. i, 201.—Don, Miller's Dict. ii, 599.—Eaton, Manual, 6 ed. 111.—Beck, Bot. 112.—Eaton & Wright, Bot. 211.—Loudon, Arboretum, ii, 817, f. 550, 567, 568 & t.—Richardson, Arctic Exped. 427.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 84.—Regel in Act. Hort. St. Petersburg, i, 120.

Mespilus glandulosa, Willdenow, Enum. 523.—Sprengel, Syst. ii, 507.—Spach, Hist. Veg. ii, 62.—Koch, Dendrologie, i, 145.

Mespilus pubescens, Wendland in Regensb. Fl. 1823, 700.

C. Crus-galli, Bigelow, Fl. Boston. 2 ed. 194 [not Linnæus].

? *Mespilus Wendlandii*, Opiz in Regensb. Fl. 1834, 590.

C. macracantha, Loddiges in Loudon, Arboretum, ii, 819, f. 572, 573 & t.

C. glandulosa, var. *macracantha*, Lindley in Bot. Reg. xxii, t. 1912.

Mespilus flabellata, Spach, Hist. Veg. ii, 63.—Koch, Dendrologie, i, 148.

Halmia flabellata, Rœmer, Syn. Mon. iii, 136.

Anthomeles rotundifolia, Rœmer, Syn. Mon. iii, 140.

Phænopyrum coccineum, Rœmer, Syn. Mon. iii, 156.

Phænopyrum Wendlandii, Rœmer, Syn. Mon. iii, 156.

SCARLET HAW. RED HAW. WHITE THORN.

West coast of Newfoundland, west along the valley of the Saint Lawrence river and the northern shores of the great lakes to Manitoba, south through the Atlantic forests to northern Florida and eastern Texas.

A small tree, sometimes 9 meters in height, with a trunk 0.30 meter in diameter; open upland woods or along streams and borders of prairies; very common at the north, rare at the south; running into many forms, varying in the size and shape of the leaves, size of the fruit, etc. The best marked are—

var. **viridis**, Torrey & Gray, Fl. N. America, i, 465.—Torrey in Nicollet's Rep. 149.

C. viridis, Linnæus, Spec. 1 ed. 476.—Willdenow, Spec. ii, 1001.—Persoon, Syn. ii, 36.—Elliott, Sk. i, 551.—De Candolle, Prodr. ii, 630.—Don, Miller's Dict. ii, 601.—Eaton, Manual, 6 ed. 112.—Darlington, Fl. Cestrica, 2 ed. 293.—Eaton & Wright, Bot. 212.—Beck, Bot. 305.—Darby, Bot. S. States, 305.—Wood, Cl. Book, 332; Bot. & Fl. 111.

? *Phœnopyrum viride*, Rœmer, Syn. Mon. iii, 156.

Mespilus viridis, Koch, Dendrologie, i, 149.

C. glandulosa, var. *rotundifolia*, Regel in Act. Hort. St. Petersburg, i, 120.

var. **populifolia**, Torrey & Gray, Fl. N. America, i, 465.

C. populifolia, Elliott, Sk. i, 553 [not Walter].—Nuttall, Genera, i, 305.—Eaton, Manual, 6 ed. 112—Beck, Bot. 305.—Eaton & Wright, Bot. 212.—Darby, Bot. S. States, 305.

Mespilus populifolia, Lamarck, Dict. iv, 447.

Phœnopyrum populifolium, Rœmer, Syn. Mon. iii, 156.

C. coccinea, var. *typica*, Regel in Act. Hort. St. Petersburg, i, 121.

var. **oligandra**, Torrey & Gray, Fl. N. America, i, 465.

Wood heavy, hard, close-grained, compact; medullary rays thin, very obscure; color, brown tinged with red, the sap-wood a little lighter; specific gravity, 0.8618; ash, 0.38.

128.—Cratægus subvillosa, Schrader,

Ind. Sem. Hort. Gœtt.—Torrey in Pacific R. R. Rep. iv, 35.—Ridgway in Proc. U. S. Nat. Mus. 1882, 66.

C. coccinea, var. *mollis*, Torrey & Gray, Fl. N. America, i, 465.—Gray in Jour. Boston Soc. Nat. Hist. vi, 186.—Parry in Owen's Rep. 612.—Regel in Act. Hort. St. Petersburg, i, 121.

Phœnopyrum subvillosum, Rœmer, Syn. Mon. iii, 154.

C. mollis, Scheele in Linnæa, xxi, 569; Rœmer, Texas, Appx. 473.—Walpers, Ann. ii, 523.

C. sanguinea, var. *villosa*, Ruprecht & Maximowicz, Prim. Fl. Amuronsis, 101.

C. Texana, Buckley in Proc. Philadelphia Acad. 1861, 454 (see Gray in same, 1862, 163).—Young, Fl. Texas, 258.

C. tomentosa, var. *mollis*, Gray, Manual N. States, 5 ed. 160.—Wood, Cl. Book, 330; Bot. & Fl. 121.—Vasey, Cat. Forest Trees, 14.

Mespilus tiliæfolia, Koch, Dendrologie, i, 151.

SCARLET HAW.

Eastern Massachusetts (possibly introduced); central Michigan to eastern Nebraska, south to middle Tennessee, and southwest through Missouri, Arkansas, the Indian territory, and Texas to the valley of the San Antonio river.

A small tree, 7 to 9 meters in height, with a trunk rarely 0.45 meter in diameter; rich woods and along borders of streams and prairies.

Wood heavy, hard, not strong, close-grained, compact; medullary rays numerous, very obscure; color, light brown or light red, the sap-wood lighter; specific gravity, 0.7953; ash, 0.69.

The large red fruit often downy, edible, and of agreeable flavor.

129.—Cratægus tomentosa, Linnæus,

Spec. 1 ed. 476 (excl. syn. Gronovius).—Kalm, Travels, English ed. ii, 151.—Du Roi, Harbk. i, 183.—Torrey & Gray, Fl. N. America, i, 466.—Dietrich, Syn. iii, 160.—Torrey, Fl. N. York, i, 222.—Emerson, Trees Massachusetts, 1 ed. 435; 2 ed. ii, 494 & t.—Parry in Owen's Rep. 612.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 127.—Lesquereux in Owen's 2d Rep. Arkansas, 359.—Wood, Cl. Book, 330.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 191.—Gray, Manual N. States, 5 ed. 160.—Young, Bot. Texas, 258.—Vasey, Cat. Forest Trees, 14.—Macoun in Geological Rep. Canada, 1875-'76, 195.—Ridgway in Proc. U. S. Nat. Mus. 1882, 66.

C. leucophlœos, Mœnch, Hort. Weiss. 31, t. 2.—Regel in Act. Hort. St. Petersburg, i, 106.

Mespilus Calpodendron, Ehrhart, Beitr. ii, 67.

C. pyrifolia, Aiton, Hort. Kew. ii, 168; 2 ed. iii, 200.—Willdenow, Spec. ii, 1001.—Persoon, Syn. ii, 36.—Nouveau Duhamel, iv, 131.—Poiret, Suppl. i, 292.—Pursh, Fl. Am. Sept. i, 337.—Nuttall, Genera, i, 305.—Elliott, Sk. i, 550.—Torrey, Fl. U. S. 475; Compend. Fl. N. States, 201.—De Candolle, Prodr. ii, 627.—Hooker, Fl. Bor.-Am. i, 201.—Don, Miller's Dict. ii, 599.—Eaton, Manual, 6 ed. 111.—Lindley, Bot. Reg. xxii, t. 1877.—Loudon, Arboretum, ii, 819, f. 571 & t.—Eaton & Wright, Bot. 211.

Mespilus latifolia, Lamarck, Dict. iv, 444.—Desfontaines, Hist. Arb. ii, 156.—Nouveau Duhamel, iv, 150.—Spach, Hist. Veg. ii, 60.

C. latifolia, Persoon, Syn. ii, 36.—Don, Miller's Dict. ii, 598.—Eaton, Manual, 6 ed. 112.—Eaton & Wright, Bot. 212.—Rœmer, Syn. Mon. 119.

Mespilus pyrifolia, Willdenow, Enum. 523; Berl. Baumz. 240.—Kaleniczenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 15.—Sprengel, Syst. ii, 507.—Hayne, Dend. Fl. 78.

Mespilus lobata, Poiret, Suppl. iv, 71.

Mespilus odorata, Wendland in Regensb. Fl. 1823, 700.

Mespilus pruinosa, Wendland in Regensb. Fl. 1823, 700.

C. lobata, Bosc in De Candolle, Prodr. ii, 628.

C. flava, Hooker, Fl. Bor.-Am. i, 202 (excl. syn.).

Halmia tomentosa, Rœmer, Syn. Mon. 135.

Halmia lobata, Rœmer, Syn. Mon. 135.

Phænopyrum pruinosum, Rœmer, Syn. Mon. 155.

? *C. coccinea*, var. *viridis*, Torrey in Pacific R. R. Rep. iv, 86 [not Torrey & Gray].

C. tomentosa, var. *pyrifolia*, Gray, Manual N. States, 5 ed. 160.—Wood, Bot. & Fl. 111.

C. coccinea, Brandegee in Hayden's Rep. 1875, 236 [not Linnæus].

C. leucocephalus, Lavallée, Arboretum Segrez. 78, t. 22 [not Mœnch].

C. coccinea, var. *cordata*, Lavallée, Arboretum Segrez. 81, t. 22.

BLACK THORN. PEAR HAW.

New Brunswick, westward along the valley of the Saint Lawrence river and the northern shores of the great lakes to the Saskatchewan region, southward through the Atlantic forests to the Chattahoochee region of western Florida, and eastern Texas west to the mountains of eastern Washington territory and Oregon, southwestern Colorado, and southwestern New Mexico.

A small tree, 6 to 9 meters in height, with a trunk rarely 0.45 meter in diameter, or often, especially west of the Rocky mountains, reduced to a low shrub, here forming dense thickets along mountain streams; the most widely-distributed of the North American *Cratægi*, varying greatly in the size, shape, and color of the fruit, form of the leaves, amount of pubescence, etc.

Wood heavy, hard, not strong, close-grained, compact; medullary rays numerous, thin; color, bright reddish-brown, the sap-wood lighter; specific gravity, 0.7633; ash, 0.50.

Var. punctata, Gray,

Manual N. States, 2 ed. 124.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 127.—Porter in Hayden's Rep. 1871, 481.—Vasey, Cat. Forest Trees, 14.

C. punctata, Jacquin, Hort. Vindob. i, 10, t. 28.—Aiton, Hort. Kew. ii, 169; 2 ed. iii, 202.—Willdenow, Spec. ii, 1004.—Michaux, Fl. Bor.-Am. i, 289.—Persoon, Syn. i, 37.—Pursh, Fl. Am. Sept. i, 338.—Elliott, Sk. i, 548.—Torrey, Fl. U. S. 476; Compend. Fl. N. States, 202; Fl. N. York, i, 222.—De Candolle, Prodr. ii, 627.—Hooker, Fl. Bor.-Am. i, 201 (excl. var.); Companion Bot. Mag. i, 25.—Don, Miller's Dict. ii, 589.—Eaton, Manual, 6 ed. 111.—Beck, Bot. 111.—Torrey & Gray, Fl. N. America, i, 466.—Loudon, Arboretum, ii, 818, f. 569, 570 & t.—Eaton & Wright, Bot. 211.—Dietrich, Syn. iii, 159.—Browne, Trees of America, 277.—Emerson, Trees Massachusetts, 435; 2 ed. ii, 495.—Gray, Manual N. States, 1 ed. 128.—Richardson, Arctic Exped. 427.—Darlington, Fl. Cestrica, 3 ed. 84.—Darby, Bot. S. States, 306.—Lesquereux in Owen's 2d Rep. Arkansas, 359.—Wood, Cl. Book, 330; Bot. & Fl. 111.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 191.—Kaleniczenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 14.

Mespilus cornifolia, Muenchhausen, Hausv. v, 145.—Lamarck, Dict. iv, 444.—Koch, Dendrologie, i, 134.—Spach, Hist. Veg. ii, 60, t. 10, f. c.

C. Crus-galli, Wangenheim, Amor. 52.—Du Roi, Harbk. i, 195 [not Linnæus].

Mespilus cuneifolia, Ehrhart, Beitr. iii, 21.—Sprengel, Syst. ii, 506.—Spach, Hist. Veg. ii, 61.

Mespilus punctata, Loiseleur in Nouveau Duhamel, iv, 152.—Willdenow, Enum. 524; Berl. Baumz. 243.—Poiret, Suppl. iv, 70.—Hayne, Dend. Fl. 79.—Watson, Dend. Brit. i, t. 57.—Spach, Hist. Veg. ii, 61.—Wenzig in Linnæa, xxxviii, 128.

Mespilus pyrifolia, Desfontaines, Hist. Arb. ii, 155.

C. punctata, var. *rubra* and *aurea*, Aiton, Hort. Kew. 2 ed. iii, 202.

C. latifolia, De Candolle, Prodr. ii, 627.

? *C. flexuosa*, Schweinitz in Long's 2d Exped. ii, Appx. 112.

C. flava, Darlington, Fl. Cestrica, 2 ed. 292 [not Aiton].

C. cuneifolia, Rœmer, Syn. Mon. iii, 118.

C. obovatifolia, Rœmer, Syn. Mon. iii, 120.

Halmia punctata, Rœmer, Syn. Mon. iii, 134.

Halmia cornifolia, Rœmer, Syn. Mon. iii, 134.

C. tomentosa, var. *plicata*, Wood, Cl. Book, 330; Bot. & Fl. 111.

C. punctata, var. *xanthocarpa*, Lavallée, Arboretum Segrez. i, 53, t. 16.

Fruit larger than that of the species, dull red or yellow.

130.—Cratægus cordata, Aiton,

Hort. Kew. ii, 168; 2 ed. iii, 200.—Willdenow, Spec. ii, 1000.—Persoon, Syn. ii, 36.—Eaton, Manual, 55; 6 ed. 111.—Elliott, Sk. i, 554.—Torrey, Fl. U. S. 474; Compend. Fl. N. States, 201.—De Candolle, Prodr. ii, 628.—Watson, Dend. Brit. i, t. 63.—Lindley, Bot. Reg. xiv, t. 1151.—Hooker, Fl. Bor.-Am. i, 201.—Don, Miller's Dict. ii, 599.—Beck, Bot. 112.—Torrey & Gray, Fl. N. America, i, 467.—London, Arboretum, ii, 825 & t.—Eaton & Wright, Bot. 211.—Dietrich, Syn. iii, 160.—Browne, Trees of America, 280.—Richardson, Arctic Exped. 427.—Darlington, Fl. Cestrica, 3 ed. 83.—Darby, Bot. S. States, 306.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 127.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 82.—Wood, Cl. Book, 331; Bot. & Fl. 111.—Gray, Manual N. States, 5 ed. 159.—Young, Bot. Texas, 257.—Regel in Act. Hort. St. Petersburg, i, 114.—Kaleniczenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 31.—Vasey, Cat. Forest Trees, 14.

Mespilus Phænopyrum, Ehrhart in Linnæus f. Suppl. 254; Beitr. i, 181; ii, 67.—Mœnch, Meth. 685.—Lamarck, Dict. iv, 446.

C. populifolia, Walter, Fl. Caroliniana, 147 [not Elliott].—Pursh, Fl. Am. Sept. i, 337.

Mespilus acerifolia, Burgsdorf in Lamarck, Dict. iv, 442.—Nouveau Duhamel, iv, 151.—Spach, Hist. Veg. ii, 65.

Mespilus cordata, Miller, Icon. t. 179.—Willdenow, Enum. 523; Berl. Baumz. 239.—Hayne, Dend. Fl. 77.—Sprengel, Syst. ii, 507.—Koch, Dendrologie, i, 138.

Phænopyrum cordatum, Rœmer, Syn. Mon. iii, 157.

Phænopyrum acerifolium, Rœmer, Syn. Mon. iii, 157.

WASHINGTON THORN.

Valley of the upper Potomac river, Virginia, southward along the Alleghany mountains to northern Georgia and Alabama, extending west through eastern and middle Kentucky and Tennessee to the valley of the lower Wabash river, Illinois.

A small tree, 6 to 8 meters in height, with a trunk rarely 0.30 meter in diameter; generally along banks of streams.

Wood heavy, hard, close-grained, compact; medullary rays numerous, obscure; color, brown tinged with red, the sap-wood lighter; specific gravity, 0.7293; ash, 0.46.

Formerly widely planted as a hedge plant.

131.—Cratægus apiifolia, Michaux,

Fl. Bor.-Am. i, 287.—Persoon, Syn. ii, 38.—Pursh, Fl. Am. Sept. i, 336.—Nuttall, Genera, i, 305.—Elliott, Sk. i, 552.—De Candolle, Prodr. ii, 627.—Don, Miller's Dict. ii, 599.—Audubon, Birds, t. 192.—Eaton, Manual, 6 ed. 112.—Hooker, Companion Bot. Mag. i, 25.—Torrey & Gray, Fl. N. America, i, 467.—London, Arboretum, ii, 824, f. 588, 589 & t.—Eaton & Wright, Bot. 212.—Dietrich, Syn. iii, 160.—Darby, Bot. S. States, 306.—Rœmer, Syn. Mon. iii, 121.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 127.—Wood, Cl. Book, 331; Bot. & Fl. 111.—Gray, Manual N. States, 5 ed. 159; Hall's Pl. Texas, 9.—Young, Bot. Texas, 257.—Kaleniczenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 29.—Vasey, Cat. Forest Trees, 14.

C. oxyacantha, Walter, Fl. Caroliniana, 147 [not Linnæus].

Mespilus apiifolia, Marshall, Arbustum, 89.—Poiret, Suppl. iv, 68.—Sprengel, Syst. ii, 508.—Spach, Hist. Veg. ii, 67.

Mespilus monogyna, var. *apiifolia*, Koch, Dendrologie, i, 160.

C. oxyacantha, var. *apiifolia*, Regel in Act. Hort. St. Petersburg, 119.

PARSLEY HAW.

Southern Virginia, southward near the coast to about latitude 28°, extending west through the Gulf states to southern Arkansas and the valley of the Trinity river, Texas.

A small tree, rarely 6 to 9 meters in height, with a slender stem rarely exceeding 0.08 to 0.10 meter in diameter, or more often a low shrub, throwing up many stems from the ground; low, rich soil, reaching its greatest development in the pine-barren hummocks of central Florida.

Wood heavy, hard, very close-grained, compact, susceptible of a beautiful polish; medullary rays thin, very obscure; color, bright brown tinged with red or rose, the sap-wood much lighter; specific gravity, 0.7453; ash, 0.97.

132.—Cratægus spathulata, Michaux,

Fl. Bor.-Am. i, 228.—Persoon, Syn. ii, 37.—Barton, Compend. Fl. Philadelph. i, 226.—Elliott, Sk. i, 552.—Loddiges, Bot. Cab. t. 1261.—Don, Miller's Dict. ii, 599.—Hooker, Companion Bot. Mag. i, 25.—Gray in Lindley, Bot. Reg. xxiii under t. 1957; Manual N. States, 5 ed. 159.—Eaton, Manual, 6 ed. 112.—Torrey & Gray, Fl. N. America, i, 467.—Loudon, Arboretum, ii, 825, f. 591 & t.—Eaton & Wright, Bot. 212.—Dietrich, Syn. iii, 160.—Darby, Bot. S. States, 306.—Chapman, Fl. S. States, 126.—Lesquereux in Owen's 2d Rep. Arkansas, 359.—Wood, Cl. Book, 331; Bot. & Fl. 111.—Young, Bot. Texas, 257.—Kaleniczenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 31.—Ridgway in Am. Nat. vi, 728.

Mespilus Azarolus, Marshall, Arbustum, 89 [not Linnæus].

Mespilus spathulata, Poiret, Suppl. iv, 68.—Desfontaines, Hist. Arb. ii, 157.—Sprengel, Syst. ii, 507.—Spach, Hist. Veg. ii, 66.—Koch, Dendrologie, i, 137.

C. microcarpa, Lindley, Bot. Reg. xxii, t. 1846.

Phœnopyrum spathulatum, Rœmer, Syn. Mon. iii, 355.

SMALL-FRUITED HAW.

Virginia, southward to the Chattahoochee region of western Florida, west through the Gulf states to the valley of the Washita river, Arkansas (Hot Springs. *Letterman*), and the Colorado river, Texas.

A small tree, 6 to 8 meters in height, with a trunk 0.20 to 0.25 meter in diameter, or often reduced to a low shrub; margins of streams and prairies; common and reaching its greatest development along the bottom lands of western Louisiana and eastern Texas.

Wood heavy, hard, not strong, close-grained, compact; medullary rays very numerous, obscure; color, light brown or red, the sap-wood lighter; specific gravity, 0.7159; ash, 0.66.

133.—Cratægus berberifolia, Torrey & Gray,

Fl. N. America, i, 469.—Dietrich, Syn. iii, 159.—Walpers, Rep. ii, 59.—Rœmer, Syn. Mon. iii, 115.—Wood, Cl. Book, 332.—Regel in Act. Hort. St. Petersburg, i, 123.—Engelmann in Coulter's Bot. Gazette, vii, 128.

Mespilus berberifolia, Wenzig in Linnæa, xxxviii, 125.

Phænopyrum ellipticum, Rœmer, Syn. Mon. iii, 155.

Phænopyrum Virginicum, Rœmer, Syn. Mon. iii, 155.

New Orleans? (*Drummond*, No. 105[1]); Opelousas, Louisiana (*Carpenter*, *Sargent*).

A small tree, 6 to 8 meters in height, with a trunk 0.20 to 0.25 meter in diameter; borders of prairies, in low ground; the fruit and wood not yet collected.

134.—Cratægus æstivalis, Torrey & Gray,

Fl. N. America, i, 468.—Walpers, Rep. ii, 58.—Dietrich, Syn. iii, 162.—Nuttall, Sylva, ii, 12; 2 ed. i, 162.—Darby, Bot. S. States, 306.—Chapman, Fl. S. States, 127.—Lesquereux in Owen's 2d Rep. Arkansas, 359.—Wood, Cl. Book, 331; Bot. & Fl. 111.—Regel in Act. Hort. St. Petersburg, i, 124.—Vasey, Cat. Forest Trees, 14.

Mespilus æstivalis, Walter, Fl. Caroliniana, 148.—Lamarck, Dict. iv, 447.

C. elliptica, Elliott, Sk. i, 548 [not Aiton].

C. lucida, Elliott, Sk. i, 549 [not Ehrhart].

C. opaca, Hooker & Arnott in Companion Bot. Mag. i, 25.—Loudon, Arboretum, iv, 2563.

Anthomeles æstivalis, Rœmer, Syn. Mon. iii, 141.

MAY HAW. APPLE HAW.

South Carolina, south to northern Florida, west through the Gulf states to southern Arkansas and the valley of the Sabine river, Texas.

A small tree, 6 to 9 meters in height, with a trunk 0.15 to 0.20 meter in diameter; generally in sandy soil along the margins of streams and ponds; common and reaching its greatest development in the bottom lands of western Louisiana and eastern Texas.

Wood heavy, hard, not strong, close-grained, compact; medullary rays numerous, obscure; color, light brown or red, the sap-wood lighter; specific gravity, 0.6564; ash, 0.57.

The large, globular, fragrant, red fruit, of agreeable subacid flavor, used as a preserve, in jellies, etc.; ripening in May.

135.—Cratægus flava, Aiton,

Hort. Kew. ii, 169; 2 ed. iii, 201.—Willdenow, Spec. ii, 1002.—Persoon, Syn. ii, 37.—Pursh, Fl. Am. Sept. i, 338.—Nuttall, Genera, i, 305.—De Candolle, Prodr. ii, 628.—Watson, Dend. Brit. i, t. 59.—Don, Miller's Dict. ii, 600.—Lindley, Bot. Reg. xxiii, t. 1939.—Torrey & Gray, Fl. N. America, i, 468.—Eaton, Manual, 6 ed. 112.—London, Arboretum, ii, 823, f. 585 & t.—Eaton & Wright, Bot. 211.—Dietrich, Syn. iii, 160.—Darby, Bot. S. States, 306.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 28.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 83.—Lesquereux in Owen's 2d Rep. Arkansas, 359.—Wood, Cl. Book, 332; Bot. & Fl. 111.—Gray, Manual N. States, 5 ed. 160.—Regel in Act. Hort. St. Petersburg, i, 122.—Kaleniczenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 27.—Vasey, Cat. Forest Trees, 14.

Mespilus flexispina, Mœnch, Verz. Baum. 62, t. 4.—Koch, Dendrologie, i, 139.

C. glandulosa, Aiton, Hort. Kew. ii, 168; 2 ed. iii, 201 [not Michaux].—Persoon, Syn. ii, 37.—Poiret, Suppl. iv, 69, in part.

Mespilus Caroliniana, Poiret in Lamarck, Dict. iv, 442.—Desfontaines, Hist. Arb. ii, 156.—Sprengel, Syst. ii, 507.

C. Caroliniana, Persoon, Syn. ii, 36.—Elliott, Sk. i, 554.—Eaton, Manual, 6 ed. 112.—Eaton & Wright, Bot. 212.

Mespilus flava, Willdenow, Enum. 523.—Poiret, Suppl. iv, 70.—Watson, Dend. Brit. i, t. 59.—Spach, Hist. Veg. ii, 59.

C. turbinata, Pursh, Fl. Am. Sept. Addend. 735.—Poiret, Suppl. v, 543.—Elliott, Sk. i, 549.—De Candolle, Prodr. ii, 627.—Don, Miller's Dict. ii, 599.—Eaton & Wright, Bot. 212.

Mespilus turbinata, Sprengel, Syst. ii, 506.—Spach, Hist. Veg. ii, 66.

C. flava, var. *lobata*, Lindley, Bot. Reg. xxiii, t. 1932.

C. lobata, Bosc in De Candolle, Prodr. ii, 628.—Don, Miller's Dict. ii, 599.—Loudon, Arboretum, ii, 824, f. 554, 586.

Phænopyrum Carolinianum, Rœmer, Syn. Mon. iii, 152.

Anthomeles flava, *glandulosa*, and *turbinata*, Rœmer, Syn. Mon. iii, 141.

SUMMER HAW. YELLOW HAW.

Virginia, southward, generally near the coast, to Tampa bay, Florida, west through the Gulf states to eastern Texas and southern Arkansas.

A small tree, rarely 7 meters in height, with a trunk 0.30 meter in diameter, or reduced to a much-branched shrub 2 to 3 meters in height; borders of streams, in low, sandy soil subject to overflow.

Wood heavy, hard, close-grained, checking badly in drying, satiny, susceptible of a good polish; medullary rays very numerous, obscure; color, light brown tinged with red or rose, the sap-wood lighter; specific gravity, 0.7809; ash, 0.79.

Fruit small, red or yellow, acid.

Var. pubescens, Gray,

Manual N. States, 5 ed. 160.

Mespilus hiemalis, Walter, Fl. Caroliniana, 148.—Lamarck, Dict. iv, 447.

C. viridis, Walter, Fl. Caroliniana, 147 [not Linnæus].—Elliott, Sk. i, 551.

C. elliptica, Aiton, Hort. Kew. ii, 168; 2 ed. iii, 201.—Willdenow, Spec. ii, 1002.—Persoon, Syn. ii, 37.—Pursh, Fl. Am. Sept. i, 337.—Nuttall, Genera, i, 305.—Torrey, Fl. U. S. 475; Compend. Fl. N. States, 201.—De Candolle, Prodr. ii, 627.—Hooker, Fl. Bor.-Am. i, 201.—Don, Miller's Dict. ii, 598.—Beck, Bot. 33.—Eaton, Manual, 6 ed. 111.—Torrey & Gray, Fl. N. America, i, 469.—Eaton & Wright, Bot. 211.—Dietrich, Syn. iii, 109.—Darby, Bot. S. States, 306.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 84.—Regel in Act. Hort. St. Petersburg, i, 122.

Mespilus elliptica, Lamarck, Dict. iv, 447.—Wenzig in Linnæa, xxxviii, 125.—Koch, Dendrologie, i, 140.

C. glandulosa, Michaux, Fl. Bor.-Am. i, 288 [not Aiton].—Nuttall, Genera, i, 305.—Chapman, Fl. S. States, 128.—Vasey, Cat. Forest Trees, 14.

C. Michauxii, Persoon, Syn. ii, 38.

C. spathulata, Pursh, Fl. Am. Sept. i, 336 [not Michaux].—De Candolle, Prodr. ii, 627.—Lindley, Bot. Reg. xxii, t. 1890; xxiii, under t. 1957.

Mespilus Michauxii, Hornemann, Hort. Hafn. 455.—Poiret, Suppl. iv, 69.

C. flava, Elliott, Sk. i, 551 [not Aiton].

C. Virginica, Loddiges in London, Arboretum, ii, 842, f. 560, 615.—Kaleniczenko in Bull. Soc. Imp. Nat. Moscow, xlviii, 58.

SUMMER-HAW. RED HAW.

Virginia, southward to Tampa bay, Florida, and sparingly through the Gulf states to western Louisiana.

A low tree growing with the species, from which it is distinguished by the pubescence of the calyx and young branches, the smaller flowers, and larger, bright red or yellow, globular or pear-shaped fruit.

Wood heavy, hard, not strong, close-grained, compact; medullary rays numerous, very obscure; color, bright red or rose, the sap-wood lighter; specific gravity, 0.7683; ash, 0.91.

The large, edible fruit used in the south Atlantic states in preserves, jellies, etc.

NOTE.—*Cratægus parvifolia*, Aiton, of the south Atlantic region, a low shrub, is not included in this catalogue.

136.—Heteromeles arbutifolia, Rœmer,

Syn. Mon. iii, 105.—Decaisne in Nouv. Arch. Mus. x, 144, t. 9.—Brewer & Watson, Bot. California, i, 188; ii, 444.

Cratægus arbutifolia, Poiret in Nouveau Duhamel, iv, 131; Dict. Suppl. i, 292.—Aiton, Hort. Kew. 2 ed. iii, 202.—Loddiges, Bot. Cab. t. 201.

Aronia arbutifolia, Nuttall, Genera, i, 306.

Photinia arbutifolia, Lindley in Trans. Linnæan Soc. xiii, 103; Bot. Reg. vi, 491 & under t. 1956.—Sprengel, Syst. ii, 508.—De Candolle, Prodr. ii, 631.—Chamisso & Schlechtendal in Linnæa, ii, 542.—Don, Miller's Dict. ii. 602.—Spach, Hist. Veg. ii, 80.—Hooker & Arnott, Bot. Beechey, 139, 340.—Torrey & Gray, Fl. N. America, i, 473.—Dietrich, Syn. iii, 162.—Loudon, Arboretum, ii, 868, f. 619.—Bentham, Bot. Sulphur, 14; Pl. Hartweg. 307.—Torrey in Emory's Rep. 140; Sitgreaves' Rep. 119; Pacific R. R. Rep. iv, 85; Bot. Mex. Boundary Survey, 64; Bot. Wilkes Exped. 291.—Wood, Cl. Book, 329.—Bolander in Proc. California Acad. iii, 80.—Vasey, Cat. Forest Trees, 14.—Palmer in Am. Nat. xii, 599.—Maximowicz in Bull. Acad. Sci. St. Petersburg, xix, 180.—Wenzig in Linnæa, xxxviii, 96.

Mespilus arbutifolia, Link, Enum. Hort. Berol. ii, 36.

Photinia salicifolia, Presl, Epimel. Bot. 204.—Walpers, Ann. iii, 858.

H. Fremontiana, Decaisne in Nouv. Arch. Mus. x, 144.

TOYON. TOLLON. CALIFORNIA HOLLY.

California Coast ranges, Mendocino to San Diego county, extending east to the foot-hills of the Sierra Nevada and San Bernardino mountains.

A small, low-branched evergreen tree, rarely exceeding 9 meters in height, the short trunk sometimes 0.30 to 0.45 meter in diameter, or more often a low, much-branched shrub.

Wood very heavy, hard, close-grained, inclined to check in drying, satiny, susceptible of a beautiful polish; medullary rays numerous, very obscure; color, dark reddish-brown, the sap-wood lighter; specific gravity, 0.9326; ash, 0.54.

137.—Amelanchier Canadensis, Torrey & Gray,

Fl. N. America, i, 473.—Walpers, Rep. ii, 55.—Dietrich, Syn. iii, 158.—Torrey, Fl. N. York, i, 225.—Browne, Trees of America, 282.—Emerson, Trees Massachusetts, i, 443; 2 ed. ii, 503 & t.—Parry in Owen's Rep. 612.—Darlington, Fl. Cestrica, 3 ed. 86.—Richardson, Arctic Exped. 428.—Seemann, Bot. Herald, 52.—Hooker f. in Trans. Linnæan Soc. xxii², 290, 327.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 129.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 68.—Lesquereux in Owen's 2d Rep. Arkansas, 359.—Wood, Cl. Book, 329; Bot. & Fl. 110.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 191.—Porcher, Resources S. Forests, 168.—Gray, Manual N. States, 5 ed. 162.—Koch, Dendrologie, i, 180.—Vasey, Cat. Forest Trees, 14.—Maximowicz in Bull. Acad. St. Petersburg, xix, 175.—Ridgway in Proc. U. S. Nat. Mus. 1882, 66.

Mespilus Canadensis, Linnæus, Spec. 1 ed. 478 (excl. syn. Gronovius).—Walter, Fl. Caroliniana, 148.—Aiton, Hort. Kew. ii, 173.

Cratægus tomentosa, Linnæus, Spec. 1 ed. 476 (excl. syn. Gronovius).

Pyrus Botryapium, Linnæus f. Suppl. 255.—Wangenheim, Amer. 90, t. 28, f. 65.—Ehrhart, Beitr. i, 183; ii, 68.—Willdenow, Spec. ii, 1013; Enum. 525; Berl. Baumz. 322.—Aiton, Hort. Kew. 2 ed. iii, 207.—Pursh, Fl. Am. Sept. i, 339.—Hayne, Dend. Fl. 83.—Guimpel, Otto & Hayne, 100, t. 79.—Sprengel, Syst. ii, 509.—Audubon, Birds, t. 60.—Bigelow, Fl. Boston. 3 ed. 308.

Cratægus racemosa, Lamarck, Dict. i, 84.—Desfontaines, Hist. Arb. ii, 148.—Nouveau Duhamel, iv, 133.—Poiret, Suppl. i, 292.

Mespilus nivea, Marshall, Arbustum, 90.

Mespilus Canadensis, var. *cordata*, Michaux, Fl. Bor.-Am. i, 291.

Aronia Botryapium, Persoon, Syn. ii, 39.—Nuttall, Genera, i, 557.—Elliott, Sk. i, 557.—Torrey, Fl. U. S. 479; Compend. Fl. N. States, 203.—Eaton, Manual, 6 ed. 29.—Eaton & Wright, Bot. 135.

Mespilus arborea, Michaux f. Hist. Arb. Am. iii, 68, t. 11; N. American Sylva, 3 ed. ii, 60, t. 66.—Barton, Prodr. Fl. Philadelph. 55.

A. Botryapium, Lindley in Trans. Linnæan Soc. xiii, 100.—De Candolle, Prodr. ii, 632.—Hooker, Fl. Bor.-Am. i, 202.—Don, Miller's Dict. ii, 604.—Beck, Bot. 112.—Spach, Hist. Veg. ii, 84.—Loudon, Arboretum. ii, 874, f. 627–629 & t.—Rœmer, Syn. Mon. iii, 145.—Darby, Bot. S. States, 307.—Wenzig in Linnæa, xxxiii, 110.—Decaisne in Nouv. Arch. Mus. x, 135.

Aronia arborea, Barton, Compend. Philadelph. i, 228.

Aronia cordata, Rafinesque, Med. Bot. ii, 196.

A. ovalis, Hooker, Fl. Bor.-Am. i, 202, in part.

Pyrus Bartramiana, Tausch, Fl. xxi, 715.

Pyrus Wangenheimiana, Tausch, Fl. xxi, 715.

A. Bartramiana, Rœmer, Syn. Mon. iii, 145.

A. Wangenheimiana, Rœmer, Syn. Mon. 146.

JUNE BERRY. SHAD BUSH. SERVICE TREE. MAY CHERRY.

Newfoundland and Labrador, west along the southern shores of Hudson bay to the Saskatchewan region, south through the Atlantic forests to northern Florida, southwestern Arkansas, and the Indian territory.

A small tree, 9 to 15 meters in height, with a trunk 0.30 to 0.45 meter in diameter, or in some forms reduced to a low shrub (var. *rotundifolia*, Torrey & Gray; var. *oligocarpa*, Torrey & Gray); common at the north, rare at the south, and reaching its greatest development on the high slopes of the southern Alleghany mountains; varying greatly in the shape of the leaves, size of the flowers, amount of pubescence on the leaves and young shoots, etc.

The best marked arborescent variety is—

var. **oblongifolia**, Torrey & Gray, Fl. N. America, i, 473.—Walpers, Rep. ii, 55.—Dietrich, Syn. iii, 158.—Torrey, Fl. N. York, i, 225; Nicollet's Rep. 149.—Emerson, Trees Massachusetts, i, 444; 2 ed. ii, 504 & t.—Wood, Cl. Book, 330; Bot. & Fl. 110.—Gray, Manuel N. States, 5 ed. 162.—Macoun in Geological Rep. Canada, 1875–'76, 195.

Cratœgus spicata, Lamarck, Dict. i, 84.—Desfontaines, Hist. Arb. ii, 148.—Nouveau Duhamel, iv, 132.—Poiret, Suppl. i, 292.

Mespilus Canadensis, var. *obovalis*, Michaux, Fl. Bor.-Am. i, 291.

Pyrus ovalis, Willdenow, Spec. ii, 1014; Berl. Baumz. 323.—Pursh, Fl. Am. Sept. i, 340.—Schrank, Pl. Labrador, 26.—Bigelow, Fl. Boston. 3 ed. 207.

Aronia ovalis, Torrey, Fl. U. S. 479; Compend. Fl. N. States, 203.—Eaton, Manual, 6 ed. 29.—Eaton & Wright, Bot. 135.

A. ovalis, De Candolle, Prodr. ii, 632.—Meyer, Pl. Labrador, 81.—Hooker, Fl. Bor.-Am. i, 202, in part.—Don, Miller's Dict. ii, 604.—Beck, Bot. 112.—Spach, Hist. Veg. ii, 85.—London, Arboretum, ii, 876, f. 632.

A. intermedia, Spach, Hist. Veg. ii, 85.—Wenzig in Linnæa, xxxiii, 112.

A. oblongifolia, Rœmer, Syn. Mon. iii, 147.

A. spicata, Decaisne in Nouv. Arch. Mus. x, 135, t. 9, f. 5.

Wood heavy, exceedingly hard, strong, close-grained, checking somewhat in seasoning, satiny, susceptible of a good polish; medullary rays very numerous, obscure; color, dark brown often tinged with red, the sap-wood much lighter; specific gravity, 0.7838; ash, 0.55; the small fruit sweet and edible.

NOTE.—The closely allied *Amelanchier alnifolia*, Nuttall, a low shrub, is widely distributed over the mountain ranges of the interior Pacific region.

HAMAMELACEÆ.

138.—Hamamelis Virginica, Linnæus,

Spec. 2 ed. 124.—Marshall, Arbustum, 58.—Du Roi, Harbk. i, 423.—Wangenheim, Amer. 89, t. 29, f. 62.—Lamarck, Dict. iii, 68; Ill. i, 350, t. 88.—Aiton, Hort. Kew. i, 167; 2 ed. i, 275.—Schkuhr, Handb. i, 88, t. 27.—Willdenow, Spec. i, 701; Enum. 171; Berl. Baumz. 172.—Michaux, Fl. Bor. Am. i, 100.—Persoon, Syn. i, 150.—Desfontaines, Hist. Arb. ii, 29.—Pursh. Fl. Am. Sept. i, 116.—Nuttall, Genera, i, 107.—Nouveau Duhamel, vii, 207, t. 60.—Elliott, Sk. i, 219.—Rœmer & Schultes, Syst. iii, 483.—Loddiges, Bot. Cab. t. 598.—Barton, Fl. N. America, iii, 21, t. 78.—Torrey, Fl. U. S. 192; Compend. Fl. N. States, 86; Fl. N. York, i, 260.—Guimpel, Otto & Hayne, Abb. Holz. 95, t. 75.—Sprengel, Syst. i, 491.—Rafinesque, Med. Bot. i, 227, f. 45.—De Candolle, Prodr. iv, 268.—Hooker, Fl. Bor.-Am. i, 275; Companion Bot. Mag. i, 48.—Don, Miller's Dict. iii, 396, f. 69.—Beck, Bot. 152.—Eaton, Manual 6 ed. 164.—Spach, Hist, Veg. viii, 79.—Dietrich, Syn. i, 550.—Torrey & Gray, Fl. N. America, i, 597.—Loudon, Arboretum, ii, 1007, f. 756, 757.—Eaton & Wright, Bot. 260.—Bigelow, Fl. Boston. 3 ed. 63.—Emerson, Trees Massachusetts, 416; 2 ed. ii, 473 & t.—Darby, Bot. S. States, 328.—Darlington, Fl. Cestrica, 3 ed. 98.—Agardh, Theor. & Syst. Pl. t. 13, f. 7.—Schnizlein, Icon. t. 167, f. 18–25, 27–29.—Gray in Am. Jour. Sci. 2 ser. xxiv, 438; 3 ser. v, 144; Manual N. States, 5 ed. 173.—Chapman, Fl. S. States, 157.—Curtis in Rep. Geological Surv. N. Carolina, iii, 105.—Lesquereux in Owen's 2d Rep. Arkansas, 362.—Wood, Cl. Book, 375; Bot. & Fl. 120.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 193.—Porcher, Resources S. Forests, 58.—Koch, Dendrologie, ii, 458.—Baillon in Adansonia, x, 123; Hist. Pl. iii, 389, f. 462–464.—Young, Bot. Texas, 291.—Maout & Decaisne, Bot. English ed. 408 & f.

H. dioica, Walter, Fl. Caroliniana, 255.—Gmelin, Syst. Veg. i, 281.

H. androgyna, Walter, Fl. Caroliniana, 255.—Gmelin, Syst. Veg. i, 282.

H. corylifolia, Mœnch, Meth. 273.

H. macrophylla, Pursh. Fl. Am. Sept. i, 116.—Poiret, Suppl. v, 698.—Elliott, Sk. i, 220.—Rœmer & Schultes, Syst. iii, 483.—Rafinesque, Med. Bot. i, 230.—Eaton, Manual, 6 ed. 164.—Don, Miller's Dict. iii, 396.—Eaton & Wright, Bot. 261.

Trilopus Virginiana, nigra, rotundifolia, and *dentata*, Rafinesque, New Sylva, 15–17.

H. Virginiana, var. *parvifolia*, Nuttall, Genera, i, 107.—Torrey, Fl. U. S. 193; Compend. Fl. N. States, 87.—Don, Miller's Dict. iii, 396.—Beck, Bot. 152.—Torrey & Gray, Fl. N. America, i, 597.

H. parvifolia, Rafinesque, Med. Bot. i, 230.

Trilopus parvifolia, Rafinesque, New Sylva, 17.

WITCH HAZEL.

Northern New England and southern Ontario to Wisconsin, south through the Atlantic region to northern Florida and eastern Texas.

A small tree, exceptionally 7 to 9 meters in height, with a trunk 0.30 to 0.37 meter in diameter, or more often a tall shrub throwing up many stems from the ground; common; rich, rather damp woodlands, reaching its greatest development in the region of the southern Alleghany mountains.

Wood heavy, hard, very close-grained, compact; layers of annual growth hardly distinguishable; medullary rays numerous, thin, obscure; color, light brown tinged with red, the sap-wood nearly white; specific gravity, 0.6856; ash, 0.37.

The bark and leaves rich in tannin, and largely used by herbalists in the form of fluid extracts, decoctions, etc., in external applications, and as a reputed remedy in hemorrhoidal affections (*New York Jour. Med.* x, 208.—*Trans. Am. Med. Assoc.* i, 350.—*U. S. Dispensatory*, 14 ed. 1661.—*Nat. Dispensatory*, 2 ed. 704).

139.—Liquidambar Styraciflua, Linnæus,

Spec. 1 ed. 999.—Marshall, Arbustum, 77.—Wangenheim, Amer. 49, t. 16, f. 40.—Walter, Fl. Caroliniana, 237.—Lamarck, Dict. iii, 533; Ill. iii, 367, t. 783.—Aiton, Hort. Kew. iii, 365; 2 ed. v, 306.—Gærtner, Fruct. ii, 57, t. 90.—Mœnch, Meth. 340.—Abbot, Insects Georgia, i, 48.—B. S. Barton, Coll. i, 16.—Willdenow, Spec. iv, 475; Enum. 985; Berl. Baumz. 214.—Michaux, Fl. Bor.-Am. ii, 202.—Persoon, Syn. ii, 573.—Desfontaines, Hist. Arb. ii, 541.—Titford, Hort. Bot. Am. 97.—Schkuhr, Handb. iii, 275, t. 307.—Nouveau Duhamel, ii, 42, t. 10; vii, 207, t. 60.—Michaux f. Hist. Arb. Am. iii, 194, t. 4; N. American Sylva, 3 ed. ii, 42, t. 64.—Barton, Prodr. Fl. Philadelph. 92; Compend. Fl. Philadelph. ii, 177.—Pursh, Fl. Am. Sept. ii, 635.—Eaton, Manual, 110; 6 ed. 208.—Rafinesque, Fl. Ludoviciana, 116.—Nuttall, Genera, ii, 219; Trans. Am. Phil. Soc. 2 ser. v, 168.—Nees, Fl. Offic. t. 95.—Elliott, Sk. ii, 621.—Sprengel, Syst. iii, 864.—Humboldt, Bonpland & Kunth, Nouv. Gen. & Spec. vii, 273.—Audubon, Birds, t. 44.—Torrey, Compend. Fl. N. States, 357; Fl. N. York, ii, 217.—Beck, Bot. 326.—Hooker, Companion Bot. Mag. ii, 64.—Eaton & Wright, Bot. 302.—Spach, Hist. Veg. x, 84.—London, Arboretum, iv, 2049, f. 1961 & t.—Lindley, Fl. Med. 322.—Griffith, Med. Bot. 581, f. 254.—Broomfield in London Jour. Bot. vii, 144.—Schnizlein, Icon. t. 98, f. 5-21.—Seemann, Bot. Herald, 346.—Darby, Bot. S. States, 509.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 157.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 77.—Lesquereux in Owen's 2d Rep. Arkansas, 362.—Wood, Cl. Book, 375; Bot. & Fl. 120.—Porcher, Resources S. Forests, 344.—De Candolle, Prodr. xvi², 157.—Oliver in Hooker f. Icon. xi, 13.—Gray, Manual N. States, 5 ed. 174.—Koch, Dendrologie, ii, 464.—Young, Bot. Texas, 291.—Vasey, Cat. Forest Trees, 15.—Maout & Decaisne, Bot. English ed. 412 & figs.—Baillon, Hist. Pl. iii, 397, f. 471-474.—Guibourt, Hist. Drogues, 7 ed. ii, 300, f. 445.—Ridgway in Am. Nat. vi, 664; Proc. U. S. Nat. Mus. 1882, 67.—Broadhead in Coulter's Bot. Gazette, iii, 53.—Hemsley, Bot. Am.-Cent. i, 400.

L. Styraciflua, var. *Mexicana*, Örsted, Am.-Cent. xvi, t. 11.

L. macrophylla, Örsted, Am.-Cent. xvi, t. 10.

SWEET GUM. STAR-LEAVED GUM. LIQUIDAMBER. RED GUM. BILSTED.

Fairfield county, Connecticut, to the valleys of the lower Ohio, White, and Wabash rivers, south to cape Canaveral and Tampa bay, Florida, southwest through southern Missouri, Arkansas, and the Indian territory to the valley of the Trinity river, Texas; in central and southern Mexico.

A large tree, often 30 to 36 or, exceptionally, 48 meters in height, with a trunk 1.20 to 1.80 meter in diameter; in low, wet soil; very common and reaching its greatest development in the bottom lands of the Mississippi basin, here, with the cotton gum, forming a large proportion of the heavy forest growth.

Wood heavy, hard, not strong, rather tough, close-grained, compact, inclined to shrink and warp badly in seasoning, susceptible of a beautiful polish; medullary rays numerous, very obscure; color, bright brown tinged with red, the sap-wood nearly white; specific gravity, 0.5910; ash, 0.61; manufactured into lumber and used in the construction of buildings for plates, boarding, and clapboards, in cabinet work as a substitute for black walnut, and for veneering and street pavements; its great economic value hardly appreciated on account of the difficulty experienced in properly seasoning it.

The balsamic exudation obtained from this species at the south collected by herbalists and sometimes used in the form of a sirup as a substitute for storax in the treatment of catarrhal affections, or externally as an ointment in dressing frost-bite, abscess, etc., and in the manufacture of chewing gums (*Flückiger & Hanbury*, *Pharmacographia*, 246.—*Nat. Dispensatory*, 2 ed. 834).

RHIZOPHORACEÆ.

140.—Rhizophora Mangle, Linnæus,

Spec. 1 ed. 443.—Jacquin, Amer. 141, t. 89.—Gærtner, Fruct. i, 212, t. 45, f. 1.—Lamarck, Ill. ii, 517, t. 396; Dict. vi, 160.—Willdenow, Spec. ii, 844.—Persoon, Syn. ii, 2.—Decourtilz, Fl. Med. Antilles, i, 45, t. 10.—Vellozo, Fl. Flum. t. 1.—De Candolle, Prodr. iii, 32.—Eaton, Manual, 6 ed. 301.—Spach, Hist. Veg. iv, 332, t. 34.—Torrey & Gray, Fl. N. America, i, 484.—Nuttall in Am. Jour. Sci. 1 ser. v, 295.—Hooker & Arnott, Bot. Beechey, 290.—Arnott in Ann. Nat. Hist. i, 361.—Walpers, Rep. ii, 70.—Bentham, Bot. Sulphur, 14.—Darby, Bot. S. States, 312.—Porcher, Resources S. Forests, 55.—Grisebach, Fl. British West Indies, 274.—Schnizlein, Icon. t. 263, f. 1-7.—Maout & Decaisne, Bot. English ed. 419.—Eichler in Martius, Fl. Brasil. xii², 426, t. 90.—Vasey, Cat. Forest Trees, 15.—Baillon, Hist. Pl. vi, 284, f. 253-259.

R. racemosa, Meyer, Prim. Fl. Esseq. 185.—De Candolle, Prodr. iii, 32.

R. Americana, Nuttall, Sylva, i, 95, t. 24; 2 ed. i, 112, t. 24.—Cooper in Smithsonian Rep. 1858, 264.

MANGROVE.

Semi-tropical Florida, Mosquito inlet and Cedar Keys to the southern keys; delta of the Mississippi river and coast of Texas; southward through the West Indies and tropical America; now widely naturalized throughout the tropics of the old world (*A. De Candolle, Geog. Bot.* ii, 772).

A tree 12 to 18, or, exceptionally, 27 meters in height, with a trunk 0.30 to 0.60 meter in diameter, or more commonly not exceeding 4 to 7 meters in height; low saline shores, reaching in the United States its greatest development on bay Biscayne and cape Sable; south of latitude 29°, bordering with almost impenetrable thickets the coast of the Florida peninsula, ascending the rivers for many miles, especially those flowing from the Everglades, and entirely covering many of the southern keys.

Wood exceedingly heavy, hard and strong, close-grained, checking in drying, satiny, susceptible of a beautiful polish, containing many evenly-distributed rather small open ducts; medullary rays numerous, thin; color, dark reddish brown streaked with lighter brown, sap-wood lighter; specific gravity, 1.1617; ash, 1.82; furnishing valuable fuel; not greatly affected by the teredo, and used for piles.

COMBRETACEÆ.

141.—Conocarpus erecta, Linnæus,

Spec. 1 ed. 176.—Lamarck, Dict. ii, 96; Ill. i, 126, f. 1.—Jacquin, Amer. t. 78.—Gærtner, Fruct. ii, 470, t. 177, f. 3.—Swartz, Obs. 79.—Willdenow, Sp. i, 994.—Aiton, Hort. Kew. 2 ed. i, 381.—Titford, Hort. Bot. Am. 47.—De Candolle, Prodr. iii, 16.—Decourtilz, Fl. Med. Antilles, vi, 68, t. 399.—Spach, Hist. Veg. iv, 304.—Torrey & Gray, Fl. N. America, i, 485.—Nuttall, Sylva, i, 113, t. 33; 2 ed. i, 128, t. 33.—Richard, Fl. Cuba, 526.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 136.—Grisebach, Fl. British West Indies, 277.—Eichler in Martins, Fl. Brasil. xiv², 101, t. 35, f. 2.—Vasey, Cat. Forest Trees, 15.

BUTTON WOOD.

Semi-tropical Florida, cape Canaveral to the southern keys, west coast, Tampa bay to cape Sable; through the West Indies to Brazil.

A low tree, often 8 or, exceptionally, 15 to 18 meters in height, with a trunk sometimes 0.60 meter in diameter; common and reaching its greatest development in the United States on Lost Man's river, north of cape Sable; or reduced to a low under shrub (var. *procumbens*, De Candolle, *l. c.*—Eichler, *l. c.; C. procumbens*, Linnæus, Spec. 1 ed. 177.—Jacquin *l. c.* 79, t. 52, f. 2.—Gærtner, *l. c.* iii, 205, f. 4—Grisebach, *l. c.; C. acutifolia*, Willdenow in Rœmer & Schultes, Syst. v, 574).

Wood very heavy and hard, strong, close-grained, very compact, susceptible of a beautiful polish; medullary rays numerous, obscure; color, dark yellow brown, the sap-wood lighter; specific gravity, 0.9900; ash, 0.32; burning slowly like charcoal, and highly valued for fuel.

142.—Laguncularia racemosa, Gærtner f.

Fruct. Suppl. 209, t. 217.—De Candolle, Prodr. iii, 17.—Spach, Hist. Veg. iv, 305.—Nuttall, Sylva, i, 117, t. 34; 2 ed. i, 132, t. 34.—Bentham, Bot. Sulphur, 14, 92.—Richard, Fl. Cuba, 527.—Eichler in Martius, Fl. Brasil. xiv², 102, t. 35, f. 3.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 136.—Grisebach, Fl. British West Indies, 276.—Vasey, Cat. Forest Trees, 15.—Baillon, Hist. Pl. vi, 278.

Conocarpus racemosa, Linnæus, Spec. 2 ed. 251; Syst. 181.—Jacquin, Amer. 80, t. 53.—Swartz, Obs. 79.—Willdenow, Spec. i, 995.

Schousbœa commutata, Sprengel, Syst. ii, 332.

Bucida Buceras, Vellozo, Fl. Flum. iv, t. 87 [not Linnæus].

L. glabrifolia, Presl, Reil. Hænk, ii, 22.—Walpers, Rep. ii, 63.—Chapman, Fl. S. States, 136.

WHITE BUTTON WOOD. WHITE MANGROVE.

Semi-tropical Florida, cape Canaveral to the southern keys, west coast, Cedar Keys to cape Sable; through the West Indies and tropical America; coast of tropical Africa.

A small tree, sometimes 6 or, exceptionally, 22 meters in height (Shark river, Florida, *Curtiss*), with a trunk 0.30 to 0.60 meter in diameter, or toward its northern limits reduced to a low shrub; very common; saline shores of lagoons and bays.

Wood very heavy and hard, strong, close-grained, very compact; susceptible of a beautiful polish; medullary rays numerous, obscure; color, dark yellow-brown, the sap-wood much lighter; specific gravity, 0.7137; ash, 1.62.

MYRTACEÆ.

143.—Calyptranthes Chytraculia, Swartz,

Prodr. 79; Fl. Ind. Occ. ii, 921.—Willdenow, Spec. ii, 975.—Aiton, Hort. Kew. 2 ed. iii, 192.—De Candolle, Prodr. iii, 237.—Nuttall, Sylva, i, 101, t. 26; 2 ed. i, 117, t. 26.—Berg in Linnæa, xxvii, 26.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 131.—Grisebach, Fl. British West Indies, 232.—Hemsley. Bot. Am.-Cent. i, 408.

Myrtus Chytraculia, Linnæus, Amœn. v, 398.—Swartz, Obs. 202.

Eugenia pallens, Poiret, Suppl. iii, 122.

Semi-tropical Florida, shores of bay Biscayne, Key Largo; in the West Indies.

A small tree, sometimes 8 meters in height, with a trunk 0.10 to 0.15 meter in diameter.

Wood very heavy, hard, close-grained, compact, containing many evenly-distributed rather large open ducts; medullary rays numerous, thin; color, brown tinged with red, the sap-wood a little lighter; specific gravity, 0.8992; ash, 3.32.

144.—Eugenia buxifolia, Willdenow,

Spec. ii, 960.—Persoon, Syn. ii, 28.—De Candolle, Prodr. iii, 275.—Nuttall, Sylva, i, 108, t. 29; 2 ed. i, 123, t. 29.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 131.—Grisebach, Fl. British West Indies, 236.—Vasey, Cat. Forest Trees, 15.

Myrtus buxifolia, Swartz, Prodr. 78; Fl. Ind. Occ. ii, 899.

Myrtus axillaris, Poiret in Lamarck, Dict. iv, 412.

E. myrtoides, Poiret, Suppl. iii, 125.

Myrtus Poireti, Sprengel, Syst. ii, 483.

E. triplinervia, Berg in Linnæa, xxvii, 190, in part.

GURGEON STOPPER. SPANISH STOPPER.

Semi-tropical Florida, cape Canaveral to the southern keys, west coast, Caloosa river to cape Romano; in the West Indies.

A small tree, rarely 6 to 9 meters in height, with a trunk sometimes 0.30 meter in diameter, reaching its greatest development on the rich hummocks of the Everglades.

Wood very heavy, exceedingly hard, very strong, close-grained, very compact; medullary rays numerous, thin; color, dark brown shaded with red, the sap-wood a little lighter; specific gravity, 0.9360; ash, 1.50; somewhat used for fuel.

145.—Eugenia dichotoma, De Candolle,

Prodr. iii, 278.—Nuttall, Sylva, i, 103, t. 27; 2 ed. i, 120, t. 27.—Berg in Linnæa, xxvii, 261.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 131.—Vasey, Cat. Forest Trees, 15.

E. divaricata, Lamarck, Dict. i, 202.

? *Myrtus dichotoma*, Vahl in Poiret, Suppl. iv, 53.

Anamomis punctata, Grisebach, Fl. British West Indies, 240.

NAKED WOOD.

Semi-tropical Florida, Mosquito inlet to cape Canaveral, common; west coast, Caloosa river to cape Romano; in the West Indies.

A small tree, sometimes 6 to 8 meters in height, with a trunk rarely 0.15 meter in diameter.

A form with the leaves, buds, and calyx more or less pubescent (*E. dichotoma*, var. *fragrans*, Nuttall, *l. c.*; *E. pungens*, Willdenow, Spec. ii, 964; Bot. Mag. t. 1242; *E. montana*, Aublet, Guian. i, 495, t. 195), not rare in West Indies, and, according to *Nuttall*, collected by Mr. Baldwin in the vicinity of New Smyrna, Florida, has not been rediscovered within the limits of the United States.

Wood very heavy, hard, close-grained, compact; medullary rays numerous, thin; color, light brown or red, sap-wood yellow; specific gravity, 0.8983; ash, 0.74.

The small, edible fruit of agreeable aromatic flavor, and greatly improved by cultivation in rich soil.

146.—Eugenia monticola, De Candolle,

Prodr. iii, 275.—Chapman, Fl. S. States, 131.—Grisebach, Fl. British West Indies, 236.—Vasey, Cat. Forest Trees, 15.

Myrtus monticola, Swartz, Fl. Ind. Occ. ii, 898.

E. triplinervia, Berg in Linnæa, xxvii, 190, in part.

E. axillaris, Berg in Linnæa, xxvii, 201, in part.

STOPPER. WHITE STOPPER.

Florida, Saint John's river to Umbrella Key; rare; in the West Indies.

A small tree, rarely 7 meters in height, with a trunk 0.30 meter in diameter, or in northern Florida reduced to a low shrub.

Wood very heavy, hard, strong, very close-grained, compact; medullary rays numerous, thin; color, brown, often tinged with red, the sap-wood darker; specific gravity, 0.9156; ash, 1.89.

147.—Eugenia longipes, Berg,

Linnæa, xxvii, 150.—Chapman, Fl. S. States, Suppl. 620.

STOPPER.

Semi-tropical Florida, No-Name Key; in the West Indies.

A small tree, 4 to 7 meters in height, with a trunk 0.15 to 0.20 meter in diameter; rare.

Wood very heavy, hard, close-grained, checking badly in drying, containing many evenly-distribnted open ducts; medullary rays numerous, very obscure; color, dark brown or nearly black, the sap-wood brown tinged with red; specific gravity, 1.1235; ash, 3.48.

The small red fruit with the flavor of cranberries.

148.—Eugenia procera, Poiret,

Suppl. ii, 129.—De Candolle, Prodr. iii, 268.—Nuttall, Sylva, i, 106, t. 28; 2 ed. i, 122, t. 28.—Berg in Linnæa, xxvii, 207.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 131.—Grisebach, Fl. British West Indies, 238.—Vasey, Cat. Forest Trees, 15.

Myrtus procera, Swartz, Prodr. 77; Fl. Ind. Occ. ii, 887.—Willdenow, Spec. ii, 968.

E. Baruensis, Grisebach, Cat. Pl. Cub. [not Jacquin], 87.

RED STOPPER.

Semi-tropical Florida, shores of bay Biscayne, Key Largo, Elliott's Key; in the West Indies.

A tree, 12 to 18 meters in height, with a trunk 0.30 to 0.45 meter in diameter; often forming extensive groves, and reaching its greatest development in the United States in the neighborhood of Miami, bay Biscayne.

Wood very heavy, exceedingly hard, very strong and close-grained, compact; medullary rays nnmerous, hardly distinguishable; color, light yellow-brown, the sap-wood darker; specific gravity, 0.9453; ash, 2.62; probably valuable in cabinet-making and as a substitute for box-wood for coarse wood-engraving.

NOTE.—*Psidium Guaiava*, Raddi, the Guava, widely cultivated in the tropics for its fruit, is now sparingly naturalized in semi-tropical Florida.

CACTACEÆ.

149.—Cereus giganteus, Engelmann;

Emory's Rep. 158; Am. Jour. Sci. 2 ser. xiv, 335; xvii, 231; Proc. Am. Acad. iii, 287; Bot. Mex. Boundary Survey, Cactaceæ, 42, t. 61, 62 & front.; Brewer & Watson, Bot. California, i, 247.—Thurber in Mem. Am. Acad. new ser. v, 302, 305.—Fl. des Serres, x, 24, & t.; xv, 187, t. 1600.—Bigelow in Pacific R. R. Rep. iv, 12.—Engelmann & Bigelow in Pacific R. R. Rep. iv, 36.—Walpers, Ann. v, 46.—Cooper in Smithsonian Rep. 1858, 259.—Lemaire, Ill. Hort. ix, Misc. 95.—Marcou in Jour. Hort. Soc. France, 2 ser. iii, 676.—Lindley, Treasury Bot. 256, t. 17.—Vasey, Cat. Forest Trees, 15.—Rothrock in Wheeler's Rep. vi, front.—Hemsley, Bot. Am.-Cent. i, 343.—James in Am. Nat. xv, 982, f. 3.

Pilocereus Engelmanni, Lemaire, Ill. Hort. ix, Misc. 95.

SUWARROW. SAGUARO. GIANT CACTUS.

Valley of Bill Williams river, Arizona, south and east through central Arizona to the valley of the San Pedro river; southward in Sonora.

A tall, columnar tree, 8 to 18 meters in height, with a trunk sometimes 0.60 meter in diameter; dry, stony *mesas* or low hills rising from the desert.

Wood of the large, strong ribs, very light, soft, rather coarse-grained, solid, satiny, susceptible of a fine polish, almost indestructible in contact with the ground; medullary rays very numerous, broad; color, light brown tinged with yellow; specific gravity, 0.3188; ash, 3.45; used in the region almost exclusively for the rafters of adobe houses, for fencing, and by the Indians for lances, bows, etc.

The edible fruit largely collected and dried by the Indians.

CORNACEÆ.

150.—Cornus alternifolia, Linnæus f.

Suppl. 125.—Lamarck, Dict. ii, 116; Ill. i, 303.—L'Heritier, Cornus, 10, t. 6.—Ehrhart, Beitr. iii, 19.—Aiton, Hort. Kew. i, 159; 2 ed. i, 262.—Willdenow, Spec. i, 664; Enum. 165; Berl. Baumz. 104.—Michaux, Fl. Bor.-Am. i, 93.—Persoon, Syn. i, 144.—Desfontaines, Hist. Arb. i, 351.—Nouveau Duhamel, ii, 157, t. 45.—Pursh, Fl. Am. Sept. i, 109.—Nuttall, Genera, i, 99.—Rœmer & Schultes, Syst. iii, 323; Mant. 251.—Elliott, Sk. i, 210.—Guimpel, Otto & Hayne, Abb. Holz. 53, t. 43.—Hayne, Dend. Fl. 8.—Torrey, Fl. U. S. 180; Compend. Fl. N. States, 83; Fl. N. York, i, 288.—Sprengel, Syst. i, 451.—De Candolle, Prodr. iv, 271.—Hooker, Fl. Bor.-Am. i, 275.—Don, Miller's Dict. iii, 398.—Beck, Bot. 154.—Eaton, Manual, 6 ed. 109.—Tausch in Regensb. Fl. xxi, 732.—Spach, Hist. Veg. viii, 92.—Dietrich, Syn. i, 503.—Torrey & Gray, Fl. N. America, i, 649.—Loudon, Arboretum, ii, 1010, f. 760.—Eaton & Wright, Bot. 210.—Bigelow, Fl. Boston. 3 ed. 60.—C. A. Meyer in Mem. Acad. Sci. St. Petersburg, v, 6, 13.—Walpers, Rep. v, 932.—Emerson, Trees Massachusetts, 409; 2 ed. ii, 463 & t.—Parry in Owen's Rep. 613.—Darlington, Fl. Cestrica, 3 ed. 110.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 167.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 167.—Wood, Cl. Book, 391; Bot. & Fl. 143.—Gray, Manual N. States, 5 ed. 201.—Koch, Dendrologie, i, 690.—Young, Bot. Texas, 303.

C. alterna, Marshall, Arbustum, 35.

DOGWOOD.

New Brunswick, west along the valley of the Saint Lawrence river to the northern shores of lake Superior, south through the northern states and along the Alleghany mountains to northern Georgia and Alabama.

A small tree, 4 to 8 meters in height, with a trunk 0.15 to 0.20 meter in diameter; low, rich woods and borders of streams and swamps.

Wood heavy, hard, close-grained, checking badly in drying; medullary rays numerous, thin; color, brown tinged with red, the sap-wood light yellow; specific gravity, 0.6696; ash, 0.41.

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151.—Cornus florida, Linnæus,

Spec. 1 ed. 117.—Marshall, Arbustum, 35.—Lamarck, Dict. ii, 114; Ill. i, 302.—Wangenheim, Amer. 51, t. 17, f. 41.—Walter, Fl. Caroliniana, 88.—L'Heritier, Cornus, 4.—Aiton, Hort. Kew. i, 157; 2 ed. i, 261.—Willdenow, Spec. i, 661; Enum. 164; Berl. Baumz. 100.—Abbot, Insects Georgia, ii, t. 73.—B. S. Barton, Coll. i, 12, 45; ii, 17, 19.—Bot. Mag. t. 526.—Michaux, Fl. Bor.-Am. i, 91.—Persoon, Syn. i, 143.—Desfontaines, Hist. Arb. i, 350.—Schkuhr, Handb. 82.—Titford, Hort. Bot. Am. 41, t. 16, f. 7.—Nouveau Duhamel, ii, 153.—Michaux f. Hist. Arb. Am. iii, 138, t. 3; N. American Sylva, 3 ed. i, 176, t. 48.—Pursh, Fl. Am. Sept. i, 108.—Bigelow, Med. Bot. ii, 69, t. 73; Fl. Boston. 3 ed. 59.—Eaton, Manual, 19; 6 ed. 108.—Nuttall, Genera, i, 98.—Barton, Med. Bot. i, 43, t. 3.—Rœmer & Schultes, Syst. iii, 319.—Hayne, Dend. Fl. 6.—Guimpel, Otto & Hayne, Abb. Holz. 21, t. 19.—Elliott, Sk. i, 207.—Torrey in Ann. Lyc. N. York, ii, 208; Fl. U. S. 178; Compend. Fl. N. States, 82; Fl. N. York, i, 290; Nicollet's Rep. 151; Emory's Rep. 408.—Sprengel, Syst. i, 451.—Beck in Am. Jour. Sci. 1 ser. x, 264; Bot. 153.—Audubon, Birds, t. 8, 73, 122.—Rafinesque, Med. Bot. i, 131, f. 28.—De Candolle, Prodr. iv, 273.—Hooker, Fl. Bor.-Am. i, 277, in part; Companion Bot. Mag. i, 48.—Don, Miller's Dict. iii, 400.—Lindley, Fl. Med. 81.—Dietrich, Syn. i, 504.—Torrey & Gray, Fl. N. America, i, 652.—Loudon, Arboretum, ii, 1017, f. 769.—Eaton & Wright, Bot. 209.—Reid in London Gard. Chronicle, 1844, 276.—Browne, Trees of America, 350.—Emerson, Trees Massachusetts, 413; 2 ed. ii, 467 & t.—Griffith, Med. Bot. 347, f. 164.—Carson, Med. Bot. i, 50, t. 42.—Richardson, Arctic Exped. 429.—Darlington, Fl. Cestrica, 3 ed. 111.—Darby, Bot. S. States, 339.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 168.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 60.—Lesquereux in Owen's 2d Rep. Arkansas, 364.—Wood, Cl. Book, 391; Bot. & Fl. 143.—Blakie in Canadian Nat. vi, 1.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 194.—Porcher, Resources S. Forests, 59.—Gray, Manual N. States, 5 ed. 200; Hall's Pl. Texas, 11.—Koch, Dendrologie, i, 694.—Young, Bot. Texas, 303.—Vasey, Cat. Forest Trees, 16.—Baillon, Hist. Pl. vii, 68, f. 46.—Broadhead in Coulter's Bot. Gazette, iii, 53.—Bentley & Trimen, Med. Pl. ii, 136, t. 136.—Bell in Geological Rep. Canada, 1879–'80, 55c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 67.

Benthamidia florida, Spach, Hist. Veg. viii, 107.

FLOWERING DOGWOOD. BOX WOOD.

Southern New England, southern Ontario, southern Minnesota, and through the Atlantic forests to latitude 28° 50′ in Florida, and the valley of the Brazos river, Texas.

A small tree, 9 to 12 meters in height, with a trunk 0.30 to 0.45 meter in diameter, or toward its northern limits reduced to a low shrub; rich woods; very common, especially at the south.

Wood heavy, hard, strong, close-grained, tough, checking badly in drying, satiny, susceptible of a beautiful polish; medullary rays numerous, conspicuous; color, brown, changing in different specimens to shades of green and red, the sap-wood lighter; specific gravity, 0.8153; ash, 0.67; used in turnery, for wood engravings and the bearings of machinery, hubs of wheels, barrel hoops, etc.

The bark, especially of the root, in common with that of the other species of the genus, possesses bitter tonic properties, and is used in decoctions, etc., in the treatment of intermittent and malarial fevers (*Am. Jour. Pharm.* vii, 109.—*Maisch in Proc. Am. Pharm. Assoc.* 315.—*U. S. Dispensatory*, 14 ed. 352.—*Nat. Dispensatory*, 2 ed. 467).

152.—Cornus Nuttallii, Audubon,

Birds, t. 467.—Torrey & Gray, Fl. N. America, i, 652.—Walpers, Rep. ii, 435.—Bentham, Pl. Hartweg. 312.—Nuttall, Sylva, iii, 51, t. 97; 2 ed. ii, 117, t. 97.—Durand in Jour. Philadelphia Acad. 1855, 89.—Torrey in Pacific R. R. Rep. iv, 94; Bot. Mex. Boundary Survey, 71; Bot. Wilkes Exped. 326.—Newberry in Pacific R. R. Rep. vi, 24, 75.—Cooper in Smithsonian Rep. 1858, 259; Pacific R. R. Rep. xii², 29, 63.—Lyall in Jour. Linnæan Soc. vii, 134.—Gray in Proc. Am. Acad. viii, 387.—Brewer & Watson, Bot. California, i, 274; ii, 452.—Vasey, Cat. Forest Trees, 16.—Hall in Coulter's Bot. Gazette, ii, 88.—Macoun in Geological Rep. Canada, 1875–'76, 198.—G. M. Dawson in Canadian Nat. new ser. ix, 331.

C. florida, Hooker, Fl. Bor.-Am. i, 277, in part.

FLOWERING DOGWOOD.

Vancouver's island and along the coast of southern British Columbia, through western Washington territory and Oregon, and southward through the Coast ranges of California and along the western slope of the Sierra Nevada to the San Bernardino mountains.

A small, slender tree, sometimes 18 to 24 meters in height, with a trunk rarely 0.45 meter in diameter; ascending the Cascade mountains to 3,000 feet, and the San Bernardino mountains to from 4,000 to 5,000 feet elevation; common; rich, rather damp soil, generally in the dense shade of coniferous forests.

Wood heavy, exceedingly hard, strong, close-grained, compact, satiny, susceptible of a good polish; medullary rays numerous, obscure; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.7481; ash, 0.50; somewhat used in cabinet-making, for mauls, handles, etc.

153.—Nyssa capitata, Walter,

Fl. Caroliniana, 253.—Lamarck, Dict. iv, 508.—Michaux f. Hist. Arb. Am. ii, 257, t. 20; N. American Sylva, 3 ed. iii, 37, t. 113.—Aiton, Hort. Kew. 2 ed. v, 480.—Poiret, Suppl. v, 740.—Elliott, Sk. ii, 685.—Hooker, Companion Bot. Mag. ii, 62.—Eaton, Manual, 6 ed. 236.—Eaton & Wright, Bot. 329.—Spach, Hist. Veg. x, 464.—Darby, Bot. S. States, 493.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 168.—Lesquereux in Owen's 2d Rep. Arkansas, 364.—Wood, Cl. Book, 392; Bot. & Fl. 143.—Koch, Dendrologie, ii, 456.—Vasey, Cat. Forest Trees, 16.

N. Ogeche, Marshall, Arbustum, 97.

N. coccinea, Bartram, Travels, 2 ed. 17.

N. tomentosa, Poiret in Lamarck, Dict. iv, 508.

N. candicans, Michaux, Fl. Bor.-Am. ii, 259.—Persoon, Syn. ii, 614.—Desfontaines, Hist. Arb. i, 37.—Willdenow, Spec. iv, 1113.—Pursh, Fl. Am. Sept. i, 117.—Poiret, Suppl. iv, 116.—Nuttall, Genera, ii, 236; Trans. Am. Phil. Soc. v, 167.—Rœmer & Schultes, Syst. v, 557.—Sprengel, Syst. i, 832.—Dietrich, Syn. i, 879.—Loudon, Arboretum, iii, 1318, f. 1199.—Browne, Trees of America, 426.

N. montana, Gærtner, Fruct. iii, 201, t. 216.

OGEECHEE LIME. SOUR TUPELO. GOPHER PLUM.

Georgia, from the valley of the Ogeechee to the Saint Mary's river, west Florida (near Vernon, *Mohr*), and in southern Arkansas.

A tree 9 to 18 meters in height, with a trunk 0.30 to 0.90 meter in diameter; deep swamps and river bottoms; rare and local.

Wood light, soft, not strong, tough, rather coarse-grained, compact, unwedgeable, containing many regularly-distributed open ducts; medullary rays numerous, thin; color, white, the sap-wood hardly distinguishable; specific gravity, 0.4613; ash, 0.34.

A conserve, under the name of "Ogeechee limes", is made from the large, acid fruit.

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154.—Nyssa sylvatica, Marshall,

Arbustum, 97.—Michaux f. Hist. Arb. Am. ii, 260, t. 21; N. American Sylva, 3 ed. iii, 29, t. 110.—Poiret, Suppl. iv, 116.—Barton, Prodr. Fl. Philadelph. 97; Compend. Fl. Philadelph. ii, 193.

N. aquatica, Linnæus, Spec. 1 ed. 1058, in part.—St. Hilaire, Fam. Nat. ii, 152.—Persoon, Syn. ii, 614.—Michaux f. Hist. Arb. Am. ii, 165, t. 22; N. American Sylva, 3 ed. iii, 31, t. 111.—Rœmer & Schultes, Syst. v, 576.—Barton, Prodr. Fl. Philadelph. 97; Compend. Fl. Philadelph. ii, 192.—Sprengel, Syst. i, 832.—Audubon, Birds, t. 133.—Elliott, Sk. ii, 684.—Dietrich, Syn. i, 878.—Eaton, Manual, 6 ed. 236.—Eaton & Wright, Bot. 329.—Spach, Hist. Veg. x, 464.—Darby, Bot. S. States, 492.—Chapman, Fl. S. States, 168.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 168.—Porcher, Resources S. Forests, 347.—Koch, Dendrologie, ii, 455.—Young, Bot. Texas, 304.—Vasey, Cat. Forest Trees, 16.

N. multiflora, Wangenheim, Amer. 46, t. 16, f. 39.—Elliott, Sk. ii, 684.—Walter, Fl. Caroliniana, 253.—Beck, Bot. 307.—Eaton, Manual, 6 ed. 236.—Eaton & Wright, Bot. 329.—Spach, Hist. Veg. x, 463.—Torrey, Fl. N. York, ii, 161, t. 95.—Emerson, Trees Massachusetts, 312, t. 17; 2 ed. ii, 353 & t.—Schnizlein, Icon. t. 108, f. 1, 2.—Darlington, Fl. Cestrica, 3 ed. 254.—Darby, Bot. S. States, 492.—Cooper in Smithsonian Rep. 1858, 252.—Chapman, Fl. S. States, 168.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 62.—Lesquereux in Owen's 2d Rep. Arkansas, 364.—Wood, Cl. Book, 392; Bot. & Fl. 143.—Gray, Manual N. States, 5 ed. 201.—Koch, Dendrologie, ii, 554.—Young, Bot. Texas, 304.—Vasey, Cat. Forest Trees, 16.—Broadhead in Coulter's Bot. Gazette, iii, 53.—Bessey in Am. Nat. xv, 134.—Bell in Geological Rep. Canada, 1879-'80, 55c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 68.—Burgess in Coulter's Bot. Gazette, vii, 95.

N. Caroliniana, Poiret in Lamarck, Dict. iv, 507; Lamarck, Ill. iii, 442, t. 851, f. 1.

N. biflora, Walter, Fl. Caroliniana, 253.—Lamarck, Dict. iv, 508.—Michaux, Fl. Bor.-Am. ii, 259.—Willdenow, Spec. iv, 1113; Enum. 1061; Berl. Baumz. 256.—Desfontaines, Hist. Arb. i, 37.—Gærtner f. Fruct. Suppl. 203, t. 216.—Aiton, Hort. Kew. 2 ed. v, 479.—Pursh, Fl. Am. Sept. i, 177.—Nuttall, Genera, ii, 236; Trans. Am. Phil. Soc. v, 167.—Poiret, Suppl. iv, 115.—Torrey in Ann. Lyc. N. York, ii, 200; Compend. Bot. N. States, 372.—Hayne, Dend. Fl. 229.—Eaton, Manual, 116.—Beck, Bot. 307.—Loudon, Arboretum, iii, 1317, f. 1195, 1196.—Browne, Trees of America, 423.—Baillon, Hist. Pl. v, 266, f. 241-244.

N. integrifolia, Aiton, Hort. Kew. iii, 446.—Persoon, Syn. ii, 614.

N. Canadensis, Poiret in Lamarck, Dict. iv, 507.

N. villosa, Michaux, Fl. Bor.-Am. ii, 258.—Willdenow, Spec. iv, 1112.—Desfontaines Hist. Arb. i, 37.—Aiton, Hort. Kew. 2 ed. v, 479.—Bigelow, Fl. Boston 3 ed. 380.—Pursh, Fl. Am. Sept. i, 117.—Nuttall, Genera, ii, 276.—Rœmer & Schultes, Syst. v, 575.—Sprengel, Syst. i, 832.—Torrey, Compend. Bot. N. States, 372.—Dietrich, Syn. i, 878.—Loudon, Arboretum, iii, 1317, f. 1197, 1198.

N. multiflora, var. *sylvatica*, Watson, Index, 442.

TUPELO. SOUR GUM. PEPPERIDGE. BLACK GUM.

Valley of the Kennebec river, Maine (Kent's Hill, *Prof. Stone*), West Milton, Vermont, west to central Michigan, south to Tampa bay, Florida, and the valley of the Brazos river, Texas.

A tree 15 to 36 meters in height, with a trunk 0.60 to 1.50 meter in diameter, or at the north much smaller; borders of swamps, or on rather high, rich hillsides and pine uplands; at the south often in pine-barren ponds and deep swamps, the base of the trunk then greatly enlarged and swollen (*N. aquatica*).

Wood heavy, rather soft, strong, very tough, unwedgeable, difficult to work, inclined to check unless carefully seasoned, not durable in contact with the soil, containing numerous regularly-distributed small open ducts; medullary rays numerous, thin; color, light yellow or often nearly white, the sap-wood hardly distinguishable; specific gravity, 0.6353; ash, 0.52; now largely used for the hubs of wheels, rollers in glass factories, ox yokes, and on the gulf coast for wharf piles.

NOTE.—Various forms of *Nyssa*, which at different times have been considered by botanists as entitled to specific rank, are connected by so many intermediate forms, and offer so few distinctive characters, that they are here united into one polymorphous species, which thus enlarged may properly bear Marshall's earlier name of *Nyssa sylvatica*, rather than the more familiar *Nyssa multiflora* of Wangenheim.

155.—Nyssa uniflora, Wangenheim,

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Amer. 83, t. 27, f. 57.—Walter, Fl. Caroliniana, 253.—Elliott, Sk. ii, 686.—Eaton & Wright, Bot. 329.—Darby, Bot. S. States, 493.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 168.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 62.—Wood, Cl. Book, 392; Bot. & Fl. 143.—Gray, Manual N. States, 5 ed. 201.—Koch, Dendrologie, ii, 455.—Young, Bot. Texas, 304.—Vasey, Cat. Forest Trees, 16.

N. aquatica, Linnæus, Spec. 1058, in part.—Marshall, Arbustum, 96.—Lamarck, Dict. iv, 507.—Desfontaines, Hist. Arb. i, 36.

N. denticulata, Aiton, Hort. Kew. iii, 446; 2 ed. v, 480.—Persoon, Syn. ii, 615.—Willdenow, Spec. iv, 1114.—Gærtner f. Fruct. Suppl. 203, t. 216.—Pursh. Fl. Am. Sept. i, 178.—Poiret, Suppl. iv, 115.—Nuttall, Genera, ii, 236.—Hayne, Dend. Fl. 229.—Rœmer & Schultes, Syst. v, 577.—Sprengel, Syst. i, 832.—Dietrich, Syn. i, 879.

N. angulosa, Poiret in Lamarck, Dict. iv, 507; Ill. iii, 442, t. 851, f. 2.—Rœmer & Schultes, Syst. v, 578.

N. palustris, Salisbury, Prodr. 175.

N. tomentosa, Michaux, Fl. Bor.-Am. ii, 259.—Persoon, Syn. ii, 615.—Willdenow, Spec. iv, 1113.—Pursh, Fl. Am. Sept. i, 177.—Nuttall, Genera, ii, 236.—Rœmer & Schultes, Syst. v, 577.—Elliott, Sk. ii, 685.—Sprengel, Syst. i, 832.—Audubon, Birds, t. 13.—Dietrich, Syn. i, 879.—Eaton & Wright, Bot. 329.—Darby, Bot. S. States, 493.

N. angulisans, Michaux, Fl. Bor.-Am. ii, 259.—Dietrich, Syn. i, 879.—Spach, Hist. Veg. x, 465.

N. grandidentata, Michaux f. Hist. Arb. Am. ii, 252, t. 19; N. American Sylva, 3 ed. ii, 34, t. 112.—Loudon, Arboretum, iii, 1319, f. 1200, 1201.—Lesquereux in Owen's 2d Rep. Arkansas, 364.

N. capitata var. *grandidentata*, Browne, Trees of America, 426.

LARGE TUPELO. COTTON GUM. TUPELO GUM.

Southern Virginia, south near the coast to the valley of the Saint Mary's river, Georgia, through the Gulf states to the valley of the Neches river, Texas, and through Arkansas and southern and southeastern Missouri to the valley of the lower Wabash river, Illinois.

A large tree, 21 to 30 meters in height, with a trunk 0.90 to 1.20 meter in diameter; deep swamps and river bottoms subject to frequent overflow; one of the largest and most common trees of the bottom lands of the lower Mississippi river basin, and reaching its greatest development in the cypress swamps of western Louisiana and eastern Texas, near the coast.

Wood light, soft, not strong, close-grained, compact, unwedgeable; medullary rays numerous, thin; color, light brown, or often nearly white; specific gravity, 0.5194; ash, 0.70; used in turnery, largely for woodenware, broom handles, and wooden shoes; that of the root for the floats of nets, etc., as a substitute for cork.

CAPRIFOLIACEÆ.

156.—Sambucus glauca, Nuttall;

Torrey & Gray, Fl. N. America, ii, 13.—Walpers, Rep. ii, 453.—Torrey in Pacific R. R. Rep. vi, 12; Ives' Rep. 15; Bot. Mex. Boundary Survey, 71.—Gray in Smithsonian Contrib. v, 66; Proc. Am. Acad. vii, 387; Syn. Fl. N. America, i², 9.—Watson in King's Rep. v, 134.—Vasey, Cat. Forest Trees, 16.—Brower & Watson, Bot. California, i, 278.—Hall in Coulter's Bot. Gazette, 88.—Rotbrock in Wheeler's Rep. vi, 135, 363.

S. Californica, Hort.—Koch, Dendrologie, ii, 72.

? *S. Mexicana*, Newberry in Pacific R. R. Rep. vi, 75 [not Presl].

ELDER.

Valley of the Fraser river and Vancouver's island, British Columbia, southward through California to the Mexican boundary, extending west to the Blue mountains of Oregon and the Wahsatch range, Utah.

A small tree, sometimes 8 to 9 meters in height, with a trunk 0.30 to 0.45 meter in diameter, or toward its northern limits reduced to a large shrub; confined to valleys, in dry, gravelly soil.

Wood light, soft, weak, coarse-grained, checking in drying; medullary rays numerous, rather conspicuous; color, yellow tinged with brown, the sap-wood lighter; specific gravity, 0.5087; ash, 1.57.

The large blue-black fruit edible and sometimes cooked.

157.—Sambucus Mexicana, Presl,

Hort. Hænk.—De Candolle, Prodr. iv, 322.—Don, Miller's Dict. iii, 437.—Loudon, Arboretum, ii, 1030.—Gray in Smithsonian Contrib. v, 66; Syn. Fl. N. America, i², 9.—Torrey in Pacific R. R. Rep. iv, 95; Bot. Mex. Boundary Survey, 71.—Brewer & Watson, Bot. California, i, 278.—Rothrock in Wheeler's Rep. vi, 135.—Hemsley, Bot. Am.-Cent. ii, 1.

S. glauca, Bentham, Pl. Hartweg. 313 [not Nuttall].

S. velutina, Durand & Hilgard in Jour. Philadelphia Acad. new ser. iii, 39.

ELDER.

Valley of the Nueces river (San Patricio), south and west along the southern boundary of the United States to Posa creek, Kern county, California, and southward into Mexico.

A small tree, sometimes 6 meters in height, with a trunk 0.15 to 0.25 meter in diameter; bottom lands, in moist, gravelly loam.

Wood light, soft, rather coarse-grained, compact; medullary rays numerous, thin, conspicuous; color, light brown, the sap-wood lighter; specific gravity, 0.4614; ash, 2.00.

158.—Viburnum Lentago, Linnæus,

Spec. 1 ed. 268.—Marshall, Arbustum, 160.—Wangenheim, Amer. 100.—Walter, Fl. Caroliniana, 116.—Aiton, Hort. Kew. i, 372; 2 ed. ii, 168.—Willdenow, Spec. i, 1491; Enum. 327; Berl. Baumz. 531.—Nouveau Duhamel, ii, 129.—Schkuhr, Handb. 234.—Michaux, Fl. Bor.-Am. i, 178.—Persoon, Syn. i, 327.—Desfontaines, Hist. Arb. i, 344.—Poiret in Lamarck, Dict. viii, 658.—Pursh, Fl. Am. Sept. i, 201.—Barton, Prodr. Fl. Philadelph. 40.—Eaton, Manual, 34; 6 ed. 387.—Nuttall, Genera, i, 202.—Hayne, Dend. Fl. 37.—Rœmer & Schultes, Syst. vi, 637.—Elliott, Sk. i, 365.—Torrey, Fl. U. S. i, 318; Compend. Fl. N. States, 138; Fl. N. York, i, 305.—Watson, Dend. Brit. i, t. 21.—Sprengel, Syst. i, 934.—Guimpel, Otto & Hayne, Abb. Holz. 125, t. 102.—De Candolle, Prodr. iv, 325.—Hooker, Fl. Bor.-Am. i, 279.—Beck, Bot. 156.—Don, Miller's Dict. iii, 440.—Spach, Hist. Veg. viii, 311.—Loudon, Arboretum, ii, 1033, f. 780.—Dietrich, Syn. ii, 1011.—Eaton & Wright, Bot. 473.—Torrey & Gray, Fl. N. America, ii, 15.—Bigelow, Fl. Boston. 3 ed. 123.—Penn. Cycl. xxvii, 294.—Emerson, Trees Massachusetts, 364; 2 ed. ii, 412.—Darlington, Fl. Cestrica, 3 ed. 115.—Darby, Bot. S. States, 342.—Chapman, Fl. S. States, 171.—Wood, Cl. Book, 398; Bot. & Fl. 147.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 194; Trans. St. Louis Acad. ii, 269.—Gray, Manual N. States, 5 ed. 206; Syn. Fl. N. America, i², 12.—Koch, Dendrologie, ii, 62.—Young, Bot. Texas, 309.—Vasey, Cat. Forest Trees, 16.—Macoun in Rep. Geological Surv. Canada, 1875–'76, 198.—Ridgway in Proc. U. S. Nat. Mus. 1882, 68.

SHEEPBERRY. NANNYBERRY.

Southern shores of Hudson bay west in British America to about longitude 102°, south through the northern states to southern Indiana and Saint Louis county, Missouri, and along the Alleghany mountains to northern Georgia.

A small tree, 6 to 9 meters in height, with a trunk sometimes 0.15 to 0.25 meter in diameter; rocky ridges and along borders of streams and swamps, in rich, moist soil; most common and reaching its greatest development far north.

Wood heavy, hard, close-grained, compact, emitting a disagreeable odor; medullary rays thin, barely distinguishable; color, dark orange-brown, the sap-wood nearly white; specific gravity, 0.7303; ash, 0.29.

159.—Viburnum prunifolium, Linnæus,

Spec. 1 ed. 268.—Marshall, Arbustum, 160.—Wangenheim, Amer. 98.—Walter, Fl. Caroliniana, 116.—Aiton, Hort. Kew. i, 371; 2 ed. ii, 167.—Willdenow, Spec. i, 1487; Enum. 326; Berl. Baumz. 530.—Abbot, Insects Georgia, ii, 53.—Nouveau Duhamel, ii, 128, t. 38.—Schkuhr, Handb. 233.—Michaux, Fl. Bor.-Am. i, 178.—Persoon, Syn. i, 326.—Desfontaines, Hist. Arb. i, 344.—Poiret in Lamarck, Dict. viii, 653.—Pursh, Fl. Am. Sept. i, 201.—Barton, Prodr. Fl. Philadeph. 39; Compend. Fl. Philadelph. i, 151.—Nuttall, Genera, i, 202.—Rœmer & Schultes, Syst. vi, 631.—Hayne, Dend. Fl. 37.—Torrey, Fl. U. S. i, 318; Compend. Fl. N. States, 138.—Elliott, Sk. i, 365.—Sprengel, Syst. i, 933.—Guimpel, Otto & Hayne, Abb. Holz. 125, t. 101.—Watson, Dend. Brit. i, t. 23.—Audubon, Birds, t. 23.—De Candolle, Prodr. iv, 325.—Beck, Bot. 156.—Don, Miller's Dict. iii, 440.—Spach, Hist. Veg. viii, 312.—Loudon, Arboretum, ii, 1034, t. 193.—Hooker, Fl. Bor.-Am. ii, 279.—Torrey & Gray, Fl. N. America, ii, 14.—Walpers, Rep. ii, 451.—Darlington, Fl. Cestrica, 3 ed. 115.—Darby, Bot. S. States, 342.—Chapman, Fl. S. States, 171.—Wood, Cl. Book, 398; Bot. & Fl. 147.—Gray, Manual N. States, 5 ed. 206; Syn. Fl. N. America, i², 12.—Engelmann in Trans. St. Louis Acad. ii, 269.—Koch, Dendrologie, ii, 62.—Young, Bot. Texas, 309.—Vasey, Cat. Forest Trees, 16.—Ridgway in Proc. U. S. Nat. Mus. 1882, 68.—Watson in Proc. Am. Acad. xviii, 96.

V. pyrifolium, Poiret in Lamarck, Dict. v, 658.—Pursh, Fl. Am. Sept. i, 201.—Nuttall, Genera, i, 202.—Barton, Compend. Fl. Philadelph. i, 152.—Rœmer & Schultes, Syst. vi, 631.—Hayne, Dend. Fl. 37.—Watson, Dend. Brit. i, t. 22.—Desfontaines, Hist. Arb. i, 345; Cat. Hort. Paris, 3 ed. 404.—De Candolle, Prodr. iv, 325.—Beck, Bot. 156.—Loudon, Arboretum, ii, 1034, f. 781, 782.—Bigelow, Fl. Boston, 3 ed. 123.

V. prunifolium, var. *ferrugineum*, Torrey & Gray, Fl. N. America, ii, 15.

BLACK HAW. STAG BUSH.

Fairfield county, Connecticut, valley of the lower Hudson river (Fishkill landing), south to Hernando county, Florida, and the valley of the Colorado river, Texas, west to Missouri, Arkansas, and the Indian territory.

A small tree, sometimes 6 to 9 meters in height, with a trunk rarely exceeding 0.15 meter in diameter, or at the north generally reduced to a low, much-branched shrub; usually on rocky hillsides, in rich soil.

Wood heavy, very hard, strong, brittle, close-grained, liable to check in drying; medullary rays numerous, very obscure; color, brown tinged with red, the sap-wood nearly white; specific gravity, 0.8332; ash, 0.52.

The edible fruit sweet and insipid; the tonic and astringent bark somewhat used in the treatment of uterine disorders in the form of decoctions or fluid extracts (*Boston Med. and Surg. Jour.* October 10, 1867.—*U. S. Dispensatory*, 14 ed. 1783.—*Nat. Dispensatory*, 2 ed. 1821).

RUBIACEÆ.

160.—Exostemma Caribæum, Rœmer & Schultes,

Syst. v, 18.—Sprengel, Syst. i, 705.—De Candolle, Prodr. iv, 359.—Don, Miller's Dict. iii, 481.—Dietrich, Syn. i, 722.—Spach, Hist. Veg. viii, 395.—Torrey & Gray, Fl. N. America, ii, 36.—Chapman, Fl. S. States, 180.—Grisebach, Fl. British West Indies, 324.—Guibourt, Hist. Drogues, 7 ed. iii. 187, f. 628.—Gray, Syn. Fl. N. America, i², 23.

Cinchona Caribæa, Jacquin, Stirp. Amer. t. 176, f. 65.—Gærtner, Fruct. i, 169, t. 33.—Aiton, Hort. Kew. i, 228; 2 ed. i, 372.—Lambert, Cinchona, 38, t. 12 (excl. syn.).—Andrews, Bot. Rep. vii, t. 481.

Cinchona Jamaicencis, Wright in Trans. Royal Soc. lxvii, 504, t. 10.

Semi-tropical Florida, on the southern keys; through the West Indies.

A small tree, sometimes 7 meters in height, with a trunk 0.20 to 0.30 meter in diameter.

Wood very heavy, exceedingly hard, strong, close-grained, checking in drying, satiny, susceptible of a beautiful polish; medullary rays numerous, very obscure; color, light brown, beautifully streaked with different shades of yellow and brown, the sap-wood clear, rich yellow; specific gravity, 0.9310; ash, 0.23.

161.—Pinckneya pubens, Michaux,

Fl. Bor.-Am. i, 103, t. 13.—Willdenow, Enum. Suppl. 30.—Aiton, Hort. Kew. 2 ed. i, 372.—Michaux f. Hist. Arb. Am. ii, 276, t. 24; N. American Sylva, i, 180, t. 49.—Pursh, Fl. Am. Sept. i, 158.—Nuttall, Genera, ii, 37.—Barton, Fl. N. America, i, 25, t. 7.—Sprengel, Syst. i, 705.—Elliott, Sk. i, 269.—Rafinesque, Med. Bot. ii, 57, t. 72.—De Candolle, Prodr. iv, 366.—Audubon, Birds, t. 165.—Eaton, Manual, 6 ed. 263.—Don, Miller's Dict. iii, 486.—Lindley, Fl. Med. 433.—Spach, Hist. Veg. viii, 400.—Eaton & Wright, Bot. 357.—Torrey & Gray, Fl. N. America, ii, 37.—Browne, Trees of America, 354.—Griffith, Med. Bot. 365, f. 174.—Darby, Bot. S. States, 347.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 179.—Wood, Cl. Book, 401; Bot. & Fl. 150.—Porcher, Resources S. Forests, 404.—Vasey, Cat. Forest Trees, 17.—Gray, Syn. Fl. N. America, i², 23.

Cinchona Caroliniana, Poiret in Lamarck, Dict. vi, 40.

P. pubescens, Persoon, Syn. i, 197.—Gærtner f. Fruct. Suppl. 81, t. 194, f. 3.

GEORGIA BARK.

South Carolina, near the coast; basin of the upper Apalachicola river in Georgia and Florida.

A small tree, 6 to 9 meters in height, with a trunk 0.15 to 0.30 meter in diameter; borders of streams, in low, sandy swamps; rare.

Wood light, soft, weak, close-grained, checking badly in drying; layers of annual growth clearly marked by four to six rows of large open ducts; medullary rays few, obscure; color, brown, the sap-wood lighter; specific gravity, 0.5350; ash, 0.41.

Infusions of the bark are successfully used in the treatment of intermittent fever, as a substitute for cinchona (*U. S. Dispensatory*, 14 ed. 1734).

162.—Genipa clusiæfolia, Grisebach,

Fl. British West Indies, 317.—Gray, Syn. Fl. N. America, i², 29.

Gardenia clusiæfolia, Jacquin, Coll. Appx. 37, t. 4, f. 3.—Persoon, Syn. i, 199.—De Candolle, Prodr. iv, 381; Dietrich, Syn. i, 796.

Randia clusiæfolia, Chapman, Fl. S. States, 179.—Vasey, Cat. Forest Trees, 17.

SEVEN-YEAR APPLE.

Semi-tropical Florida, on the southern keys; in the West Indies.

A small, much-branched, knotty tree, sometimes 6 meters in height, with a trunk rarely exceeding 0.10 meter in diameter, or in Florida more often a shrub; saline shores.

Wood very heavy, hard, close-grained, compact, susceptible of a beautiful polish; medullary rays numerous, thin; color, rich dark brown shaded with orange, the sap-wood light yellow; specific gravity, 1.0316; ash, 1.06.

The large insipid fruit popularly but incorrectly supposed to require seven years in which to ripen.

163.—Guettarda elliptica, Swartz,

Prodr. 59; Fl. Ind. Occ. i, 634.—Lamarck, Ill. ii, 218.—Persoon, Syn. i, 200.—Poiret, Suppl. ii, 859.—Rœmer & Schultes, Syst. iv, 442.—De Candolle, Prodr. iv, 457.—Dietrich, Syn. i, 787.—Don, Miller's Dict. iii, 551.—Torrey & Gray, Fl. N. America, ii, 35.—Grisebach, Fl. British West Indies, 332.—Gray, Syn. Fl. N. America, i², 30.

G. Blodgettii, Shuttleworth in herb.—Chapman, Fl. S. States, 178.—Vasey, Cat. Forest Trees, 17.

Semi-tropical Florida, on the southern keys; through the West Indies.

A small tree, 4 to 7 meters in height, with a trunk rarely exceeding 0.20 meter in diameter.

Wood heavy, hard, very close-grained, checking in drying, satiny, susceptible of a beautiful polish, containing numerous scattered small open ducts; medullary rays numerous, thin; color, light brown tinged with red; specific gravity, 0.8337; ash, 1.05.

ERICACEÆ.

164.—Vaccinium arboreum, Marshall,

Arbustum, 157.—Michaux, Fl. Bor.-Am. i, 230.—Persoon, Syn. i, 479.—Desfontaines, Hist. Arb. i, 270.—Pursh, Fl. Am. Sept. i, 285.—Nuttall, Genera, i, 263.—Elliott, Sk. i, 495.—Don, Miller's Dict. iii, 853.—London, Arboretum, ii, 1159.—De Candolle, Prodr. vii, 567.—Dietrich, Syn. ii, 1264.—Darby, Bot. S. States, 414.—Loddiges, Bot. Cab. t. 1885.—Walpers, Ann. ii, 1096.—Chapman, Fl. S. States, 259.—Wood, Cl. Book, 482; Bot. & Fl. 198.—Lesquereux in Owen's 2d Rep. Arkansas, 373.—Young, Bot. Texas, 369.—Gray, Hall's Pl. Texas, 15; Syn. Fl. N. America, ii¹, 20.—Vasey, Cat. Forest Trees, 71.

V. mucronatum, Walter, Fl. Caroliniana, 139 [not Linnæus].

V. diffusum, Aiton, Hort. Kew. ii, 356.—Bot. Mag. t. 1607.—Koch, Dendrologie, ii, 96.

Batodendron arboreum, Nuttall in Trans. Am. Phil. Soc. 2 ser. viii, 261; Sylva, iii, 43; 2 ed. ii, 111.

FARKLEBERRY.

North Carolina, south near the coast to Hernando county, Florida, through the Gulf states, and from southern Illinois and southern Missouri south through Arkansas and eastern Texas to the shores of Matagorda bay.

A small tree, 7 to 9 meters in height, with a trunk rarely 0.25 meter in diameter, or toward its northern limits often reduced to a low shrub; very common throughout the pine belt of the Gulf states along the larger ponds and streams, in moist, sandy soil, and reaching its greatest development in eastern Texas, near the coast.

Wood heavy, hard, very close-grained, compact, liable to twist in drying, satiny, susceptible of a beautiful polish; medullary rays numerous, broad, conspicuous; color, light brown tinged with red, the sap-wood hardly distinguishable; specific gravity, 0.7610; ash, 0.39; somewhat used in turnery in the manufacture of small handles, etc.

165.—Andromeda ferruginea, Walter,

Fl. Caroliniana, 138.—Aiton, Hort. Kew. ii, 67; 2 ed. iii, 52.—Willdenow, Sp. ii, 609.—Michaux, Fl. Bor.-Am. i, 252.—Nouveau Duhamel, i, 190.—Ventenat, Hort. Malmaison, 80, t. 80.—Persoon, Syn. i, 480.—Desfontaines, Hist. Arb. i, 257.—Pursh, Fl. Am. Sept. i, 292.—Elliott, Sk. i, 489.—Darby, Bot. S. States, 420.—Chapman, Fl. S. States, 263.—Wood, Cl. Book, 488; Bot. & Fl. 202.—Gray, Syn. Fl. N. America ii¹, 33.

A. rhomboidalis, Nouveau Duhamel, i, 192.

A. ferruginea, var. *arborescens*, Michaux, Fl. Bor.-Am. i, 252.

A. ferruginea, var. *fruticosa*, Michaux, Fl. Bor. Am. i, 252.

A. rigida, Pursh, Fl. Am. Sept. i, 292.—Loddiges, Bot. Cab. t. 430.

Lyonia ferruginea, Nuttall, Genera, i, 266.—Don, Miller's Dict. iii, 830.—Loudon, Arboretum, ii, 1109.—Dietrich, Syn. ii, 1399.—De Candolle, Prodr. vii, 600.—Koch, Dendrologie, ii, 122.

Lyonia rigida, Nuttall, Genera, i, 266.—Don, Miller's Dict. iii, 830.—De Candolle, Prodr, vii, 600.

South Carolina to northern Florida, near the coast.

A small tree, in rich hummocks, 6 to 9 meters in height, with a trunk 0.15 to 0.25 meter in diameter, often crooked or semi-prostrate; or in sandy pine-barren soil reduced to a low shrub, 0.60 to 0.90 meter in height; the leaves varying greatly in shape, venation, etc.

Wood heavy, hard, not strong, very close-grained, checking in drying, satiny, susceptible of a beautiful polish; medullary rays numerous, thin; color, bright brown tinged with red, the sap-wood a little lighter; specific gravity, 0.7500; ash, 0.46.

166.—Arbutus Menziesii, Pursh,

Fl. Am. Sept. i, 282.—Sprengel, Syst. ii, 286.—Don, Miller's Dict. iii, 834.—London, Arboretum, ii, 1122.—De Candolle, Prodr. vii, 582.—Dietrich, Syn. ii, 1387.—Hooker, Fl. Bor.-Am. ii, 36.—Hooker & Arnott, Bot. Beechey, 143.—Nuttall, Sylva, iii, 42, t. 95; 2 ed. ii, 109, t. 95.—Torrey in Pacific R. R. Rep. iv, 116; Bot. Wilkes Exped. 378.—Newberry in Pacific R. R. Rep. vi, 23, 79, f. 22.—Cooper in Smithsonian Rep. 1858, 260; Pacific R. R. Rep. xii², 29, 66.—Lyall in Jour. Linnæan Soc. vii, 131.—Gray in Proc. Am. Acad. vii, 393; Bot. California, i, 452, in part; Syn. Fl. N. America, ii¹, 27, in part.—Vasey, Cat. Forest Trees, 17.—Hall in Coulter's Bot. Gazette, ii, 88.—Macoun in Geological Rep. Canada, 1875–'76, 203.—G. M. Dawson in Canadian Nat. new ser. ix, 331.—Hemsley, Bot. Am.-Cent. ii, 276.

A. procera, Douglas in Lindley's Bot. Reg. xxi, t. 1753.—London, Arboretum, ii, 1121.—De Candolle, Prodr. vii, 582.—Dietrich, Syn. ii, 1387.—Paxton, Mag. Bot. ii, 147 & t.—Walpers, Rep. vi, 416.

A. laurifolia, Lindley, Bot. Reg. xxx, t. 67.—Hooker, Fl. Bor.-Am. ii, 36.

MADROÑA.

Islands of British Columbia, from Seymour narrows southward through Washington territory and Oregon, near the coast, and through the Coast ranges of California to the Santa Lucia mountains.

A small tree, sometimes 15 to 25 meters in height, with a trunk 0.90 to 1.20 meter in diameter, or, exceptionally, much larger (the great specimen near San Rafael, Marin county, California, 6.85 meters in circumference 2 meters from the ground); south of San Francisco bay much smaller, often reduced to a low shrub; hillsides, in rich soil.

Wood heavy, hard, strong, close-grained, checking in drying; medullary rays numerous, conspicuous; color, light brown shaded with red, the sap-wood lighter; specific gravity, 0.7052; ash, 0.40; largely used in the manufacture of gunpowder, the bark in tanning.

167.—Arbutus Xalapensis, HBK.

Nov. Gen. & Spec. iii, 281.—Sprengel, Syst. ii, 286.—Don, Miller's Dict. iii, 834.—Hooker, Icon. i, t. 27.—Bentham, Pl. Hartweg. 66.—De Candolle, Prodr. vii, 583.—Dietrich, Syn. ii, 1388.—Walpers, Ann. ii, 1105.—Jour. Hort. Soc. London, v, 192 & t.

?*A. variens*, Bentham, Pl. Hartweg. 77.—Paxton, Brit. Fl. Gard. ii, 118.—Hemsley, Bot. Am.-Cent. ii, 277.

?*A. macrophylla*, Martens & Galeotti in Bull. Acad. Brux. ix, 9.—Walpers, Rep. ii, 725.

A. Menziesii, Gray in Bot. California, i, 452, in part; Syn. Fl. N. America, ii¹, 27, in part.—Rothrock in Wheeler's Rep. vi, 25, 183 [not Pursh].

Southern Arizona, Santa Rita mountains, between 4,500 and 7,000 feet elevation; southward through northern Mexico.

A small tree, with white, scaly bark, 9 to 12 meters in height, with a trunk 0.45 to 0.60 meter in diameter; dry, gravelly slopes; large specimens generally hollow and defective.

Wood heavy, soft, not strong, brittle, close-grained, checking badly in drying, susceptible of a good polish; medullary rays numerous, obscure; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.7099; ash, 0.25.

168.—Arbutus Texana, Buckley,

Proc. Philadelphia Acad. 1861, 460.—Gray in Proc. Philadelphia Acad. 1862, 165.—Young, Bot. Texas, 370.

A. Menziesii, Gray in Bot. California, i, 452, in part; Syn. Fl. N. America, ii¹, 27, in part.

?*A. Xalapensis*, Watson in Proc. Am. Acad. xviii, 111.

Western Texas, Hays and Travis counties (*Buckley*), west to the Guadalupe and Eagle mountains (*Havard*), and southward, probably into northern Mexico.

A small tree, 5 to 6 meters in height, with a trunk 0.15 to 0.25 meter in diameter; dry limestone hills and ridges; rare.

Wood heavy, hard, close-grained, compact; medullary rays numerous, obscure; color, brown, the sap-wood lighter, tinged with red; specific gravity, 0.7500; ash, 0.51; used in turnery, the manufacture of mathematical instruments, etc.

NOTE.—The synonomy and specific position of the Mexican species of *Arbutus* which reach the southern boundary of the United States are still obscure, and cannot be well elucidated with the existing knowledge of the Mexican flora.

169.—Oxydendrum arboreum, De Candolle,

Prodr. vii, 601.—Dietrich, Syn. ii, 1389.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 263.—Lesquereux in Owen's 2d Rep. Arkansas, 372.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 79.—Wood, Cl. Book, 489; Bot. & Fl. 203.—Gray, Manual N. States, 5 ed. 296; Syn. Fl. N. America, ii[1], 33.—Koch, Dendrologie, ii, 128.—Vasey, Cat. Forest Trees, 17.—Nat. Dispensatory, 2 ed. 798.

Andromeda arborea, Linnæus, Spec. 1 ed. 394.—Lamarck, Dict. i, 158.—Marshall, Arbustum, 7.—Wangenheim, Amer. 105.—Walter, Fl. Caroliniana, 138.—Aiton, Hort. Kew. ii, 69; 2 ed. iii, 53.—Willdenow, Spec. ii, 612; Enum. 452; Berl. Baumz. 31.—Michaux, Fl. Bor.-Am. i, 255.—Nouveau Duhamel, i, 178.—Bot. Mag. t. 905.—Desfontaines, Hist. Arb. i, 257.—Michaux f. Hist. Arb. Am. iii, 222, t. 7; N. American Sylva, 3 ed. ii, 126, t. 85.—Pursh, Fl. Am. Sept. i, 295.—Nuttall, Genera, i, 265.—Elliott, Sk. i, 491.—Barton, Fl. N. America, i, 105, t. 30.—Hayne, Dend. Fl. 59.—Torrey, Fl. U. S. i, 420; Compend. Fl. N. States, 182.—Sprengel, Syst. ii, 291.—Gray, Manual N. States, 1 ed. 266.—Darby, Bot. S. States, 419.—Porcher, Resources S. Forests, 379.

Andromeda arborescens, Persoon, Syn. i, 480.—Willdenow, Enum. 453.—Loddiges, Bot. Cab. t. 1210.

Lyonia arborea, Don in Edinburgh Phil. Jour. xvii, 159.—Don, Miller's Dict. iii, 831.—Loudon, Arboretum, ii, 1111.—Spach, Hist. Veg. ix, 486.—Browne, Trees of America, 356.

SORREL TREE. SOUR WOOD.

Western Pennsylvania, southward along the Alleghany mountains to western Florida and the eastern shores of Mobile bay, west to middle Tennessee and through the upper regions of the Gulf states to western Louisiana.

A small tree, 12 to 18 meters in height, with a trunk 0.25 to 0.35 meter in diameter; usually in rather dry, gravelly soil.

Wood heavy, hard, very close-grained, compact, susceptible of a beautiful polish; medullary rays numerous, thin; color, brown tinged with red, the sap-wood somewhat lighter; specific gravity, 0.7458; ash, 0.37; used for the handles of tools, bearings of machinery, etc.

170.—Kalmia latifolia, Linnæus,

Spec. 1 ed. 391.—Kalm, Travels, English ed. i, 335.—Marshall, Arbustum, 72.—Lamarck, Dict. ii, 345; Ill. ii, 487, t. 363, f. 1.—Gærtner, Fruct. i, 305, t. 63, f. 7.—Wangenheim, Amer. 64, t. 24, f. 50.—Walter, Fl. Caroliniana, 138.—Aiton, Hort. Kew. ii, 64; 2 ed. iii, 47.—Lamarck, Ill. 487, t. 363, f. 1.—Abbot, Insects Georgia, i, t. 87.—Willdenow, Spec. ii, 600; Enum. 450; Berl. Baumz. 202.—Schkuhr, Handb. 359, t. 116.—Michaux, Fl. Bor.-Am. i, 258.—Persoon, Syn. i, 477.—Desfontaines, Hist. Arb. i, 220.—Robin, Voyages, iii, 419.—Michaux f. Hist. Arb. Am. iii, 144, t. 4; N. American Sylva, 3 ed. ii, 62, t. 67.—Pursh, Fl. Am. Sept. i, 296.—Barton, Prodr. Fl. Philadelph. 49.—Eaton, Manual, 47; 6 ed. 195.—Bigelow, Med. Bot. i, 113, t. 13; Fl. Boston. 3 ed. 179.—Nuttall, Genera, i, 267.—Hayne, Dend. Fl. 54.—Elliott, Sk. i, 481.—Torrey, Fl. U. S. i, 422; Compend. Fl. N. States, 182.—Sprengel, Syst. ii, 293.—Audubon, Birds, t. 55.—Rafinesque, Med. Bot. ii, 16, t. 57.—Sertum Botanicum, iv & t.—Beck, Bot. 219.—Don, Miller's Dict. iii, 850.—Lindley, Fl. Med. 380.—Loudon, Arboretum, ii, 1151, f. 959.—De Candolle, Prodr. vii, 729.—Spach, Hist. Veg. ix, 498, t. 139.—Hooker, Fl. Bor.-Am. ii, 41.—Dietrich, Syn. ii, 1407.—Browne, Trees of America, 363.—Emerson, Trees Massachusetts, 392; 2 ed. ii. 443 & t.—Griffith, Med. Bot. 428, f. 192.—Darlington, Fl. Cestrica, 3 ed. 172.—Darby, Bot. S. States, 420.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 264.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 99.—Lesquereux in Owen's 2d Rep. Arkansas, 373.—Wood, Cl. Book, 484; Bot. & Fl. 200.—Porcher, Resources S. Forests, 381.—Gray, Manual N. States, 5 ed. 298; Syn. Fl. N. America, ii[1], 38.—Koch, Dendrologie, ii, 152.—Vasey, Cat. Forest Trees, 17.—London Garden, xxii, 6, t. 343.

LAUREL. CALICO BUSH. SPOON WOOD. IVY.

New Brunswick and the northern shores of lake Erie, south to western Florida, and through the Gulf states to western Louisiana and the valley of the Red river, Arkansas (Hot Springs, *Letterman*).

A small tree, sometimes 9 to 12 meters in height, with a trunk 0.30 to 0.60 meter in diameter, or more often a low shrub; rich woodlands; most common and reaching its greatest development in the southern Alleghany mountains, here often forming dense, impenetrable thickets.

Wood heavy, hard, strong, brittle, close-grained, compact; principal medullary rays broad, dark brown, conspicuous, intermediate rays numerous, thin, inconspicuous; color, brown tinged with red, the sap-wood somewhat lighter; specific gravity, 0.7160; ash, 0.41; used for tool handles, in turnery, and for fuel.

The leaves, buds, and fruit, reputed poisonous to cattle, are occasionally used medicinally (*U. S. Dispensatory*, 14 ed. 1682.—*Nat. Dispensatory*, 2 ed. 798).

171.—Rhododendron maximum, Linnæus,

Spec. 1 ed. 391.—Marshall, Arbustum, 127.—Gærtner, Fruct. i, 304, t. 63, f. 6.—Wangenheim, Amer. 63, t. 22, f. 49.—Aiton, Hort. Kew. ii, 67; 2 ed. iii, 50.—Mœnch, Meth. 45.—Lamarck, Dict. vi, 365; Ill. ii, 448, t. 364, f. 1.—B. S. Barton, Coll. i, 18.—Willdenow, Spec. ii, 606; Enum. 451; Berl. Baumz. 357.—Nouveau Duhamel, ii, 141.—Michaux, Fl. Bor.-Am. i, 259.—Schkuhr, Handb. 362.—Persoon, Syn. i, 478.—Desfontaines, Hist. Arb. i, 221.—Bot. Mag. t. 951.—Michaux f. Hist. Arb. Am. iii, 144, t. 4; N. American Sylva, 3 ed. ii, 64, t. 68.—Pursh, Fl. Am. Sept. i, 297.—Eaton, Manual, 47; 6 ed. 301.—Nuttall, Genera, i, 268.—Bigelow, Med. Bot. iii, 101, t. 51; Fl. Boston. 3 ed. 178.—Elliott, Sk. i, 483.—Hayne, Dend. Fl. 57.—Torrey, Fl. U. S. i, 426; Compend. Fl. N. States, 184.—Sprengel, Syst. ii, 292.—Audubon, Birds, t. 103.—Beck, Bot. 220.—Don, Miller's Dict. iii, 843.—Loudon, Arboretum, ii, 1134, f. 932.—De Candolle, Prodr. vii, 722.—Hooker, Fl. Bor.-Am. ii, 43.—Spach, Hist. Veg. ix, 503.—Dietrich, Syn. ii, 1404.—Eaton & Wright, Bot. 391.—Browne, Trees of America, 359.—Emerson, Trees Massachusetts, 384; 2 ed. ii, 435 & t.—Griffith, Med. Bot. 428.—Darlington, Fl. Cestrica, 3 ed. 171.—Darby, Bot. S. States, 421.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 265.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 97.—Lesquereux in Owen's 2d Rep. Arkansas, 373.—Wood, Cl. Book, 491; Bot. & Fl. 204.—Porcher, Resources S. Forests, 380.—Gray, Manual N. States, 5 ed. 300; Syn. Fl. N. America ii[1], 42.—Koch, Dendrologie, ii, 169.—Vasey, Cat. Forest Trees, 17.

R. procerum, Salisbury, Prodr. 287.

R. maximum, var. *roseum*, Pursh, Fl. Am. Sept. i, 297.—Elliott, Sk. i, 484.

R. maximum, var. *album*, Pursh, Fl. Am. Sept. i, 297.—Elliott, Sk. i, 484.

R. maximum, var. *purpureum*, Pursh, Fl. Am. Sept. i, 297.—Elliott, Sk. i, 484.

R. purpureum, Don, Miller's Dict. iii, 843.—Loudon, Arboretum, ii, 1134.—Dietrich, Syn, ii, 1404.

R. Purshii, Don, Miller's Dict. iii, 843.—Loudon, Arboretum, ii, 1135.—Dietrich, Syn. ii, 1404 (var. *album*, Pursh, *l. c.*).

GREAT LAUREL. ROSE BAY.

Nova Scotia and the northern shores of lake Erie, south through New England, New York, and along the Alleghany mountains to northern Georgia.

A small tree, sometimes 10 to 12 meters in height, with a trunk rarely exceeding 0.30 meter in diameter, or often a tall, straggling shrub; at the north in cold swamps; rare; very common and reaching its greatest development in the southern Alleghany mountains, steep, rocky banks of streams, etc.; never on limestone.

Wood heavy, hard, strong, brittle, close-grained, compact; medullary rays numerous, thin; color, light clear brown, the sap-wood lighter; specific gravity, 0.6303; ash, 0.36; occasionally used in turnery for the handles of tools, etc., and a possible substitute for box-wood in engraving. A decoction of the leaves is occasionally used domestically in the treatment of rheumatism, sciatica, etc.

MYRSINACEÆ.

172.—Myrsine Rapanea, Rœmer & Schultes,

Syst. iv, 509.—Don, Miller's Dict. iv, 10.—Dietrich, Syn. i, 618.—A. De Candolle, Prodr. viii, 97.—Miquel in Martins, Fl. Brasil. ix, 307, t. 50–52.—Gray, Syn. Fl. N. America ii[1], 65.

Rapanea Guyanensis, Aublet, Guian. i, 121, t. 46.—Swartz, Obs. 51; Fl. Ind. Occ. i, 262.—Lamarck, Ill. ii, 48, t. 122, f. 1.

Samara pentandra, Swartz, Obs. 51; Fl. Ind. Occ. i, 262 [not Aiton].

Samara floribunda, Willdenow, Spec. i, 665.—Lamarck, Ill. ii, 46, t. 122, f. 1.

Caballeria coriacea, Meyer, Prim. Fl. Esseq. 118.

M. Floridana, A. De Candolle in Trans. Linnæan Soc. xvii, 107; Prodr. viii, 98.—Dietrich, Syn. i, 98.—Chapman, Fl. S. States, 277.

M. floribunda, Grisebach, Fl. British West Indies, 393.

Semi-tropical Florida, Indian river southward to the southern keys; through the West Indies to Brazil.

A small tree, in Florida rarely exceeding 8 meters in height, with a trunk 0.10 to 0.15 meter in diameter, or often a shrub; borders of ponds and fresh-water creeks; in the West Indies much larger.

Wood heavy, hard, very close-grained, compact; medullary rays numerous, very conspicuous; color, brown tinged with red and beautifully striped with the darker medullary rays, the sap-wood hardly distinguishable; specific gravity, 0.8341; ash, 0.81.

173.—Ardisia Pickeringia, Nuttall,

Sylva, iii, 69, t. 102; 2 ed. ii, 133, t. 102.—A. De Candolle, Prodr. viii, 124.—Cooper in Smithsonian Rep. 1858, 264.—Chapman, Fl. S. States, 277.—Vasey, Cat. Forest Trees, 19.—Gray, Syn. Fl. N. America, ii[1], 65.—Hemsley, Bot. Am.-Cent. ii, 294.

Cyrilla paniculata, Nuttall in Am. Jour. Sci. v, 290.

Pickeringia paniculata, Nuttall in Jour. Philadelphia Acad. vii, 1.

MARLBERRY. CHERRY.

Semi-tropical Florida, Mosquito inlet to the southern keys, west coast, Caloosa river to cape Romano; in the West Indies and southern Mexico.

A small tree, sometimes 8 meters in height, with a trunk rarely 0.15 meter in diameter, or often a shrub; reaching its greatest development in Florida on the shores of bay Biscayne.

Wood heavy, hard, very close-grained, compact, susceptible of a beautiful polish; medullary rays very numerous, conspicuous; color, rich brown, beautifully marked with the darker medullary rays, the sap-wood a little lighter; specific gravity, 0.8602; ash, 1.85.

174.—Jacquinia armillaris, Jacquin,

Amer. 53, t. 39.—Linnæus, Spec. 2 ed. 272.—Aiton, Hort. Kew. i, 257; 2 ed. ii, 5.—Lamarck, Ill. ii, 46, t. 39.—Vahl, Eclog. i, 26.—Swartz, Obs. 85.—Willdenow, Spec. i, 1064; Enum. 246.—Persoon, Syn. i, 234.—Rœmer & Schultes, Syst. iv, 490.—Sprengel, Syst. i, 668.—Don, Miller's Dict. iv, 24.—Dietrich, Syn. i, 638.—Bentham, Bot. Sulphur, 123.—A. De Candolle, Prodr. viii, 149.—Miquel in Martius, Fl. Brasil. ix, 282, t. 27.—Cooper in Smithsonian Rep. 1858, 265.—Chapman, Fl. S. States, 276.—Grisebach, Fl. British West Indies, 397.—Seemann, Jour. Bot. iii, 279.—Vasey, Cat. Forest Trees, 19.—Gray, Syn. Fl. N. America, ii[1], 66.—Hemsley, Bot. Am.-Cent. ii, 294.

Chrysophyllum Barbasco, Lœfling, Iter. 204, 277.

JOE WOOD.

Semi-tropical Florida, on the southern keys; rare; through the West Indies to Brazil.

A low, rigid tree, rarely exceeding in Florida 4 meters in height, with a trunk sometimes 0.15 meter in diameter; in the Bahamas and other West Indian islands probably much larger.

Wood heavy, hard, coarse-grained, checking and shrinking badly in drying, containing many scattered large open ducts; medullary rays numerous, broad, conspicuous; color, light clear brown tinged with yellow; specific gravity, 0.6948; ash, 3.45.

The saponaceous leaves sometimes used as a substitute for soap.

SAPOTACEÆ.

175.—Chrysophyllum oliviforme, Lamarck,

Dict. i, 552; Ill. ii, 42.—Descourtilz, Fl. Med. Antilles, ii, 71.—A. De Candolle, Prodr. viii, 158.—Grisebach, Fl. British West Indies, 398.—Gray, Syn. Fl. N. America, ii[1], 67.—Chapman, Fl. S. States, Suppl. 634.

C. Caneto, *β*. Linnæus, Sp. 3 ed. 278 (excl. syn. Lœfling).

C. monopyrenum, Swartz, Prodr. 49; Fl. Ind. Occ. i, 480.—Persoon, Syn. i, 236.—Rœmer & Schultes, Syst. iv 703.—Sprengel, Syst. i, 666.—Bot. Mag. t. 3303.—Dietrich, Syn. i, 638.—Miquel in Martius, Fl. Brasil. vii, 94.

C. ferrugineum, Gærtner f. Fruct. Suppl. 120, t. 202, f. 1.

C. microphyllum, Chapman in Coulter's Bot. Gazette, iii, 9.—Vasey, Cat. Forest Trees, 18 [not A. De Candolle].

Semi-tropical Florida, cape Canaveral to the southern keys (Elliott's Key, No-Name Key, Key Largo), west coast, Caloosa river to cape Sable; rare; through the West Indies to Brazil.

A small tree, sometimes 9 meters in height, with a trunk 0.25 to 0.30 meter in diameter.

Wood very heavy, hard, strong, close-grained, checking in drying; medullary rays numerous, not conspicuous; color, light brown shaded with red, the thin sap-wood a little lighter; specific gravity, 0.9360; ash, 1.24.

176.—Sideroxylon Mastichodendron, Jacquin,

Coll. ii, t. 17, f. 5.—Lamarck, Ill. ii, 41, t. 120, f. 2.—Gærtner f. Fruct. Suppl. 125.—Sprengel, Syst. i, 666.—Dietrich, Syn. i, 622.—A. De Candolle, Prodr. viii, 181.—Grisebach, Fl. British West Indies, 399.—Gray, Syn. Fl. N. America ii[1], 67.

Bumelia pallida, Swartz, Prodr. 40; Fl. Ind. Occ. 489.

Achras pallida, Poiret in Lamarck, Dict. vi, 533.

Bumelia Mastichodendron, Rœmer & Schultes, Syst. iv, 493.

S. pallidum, Sprengel, Syst. i, 666.—A. De Candolle, Prodr. viii, 180.—Chapman, Fl. S. States, 274.—Vasey, Cat. Forest Trees, 18.

Bumelia fœtidissima, Nuttall, Sylva, iii, 39, t. 94; 2 ed. ii, 108, t. 94.—Cooper in Smithsonian Rep. 265.

MASTIC.

Semi-tropical Florida, cape Canaveral to the southern keys, west coast, cape Romano to cape Sable; in the West Indies.

A tree often 18 meters in height, with a trunk 0.60 to 0.90 meter in diameter; the largest and most valuable tree of semi-tropical Florida; common.

Wood very heavy, exceedingly hard, strong, close-grained, checking in drying, containing few scattered small open ducts; medullary rays numerous, not conspicuous; color, bright orange, the sap-wood yellow; specific gravity, 1.0109; ash, 5.14; not affected by the teredo; largely used in ship- and boat-building.

The dry fruit, of a pleasant subacid flavor, eagerly eaten by animals.

177.—Dipholis salicifolia, A. De Candolle,

Prodr. viii, 188 (Delessert, Icon. Mex. *ined.* t. 40).—Richard, Fl. Cuba, t. 54[2].—Miquel in Martius, Fl. Brasil. vii, 45, t. 18.—Chapman, Fl. S. States, 274.—Grisebach, Fl. British West Indies, 401.—Vasey, Cat. Forest Trees, 18.—Gray, Syn. Fl. N. America ii[1], 67.

Achras salicifolia, Linnæus, Spec. 2 ed. 470.

Bumelia salicifolia, Swartz, Prodr. 50; Fl. Ind. Occ. i, 491.—Lamarck, Ill. ii, 42.—Willdenow, Spec. i, 1086.—Aiton, Hort. Kew. 2 ed. ii, 12.—Rœmer & Schultes, Syst. iv, 494.—Dietrich, Syn. i, 621.

Sideroxylon salicifolium, Gærtner f. Fruct. Suppl. 124, t. 202.—Lamarck, Ill. ii, 42.

BUSTIC. CASSADA.

Semi-tropical Florida, bay Biscayne to the southern keys; through the West Indies to Brazil.

A tree sometimes 15 meters in height, with a trunk rarely 0.60 meter in diameter; the large trees hollow and defective; rare.

Wood very heavy, exceedingly hard, very strong, close-grained, compact, checking in drying, susceptible of a beautiful polish, containing many scattered large open ducts; color, dark brown or red, the sap-wood lighter; specific gravity, 0.9316; ash, 0.32.

178.—Bumelia tenax, Willdenow,

Spec. i, 1088; Enum. 248; Berl. Baumz. 67.—Aiton, Hort. Kew. 2 ed. ii, 12.—Rœmer & Schultes, Syst. iv, 496.—Elliott, Sk. i, 288.—Persoon, Syn. i, 237.—Hayne, Dend. Fl. 18.—Sprengel, Syst. i, 664.—Eaton, Manual, 6 ed. 60.—Don, Miller's Dict. iv, 30.—London, Arboretum, ii, 1193, f. 1017.—Dietrich, Syn. i, 621.—Spach, Hist. Veg. ix, 388.—Eaton & Wright, Bot. 162.—Nuttall, Sylva, iii, 35, t. 92; 2 ed. ii, 104, t. 92.—A. De Candolle, Prodr. viii, 196.—Darby, Bot. S. States, 428.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 275.—Wood, Cl. Book, 501; Bot. & Fl. 210.—Vasey, Cat. Forest Trees, 19.—Gray, Syn. Fl. N. America, ii[1], 68.

Sideroxylon tenax, Linnæus, Mant. 48.—Jacquin, Coll. ii, 252.—Lamarck, Dict. i, 245; Ill. ii, 42.—Aiton, Hort. Kew, i, 262.—Swartz, Obs. 91.—Desfontaines, Hist. Arb. i, 204.—Robin, Voyages, iii, 461.

Sideroxylon Carolinense, Jacquin, Obs. iii, 3, t. 54.

Sideroxylon sericeum, Walter, Fl. Caroliniana, 100.

Sideroxylon chrysophylloides, Michaux, Fl. Bor.-Am. i, 123.—Rafinesque, Fl. Ludoviciana, 53.

B. chrysophylloides, Pursh, Fl. Am. Sept. i, 155.—Nuttall, Genera, i, 135.—Watson, Dend. Brit. i, t. 10.

?*B. reclinata*, Chapman, Fl. S. States, 275 [not Ventenat].

North Carolina, south near the coast to cape Canaveral and Cedar Keys, Florida.

A small tree, 6 to 9 meters in height, with a trunk sometimes 0.15 meter in diameter; sandy soil.

Wood heavy, hard, not strong, very close-grained, compact, susceptible of a beautiful polish; well characterized, as in all the North American species, by large open ducts, defining, with several rows, the rings of annual growth, and connected by conspicuous branching groups of similar ducts, giving to a cross-section a beautifully reticulated appearance; medullary rays numerous, thin; color, light brown streaked with white, the sap-wood lighter; specific gravity, 0.7293; ash, 0.78.

179.—Bumelia lanuginosa, Persoon,

Syn. i, 237.—Pursh, Fl. Am. Sept. i, 155.—Nuttall, Genera, i, 135.—Rœmer & Schultes, Syst. iv, 497.—Elliott, Sk. i, 288.—Eaton, Manual, 6 ed. 60.—Don, Miller's Dict. iv, 30.—Loudon, Arboretum, ii, 1194.—Eaton & Wright, Bot. 162.—A. De Candolle, Prodr. viii, 190.—Darby, Bot. S. States, 428.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 275.—Lesquereux in Owen's 2d Rep. Arkansas, 374.—Wood, Cl. Book, 501; Bot. & Fl. 210.—Gray, Manual N. States, 5 ed. 308; Hall's Pl. Texas, 15; Syn. Fl. N. America, ii[1], 68.—Young, Bot. Texas, 377.—Vasey, Cat. Forest Trees, 19.

?*Sideroxylon tenax*, Walter, Fl. Caroliniana, 100.

Sideroxylon lanuginosum, Michaux, Fl. Bor.-Am. i, 122.

?*B. oblongifolia*, Nuttall, Genera, i, 135; Sylva, iii, 33; 2 ed. ii, 102.—Sprengel, Syst. i, 664.—Eaton, Manual, 6 ed. 60.—Eaton & Wright, Bot. 162.—Don, Miller's Dict. iv, 30.—Loudon, Arboretum, ii, 1194.—Dietrich, Syn. i, 621.—A. De Candolle, Prodr. viii, 190.—Lesquereux in Owen's 2d Rep. Arkansas, 374.

B. ferruginea, Nuttall, Sylva, iii, 34; 2 ed. ii, 103.

B. tomentosa, A. De Candolle, Prodr. viii, 190.

B. arborea, Buckley in Proc. Philadelphia Acad. 1861, 461.

GUM ELASTIC. SHITTIM WOOD.

Georgia and northern Florida to Mobile bay, Alabama; southern Illinois and southern Missouri, through Arkansas to the valley of the Rio Grande, Texas (Eagle pass, *Havard*) (*B. oblongifolia*).

An evergreen tree, sometimes 18 meters in height, with a trunk 0.90 meter in diameter, or in the Atlantic states much smaller, rarely exceeding 6 meters in height; common and reaching its greatest development in the rich bottom lands of eastern Texas.

A low, depressed form of the sand-hills of the Altamaha river, Georgia, still to be rediscovered, with small leaves and "edible fruit as large as a small date", is var. macrocarpa, Gray, Syn. Fl. N. America, ii[1], 68 (*B. macrocarpa*, Nuttall, Sylva, iii, 37; 2 ed. ii, 106).

Wood heavy, soft, weak, close-grained, very compact, the open ducts conspicuous; medullary rays numerous, thin; color, light brown or yellow, the sap-wood lighter; specific gravity, 0.6544; ash, 1.23; somewhat used in cabinet-making, for which it is well suited.

A clear, very viscid gum exuded from the freshly-cut wood is sometimes used domestically.

180.—Bumelia spinosa, A. De Candolle,

Prodr. viii, 191 (Delessert, Icon. Mex. *ined.* t. 75).—Hemsley, Bot. Am.-Cent. ii, 299.—Watson in Proc. Am. Acad. xviii, 112.

Santa Catalina mountains, Arizona, at an elevation of 2,700 feet (*Pringle*); Parras and Saltillo, Mexico (*Palmer*, No. 787).

A small tree, 6 to 7 meters in height, with a trunk 0.20 to 0.25 meter in diameter; dry, gravelly soil, near water-courses.

Wood heavy, hard, very close-grained, compact, the open ducts conspicuous; medullary rays thin, obscure; color, light rich brown or yellow, the sap-wood lighter; specific gravity, 0.6603; ash, 1.24.

181.—Bumelia lycioides, Gærtner f.

Fruct. Suppl. 127, t. 120.—Persoon, Syn. i, 237.—Willdenow, Enum. 249; Berl. Baumz. 68.—Pursh, Fl. Am. Sept. i, 237.—Nuttall, Genera, i, 135; Sylva, iii, 31, t. 91; 2 ed. ii, 101, t. 91.—Rœmer & Schultes, Syst. iv, 495.—Hayne, Dend. Fl. 19.—Elliott, Sk. i, 287.—Sprengel, Syst. i, 664.—Eaton, Manual, 6 ed. 60.—Don, Miller's Dict. iv, 30.—Loudon, Arboretum, ii, 1193, f. 1016.—Dietrich, Syn. i, 621.—Spach, Hist. Veg. ix, 388.—Eaton & Wright, Bot. 162.—A. De Candolle, Prodr. viii, 189.—Griffith, Med. Bot. 441.—Darby, Bot. S. States, 427.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 275.—Lesquereux in Owen's 2d Rep. Arkansas, 374.—Wood, Cl. Book, 501; Bot. & Fl. 210.—Gray, Manual N. States, 5 ed. 308; Syn. Fl. N. America, ii[1], 68.—Young, Bot. Texas, 376.—Vasey, Cat. Forest Trees, 19.—Hemsley, Bot. Am.-Cent. ii, 298.

Sideroxylon lycioides, Linnæus, Hort. Cliff. 488 (excl. hab.).—Lamarck, Dict. i, 246; Ill. ii, 42.—Aiton, Hort. Kew. i, 262; 2 ed. ii, 13.—Willdenow, Spec. i, 1090.—Michaux, Fl. Bor.-Am. i, 122.—Pursh, Fl. Am. Sept. i, 155.—Jaume St. Hilaire, Fl. & Pom. Am. Franc. t. 81.

Sideroxylon decandrum, Linnæus, Mant. 48.—Willdenow, Spec. i, 1091.

Syderoxylon læve, Walter, Fl. Caroliniana, 100.

IRON WOOD. SOUTHERN BUCKTHORN.

Coast of Virginia and southern Illinois, south to Mosquito inlet and Caloosa river, Florida, and through southern Missouri, Arkansas, and Texas to the valley of the Rio Coneho, Texas.

A small tree, sometimes 9 to 12 meters in height, with a trunk rarely exceeding 0.15 meter in diameter; low, rich soil, or often, in the Atlantic and Gulf states, a low, semi-prostrate shrub, described as—

var. **reclinatum**, Gray, Syn. Fl. N. America, ii[1], 68.

Sideroxylon reclinatum, Michaux, Fl. Bor.-Am. i, 122.

B. reclinata, Ventenat, Choix, t. 22.—Persoon, Syn. i, 237.—Pursh, Fl. Am. Sept. i, 155.—Rœmer & Schultes, Syst. iv, 496.—Elliott, Sk. i, 287.—Eaton, Manual, 6 ed. 60.—Dietrich, Syn. i, 621.—Don, Miller's Dict. iv, 30.—Loudon, Arboretum, ii, 1193.—A. De Candolle, Prodr. viii, 190.—Darby, Bot. S. States, 428.—Wood, Cl. Book, 501; Bot. & Fl. 210.

Wood heavy, hard, not strong, close-grained, compact; medullary rays numerous, thin; color, light brown or yellow, the sap-wood lighter; specific gravity, 0.7467; ash, 0.81.

182.—Bumelia cuneata, Swartz,

Fl. Ind. Occ. i, 496.—Persoon, Syn. i, 237.—Rœmer & Schultes, Syst. iv, 498.—Sprengel, Syst. i, 665.—Don, Miller's Dict. iv, 30.—Dietrich, Syn. i, 621.—Grisebach, Fl. British West Indies, 401.—Gray, Syn. Fl. N. America. ii[1], 68.—Hemsley, Bot. Am.-Cent. ii, 297.

Achras cuneifolia, Poiret in Lamarck, Dict. vi, 534.

B. angustifolia, Nuttall, Sylva, iii, 38, t. 93; 2 ed. ii, 106, t. 93.—Cooper in Smithsonian Rep. 1858, 265.

Sideroxylon cuneatum, A. De Candolle, Prodr. viii, 181.

B. parvifolia, A. De Candolle, Prodr. viii, 190.—Chapman, Fl. S. States, 275.—Vasey, Cat. Forest Trees, 19.

B. myrsinifolia, A. De Candolle, Prodr. viii, 192.

B. reclinata, Torrey, Bot. Mex. Boundary Survey, 109 [not Ventenat].

ANTS' WOOD. DOWNWARD PLUM. SAFFRON PLUM.

A small tree, rarely exceeding 4 meters in height, with a trunk sometimes 0.30 meter in diameter.

Semi-tropical Florida, Merritt's island, Indian river, and southward to the southern keys, not rare; west coast, Cedar Keys to cape Romano, rare; rocky shores and in the interior of low, barren keys; Texas, valley of the lower Rio Grande, Ross to Laredo, and southward into northern Mexico; in the West Indies.

Wood heavy, hard, not strong, very close-grained, compact, satiny, susceptible of a beautiful polish; medullary rays numerous, thin; color, light brown or orange, the sap-wood lighter; specific gravity, 0.7959; ash, 1.90.

183.—Mimusops Sieberi, A. De Candolle,

Prodr. viii, 204.—Chapman, Fl. S. States, 275.—Vasey, Cat. Forest Trees, 18.—Gray, Syn. Fl. N. America, ii[1], 69.

Achras Zapotilla, var. *parviflora*, Nuttall, Sylva, iii, 28, t. 90; 2 ed. ii, 97, t. 90.

M. dissecta, Grisebach, Fl. British West Indies, 400, in part.

Achras mammosa, Sieber, Pl. Trin. No. 33 [not Linnæus nor Bonpland].

WILD DILLY.

Semi-tropical Florida, on the southern keys, common; in the West Indies.

A small, low, gnarled tree, sometimes 9 meters in height, with a trunk 0.30 to 0.40 meter in diameter; generally hollow and defective.

Wood very heavy, hard, strong, close-grained, inclined to check in drying, susceptible of a beautiful polish; medullary rays numerous, very obscure; color, rich, very dark brown, the sap-wood lighter; specific gravity, 1.0838; ash, 2.61.

EBENACEÆ.

184.—Diospyros Virginiana, Linnæus,

Spec. 1 ed. 1057.—Kalm, Travels, English ed. i, 127, 345.—Marshall, Arbustum, 40.—Wangenheim, Amer. 84, t. 28, f. 58.—Walter, Fl. Caroliniana, 253.—Aiton, Hort. Kew. iii, 446; 2 ed. v, 478.—Abbot, Insects Georgia, ii, t. 61, 74.—B. S. Barton, Coll. i, 11, 45; ii, 52.—Michaux, Fl. Bor.-Am. ii, 258.—Gærtner f. Fruct. Suppl. 138, t. 207.—Willdenow, Spec. iv, 1107; Enum. 1061; Berl. Baumz. 127.—Poiret in Lamarck, Dict. v, 528.—Persoon, Syn. ii, 1806.—Desfontaines, Hist. Arb. i, 208.—Titford, Hort. Bot. Am. 106.—Michaux f. Hist. Arb. Am. ii, 195, t. 12; N. American Sylva, 3 ed. ii, 157, t. 93.—Pursh, Fl. Am. Sept. ii, 265.—Nouveau Duhamel, vi, 84.—Barton, Prodr. Fl. Philadelph. 97; Compend. Fl. Philadelph. ii, 198.—Eaton, Manual, 117; 6 ed. 126.—Nuttall, Genera, ii, 240.—Hayne, Dend. Fl. 228.—Elliott, Sk. ii, 712.—Collin, Förslag af några Nord-Americas Träd. 23.—Torrey, Compend. Fl. N. States, 375.—Audubon, Birds, t. 87.—Sprengel, Syst. ii, 202.—Watson, Dend. Brit. ii, 146.—Rafinesque, Med. Bot. i, 153, t. 32.—Beck, Bot. 229.—Don, Miller's Dict. iv, 39.—Loudon, Arboretum, ii, 1195, t. 200, 201.—Eaton & Wright, Bot. 225.—A. De Candolle, Prodr. iv, 228.—Browne, Trees of America, 368.—Griffith, Med. Bot. 435, f. 196.—Dietrich, Syn. v, 437.—Belg. Hort. iv, 118 & t.—Darby, Bot. S. States, 425.—Darlington, Fl. Cestrica, 3 ed. 176.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 273.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 70.—Lesquereux in Owen's 2d Rep. Arkansas, 374.—"Ettingsh. Blatt-Skel. Dikot. 89, t. 38, f. 12."—Wood, Cl. Book, 500; Bot. & Fl. 209.—Porcher, Resources S. Forests, 385.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 200.—Gray, Manual N. States, 5 ed. 308; Hall's Pl. Texas, 15; Syn. Fl. N. America, ii[1], 69.—Koch, Dendrologie, ii, 204.—Hiern in Trans. Cambridge Phil. Soc. xii[1], 224.—Vasey, Cat. Forest Trees, 18.—Broadhead in Coulter's Bot. Gazette, iii, 59.—Ridgway in Proc. U. S. Nat. Mus. 1882, 68.

D. concolor, Mœnch, Meth. 471.

D. Guaiacana, Robin, Voyages, iii, 417.

D. pubescens, Pursh, Fl. Am. Sept. i, 265 [not Persoon].—Rafinesque, Fl. Ludoviciana, 139.—Don, Miller's Dict. iv, 38.—Loudon, Arboretum, ii, 1196.

D. Virginiana, var. *pubescens*, Nuttall, Genera, ii, 240.—Elliott, Sk. ii, 713.

D. Virginiana, var. *microcarpa*, Rafinesque, Med. Bot. i, 115.

D. Virginiana, var. *concolor*, Rafinesque, Med. Bot. i, 155.

D. Virginiana, var. *macrocarpa*, Rafinesque, Med. Bot. i, 155.

D. Persimon, Wikström, Jahr. Schwed. 1830, 92.

D. ciliata, Rafinesque, New Fl. & Bot. i, 25 [not A. De Candolle].

D. calycina, Audibert, Cat. Hort. Tonn. (ex. Spach).—Loudon, Gard. Mag. 1841, 394.

D. angustifolia, Audibert, Cat. Hort. Tonn. (ex. Spach).—Loudon, Gard. Mag. 1841, 394.

D. lucida, Hort.—Loudon, Gard. Mag. 1841, 394.

D. intermedia, Hort.—Loudon, Gard. Mag. 1841, 394.

PERSIMMON.

Light-house point, New Haven, Connecticut, Long Island, New York, and southward to bay Biscayne and the Caloosa river, Florida, southern Alabama and Mississippi; southern Ohio to southeastern Iowa, southern Missouri, Arkansas, eastern Kansas, the Indian territory, and the valley of the Colorado river, Texas.

A tree 10 to 20 or, exceptionally, 30 to 35 meters in height (*Ridgway*), with a trunk sometimes 0.60 meter in diameter; very common and often entirely occupying abandoned fields throughout the middle and lower regions of the southern Atlantic and Gulf states, reaching its greatest development in the rich bottom lands of the lower Ohio basin.

Wood heavy, hard, strong, very close-grained, compact, susceptible of a high polish, containing few scattered, open ducts, the rings of annual growth marked by one or more rows of similar ducts; medullary rays numerous, conspicuous; color, dark brown, or often nearly black, the thick sap-wood light brown, often containing numerous darker spots; specific gravity of the sap-wood, 0.7908; ash, 0.96; used in turnery for shoe-lasts, plane-stocks, etc., and preferred for shuttles; the dark heart-wood only developed in very old specimens and rarely seen.

The yellow edible fruit exceedingly austere until after frost, then becoming sweet and luscious, or in the Gulf states ripening in August without austerity; sometimes used domestically, fermented with hops, corn-meal, or wheat bran, as a beverage under the name of "simmon beer".

A decoction of the bitter and astringent unripe fruit and inner bark occasionally used in the treatment of diarrhœa, sore throat, hemorrhage, etc. (*B. R. Smith in Am. Jour. Pharm.* October, 1846, 215.—*J. E. Bryan in same*, May, 1860, 215.—*U. S. Dispensatory*, 14 ed. 380.—*Nat. Dispensatory*, 2 ed. 514).

185.—Diospyros Texana, Scheele,

Linnæa, xxii, 145; Rœmer, Texas, 441; Appx. 763.—Walpers, Ann. iii, 14.—Torrey, Bot. Mex. Boundary Survey, 109.—Cooper in Smithsonian Rep. 1858, 266.—Young, Bot. Texas, 376.—Hiern in Trans. Cambridge Phil. Soc. xii[1], 238.—Gray, Hall's Pl. Texas, 15; Syn. Fl. N. America, ii[1], 70.—Vasey, Cat. Forest Trees, 18.—Hemsley, Bot. Am.-Cent. ii, 300.

BLACK PERSIMMON. MEXICAN PERSIMMON. CHAPOTE.

Western Texas, Matagorda bay to the valley of the Concho river; southward into northern Mexico.

A small tree, 4 to 10 meters in height, with a trunk sometimes 0.30 meter in diameter, or more often a low shrub; not rare, and reaching its greatest development in Texas along the rich bottoms of the Guadalupe river; borders of prairies, in rich soil; in Mexico more common and of larger size.

Wood heavy, hard, very close-grained, compact, satiny, taking a beautiful polish, containing few minute, scattered, open ducts; medullary rays numerous, thin; color, nearly black, often streaked with yellow, the thick sap-wood clear bright yellow; specific gravity, 0.8460; ash, 3.33; used in turnery for the handles of tools, etc., suitable for wood-engraving, and probably the best substitute among American woods for box-wood.

The small black fruit sweet and insipid.

STYRACACEÆ.

186.—Symplocos tinctoria, L'Heritier,

Trans. Linnæan Soc. i, 176.—Willdenow, Spec. iii, 1436.—Aiton, Hort. Kew. iv, 419.—Sprengel, Syst. iii, 339.—Don, Miller's Dict. iv, 2.—A. De Candolle, Prodr. viii, 254.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 272.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 65.—Lesquereux in Owen's 2d Rep. Arkansas, 374.—Wood, Cl. Book, 499; Bot. & Fl. 209.—Gray, Manual N. States, 5 ed. 310; Syn. Fl. N. America, ii[1], 71.—Young, Bot. Texas, 374.—Vasey, Cat. Forest Trees, 18.

Hopea tinctoria, Linnæus, Mant. 105.—Walter, Fl. Caroliniana, 189.—Michaux, Fl. Bor.-Am. ii, 42.—Persoon, Syn. ii, 72.—Desfontaines, Hist. Arb. i, 217.—Gærtner f. Fruct. Suppl. 146, t. 209, f. 2.—Robin, Voyages, iii, 419.—Michaux f. Hist. Arb. Am. iii, 61, t. 9; N. American Sylva, 3 ed. iii, 45, t. 117.—Pursh, Fl. Am. Sept. ii, 451.—Nuttall, Genera, ii, 83.—Elliott, Sk. ii, 173.—Eaton, Manual, 6 ed. 176.—Spach, Hist. Veg. ix, 420.—Eaton & Wright, Bot. 272.—Darby, Bot. S. States, 425.—Porcher, Resources S. Forests, 388.

HORSE SUGAR. SWEET LEAF.

Southern Delaware, south to about latitude 30° in Florida, and west through the Gulf states to western Louisiana and southern Arkansas (Malvern, Texarkana, *Letterman*).

A small tree, 6 to 10 meters in height, with a trunk 0.20 to 0.25 meter in diameter, or often a low shrub; borders of cypress swamps or in deep, damp, shaded woods.

Wood light, soft, not strong, close-grained, checking in drying; medullary rays numerous, thin; color, light red, or often nearly white, the sap-wood lighter; specific gravity, 0.5325; ash, 0.68.

Leaves sweet, greedily eaten by cattle and horses, and yielding, as does also the bark, a yellow dye.

187.—Halesia diptera, Linnæus,

Spec. 2 ed. 636.—Marshall, Arbustum, 57.—Lamarck, Dict. ii, 66.—Willdenow, Spec. ii, 849; Enum. 496; Berl. Baumz. 171.—Cavanilles, Diss. vi, 338, t. 187.—Michaux, Fl. Bor.-Am. ii, 40.—Persoon, Syn. ii, 4.—Aiton, Hort. Kew. 2 ed. iii, 143.—Nouveau Duhamel, v, 144.—Pursh, Fl. Am. Sept. ii, 450.—Nuttall, Genera, ii, 83.—Elliott, Sk. i, 508.—Hayne, Dend. Fl. 66.—Loddiges, Bot. Cab. t. 1172.—Sprengel, Syst. iii, 84.—Eaton, Manual, 6 ed. 164.—Don, Miller's Dict. iv, 7.—Loudon, Arboretum, ii, 1191, f. 1014.—Spach, Hist. Veg. ix, 426.—Eaton & Wright, Bot. 260.—A. De Candolle, Prodr. viii, 270.—Miers, Contrib. i, 193.—Darby, Bot. S. States, 425.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 271.—Wood, Cl. Book, 499; Bot. & Fl. 209.—Koch, Dendrologie, ii, 201.—Vasey, Cat. Forest Trees, 18.—Gray, Syn. Fl. N. America, ii[1], 71.

H. reticulata, Buckley in Proc. Philadelphia Acad. 1860, 444.

SNOW-DROP TREE. SILVER-BELL TREE.

South Carolina to northern Florida, near the coast, and west through the lower region of the Gulf states to eastern Texas and Garland county, Arkansas (*Harvey*).

A small tree, sometimes 6 to 10 meters in height, with a trunk 0.10 to 0.20 meter in diameter, or often a shrub sending up many clustered stems from the root; borders of swamps, in low, wet woods.

Wood light, soft, strong, very close-grained, compact; medullary rays numerous, thin; color, light brown, the sap-wood lighter; specific gravity, 0.5705; ash, 0.42.

188.—Halesia tetraptera, Linnæus,

Spec. 2 ed. 636.—Marshall, Arbustum, 57.—Gærtner, Fruct. i, 160, t. 32, f. 2.—Lamarck, Dict. ii, 66; Ill. ii, 521, t. 404, f. 1.—Aiton, Hort. Kew. ii, 125; 2 ed. iii, 143.—Mœnch, Meth. 507.—Abbot, Insects Georgia i, t. 46.—Willdenow, Spec. ii, 849; Enum. 496; Berl. Baumz. 170.—Cavanilles, Diss. vi, 338, t. 186.—Michaux, Fl. Bor.-Am. ii, 40.—Persoon, Syn. ii, 4.—Desfontaines, Hist. Arb. i, 216.—Nouveau Duhamel, v, 143, t. 45.—Pursh, Fl. Am. Sept. ii, 449.—Nuttall, Genera, ii, 82.—Bot. Mag. t. 910.—Elliott, Sk. i, 507.—Hayne, Dend. Fl. 66.—Loddiges, Bot. Cab. t. 1173.—Sprengel, Syst. iii, 84.—Guimpel, Otto & Hayne, Abb. Holz. 43, t. 35.—Eaton, Manual, 6 ed. 164.—Don, Miller's Dict. iv, 6.—Loudon, Arboretum, ii, 1190, f. 1012, t. 196, 197.—Spach, Hist. Veg. ix, 426.—Eaton & Wright, Bot. 260.—A. De Candolle, Prodr. viii, 270.—Browne, Trees of America, 366.—Miers, Contrib. i, 191, t. 93.—Darby, Bot. S. States, 425.—Cooper in Smithsonian Rep. 1858, 253.—Agardh, Theor. & Syst. Pl. t. 22, f. 16, 17.—Chapman, Fl. S. States, 271.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 80.—Wood, Cl. Book, 499; Bot. & Fl. 209.—Örsted in Saerskitt. Aftryk. af Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 89, f. 2.—Gray, Manual N. States, 5 ed. 310; Syn. Fl. N. America, ii[1], 71.—Koch, Dendrologie, ii, 199.—Young, Bot. Texas, 374.—Vasey, Cat. Forest Trees, 18.

RATTLEBOX. SNOW-DROP TREE. SILVER-BELL TREE. CALICO WOOD.

Mountains of West Virginia to southern Illinois, south to middle Florida, central Alabama and Mississippi, and through Arkansas to western Louisiana and eastern Texas.

A tree 10 to 15 meters in height, with a trunk rarely 0.60 meter in diameter, or often a tall shrub; generally along streams, in rich soil; most common and reaching its greatest development in the southern Alleghany mountains; common in cultivation.

Wood light, soft, close-grained, compact; medullary rays numerous, thin; color, light brown, the sap-wood lighter; specific gravity, 0.5628; ash, 0.40.

NOTE.—*Halesia parviflora*, Michaux, of southern Georgia, and Florida, does not attain the size or habit of a tree.

OLEACEÆ.

189.—Fraxinus Greggii, Gray,

Proc. Am. Acad. vii, 64; Syn. Fl. N. America, ii[1], 74.—Hemsley, Bot. Am.-Cent. ii, 305.

F. Schiedeana, var. *parvifolia*, Torrey, Bot. Mex. Boundary Survey, 166.

Western Texas, valley of the Rio Grande, from the San Pedro to the Pecos river; southward into Mexico.

A small tree, sometimes 7 to 9 meters in height, with a trunk 0.10 to 0.15 meter in diameter (Lampasas mountains, Mexico, *Buckley*), or often a graceful shrub; limestone soil.

Wood heavy, hard, very close-grained, compact; layers of annual growth and medullary rays obscure; color, brown, the sap-wood lighter; specific gravity, 0.7904; ash, 0.93.

190.—Fraxinus anomala, Torrey;

Watson in King's Rep. v, 283.—Parry in Am. Nat. ix, 203.—Vasey, Cat. Forest Trees, 20.—Gray, Syn. Fl. N. America, ii[1], 74.

Southwestern Colorado, McElmo river (*Brandegee*), southern Utah, Kanawa, Leeds, Silver Leaf, Labyrinth cañon of the Colorado river, valley of the Rio Virgen, near Saint George.

A small tree, sometimes 6 meters in height, with a trunk 0.15 to 0.20 meter in diameter, with the habit of a dwarf pear tree; common on elevated sandstone *mesas* and plateaus.

Wood heavy, hard, coarse-grained, containing many large, open, scattered ducts, the layers of annual growth marked by several rows of similar ducts; medullary rays numerous, thin; color, light brown, the sap-wood lighter; specific gravity, 0.6597; ash, 0.85.

191.—Fraxinus pistaciæfolia, Torrey,

Pacific R. R. Rep. iv, 128; Bot. Mex. Boundary Survey, 166.—Cooper in Smithsonian Rep. 1858, 260.—Gray, Hall's Pl. Texas, 19; Syn. Fl. N. America, ii[1], 74.—Vasey, Cat. Forest Trees, 20.—Rusby in Bull. Torrey Bot. Club. ix, 54.—Hemsley, Bot. Am.-Cent. ii, 305.—Watson in Proc. Am. Acad. xviii, 113.

F. velutina, Torrey in Emory's Rep. 149.

F. coriacea, Watson in Am. Nat. vii, 302, in part.—Rothrock in Wheeler's Rep. vi, 186, t. 22.—Vasey, Cat. Forest Trees, 20.

F. pistaciæfolia, var. *coriacea*, Gray, Syn. Fl. N. America, ii[1], 74.

ASH.

Mountains of western Texas, through southern New Mexico, southern and eastern Arizona, to southern Nevada (Ash Meadows, *Rothrock*); in northern Mexico.

A small tree, 10 to 12 meters in height, with a trunk rarely 0.45 meter in diameter; generally along borders of streams, in elevated cañons, less commonly in dry soil, the foliage then thick and coriaceous or, more rarely, velvety tomentose (var. *coriacea*, *Gray*, *l. c.*); the large specimens generally hollow and defective.

Wood heavy, soft, not strong, coarse-grained, compact; medullary rays numerous, thin; color, light brown, the sap-wood lighter; specific gravity, 0.6810; ash, 0.62; occasionally used in wagon-building, for ax handles, etc.

192.—Fraxinus Americana, Linnæus,

Spec. 2 ed. 1510.—Walter, Fl. Caroliniana, 254.—Aiton, Hort. Kew. iii, 445; 2 ed. v, 476.—Willdenow, Spec. iv, 1102; Enum. 1060; Berl. Baumz. 145.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 393.—Vahl Enum. i, 49.—Persoon, Syn. ii, 604.—Desfontaines, Hist. Arb. i, 102.—Nouveau Duhamel, iv, 63.—Michaux f. Hist. Arb. Am. iii, 106, t. 8; N. American Sylva, 3 ed. iii, 49, t. 118 (excl. fruit).—Barton, Prodr. Fl. Philadelph. 97; Compend. Fl. Philadelph. ii, 192.—Eaton, Manual, 114.—Hayne, Dend. Fl. 221.—Cobbett, Woodlands, 131.—Sprengel, Syst. i, 95.—Beck, Bot. 232.—Loudon, Arboretum, ii, 1232, f. 1055 & t.—Penn. Cycl. x, 455.—Bigelow, Fl. Boston. 3 ed. 408.—Hooker, Fl. Bor.-Am. ii, 51.—Torrey, Fl. N. York, ii, 125, t. 89.—A. De Candolle, Prodr. viii, 177.—Browne, Trees of America, 394.—Darlington, Fl. Cestrica, 3 ed. 238.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 369.—Curtis in Geological Rep. N. Carolina, 1860, iii, 54.—Wood, Cl. Book, 597; Bot. & Fl. 277.—Lesquereux in Owen's 2d Rep. Arkansas, 382.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 206.—Porcher, Resources S. Forests, 494.—Gray, Manual N. States, 5 ed. 401; Hall's Pl. Texas, 19; Syn. Fl. N. America, ii[1], 74.—Koch, Dendrologie, ii, 252.—Young, Bot. Texas, 452.—Vasey, Cat. Forest Trees, 20.—Macoun in Geological Rep. Canada, 1875–'76, 207.—Sears in Bull. Essex Inst. xiii, 177.—Bell in Geological Rep. Canada, 1879–'80, 52[c].—Ridgway in Proc. U. S. Nat. Mus. 1882, 68.

F. Caroliniensis, Wangenheim, Amer. 81.

F. alba, Marshall, Arbustum, 51.—Hayne, Dend. Fl. 223.

F. acuminata, Lamarck, Dict. ii, 542.—Bosc in Mem. Inst. 1808, 205.—Pursh, Fl. Am. Sept. ii, 9.—Nuttall, Genera, ii, 231; Sylva, iii, 64; 2 ed. ii, 129.—Hayne, Dend. Fl. 220.—Elliott, Sk. ii, 672.—Sprengel, Syst. i, 95.—Torrey, Compend. Fl. N. States, 371; Nicollet's Rep. 154.—Rœmer & Schultes, Syst. iii, 277.—Darlington, Fl. Cestrica, 2 ed. 8.—Eaton, Manual, 6 ed. 148.—Beck, Bot. 232.—Don, Miller's Dict. iv, 56.—Eaton & Wright, Bot. 247.—Emerson, Trees Massachusetts, 333; 2 ed. ii, 376 & t.—Darby, Bot. S. States, 429.—Porcher, Resources S. Forests, 494.

? *F. juglandifolia*, Lamarck, Dict. ii, 542.—Bosc in Mem. Inst. 1808, 208.—Desfontaines, Hist. Arb. i, 103.—Hayne, Dend. Fl. 221.—Beck, Bot. 232.—Don, Miller's Dict. iv, 55.

F. Canadensis, Gærtner, Fruct. i, 222, t. 49.

F. epiptera, Michaux, Fl. Bor.-Am. ii, 256.—Vahl, Enum. i, 50.—Willdenow, Spec. iv, 1102; Berl. Baumz. 147.—Persoon, Syn. ii, 603.—Desfontaines, Hist. Arb. i, 103.—Poiret, Suppl. ii, 671.—Nuttall, Genera, ii, 231.—Pursh, Fl. Am. Sept. i, 8.—Elliott, Sk. ii, 672.—Sprengel, Syst. i, 96.—Rœmer & Schultes, Syst. 278.—Eaton, Manual, 6 ed. 148.—Don, Miller's Dict. iv, 55.—Loudon, Arboretum, ii, 1237.—Penn. Cycl. x, 455.—Eaton & Wright, Bot. 247.—Hooker, Fl. Bor.-Am. ii, 50.—A. De Candolle, Prodr. viii, 277.—Darby, Bot. S. States, 429.—Cooper in Smithsonian Rep. 1858, 399.

F. lancea, Bosc in Mem. Inst. 1808, 209 (*fide* Loudon, Arboretum, ii, 1237).

F. discolor, Muhlenberg, Cat. 111.—Rafinesque, Fl. Ludoviciana, 37.—Spach, Hist. Veg. viii, 297.

F. Americana, var. *latifolia*, Loudon, Arboretum, ii, 1232.—Browne. Trees of America, 396.

? *F. juglandifolia*, var. *serrata*, Hayne, Dend. Fl. 221.

? *F. juglandifolia*, var. *subserrata*, Hayne, Dend. Fl. 221.

WHITE ASH.

Nova Scotia, New Brunswick, southern Ontario to northern Minnesota, south to northern Florida, central Alabama and Mississippi, and west to eastern Nebraska, eastern Kansas, the Indian territory, and the valley of the Trinity river, Texas.

A large tree of the first economic value, 15 to 30 or, exceptionally, 42 meters (*Ridgway*) in height, with a trunk 1.20 to 1.80 meter in diameter; low, rich, rather moist soil, reaching its greatest development in the bottom lands of the lower Ohio River basin; toward its western and southwestern limits smaller, of less economic value, and generally replaced by the green ash (*Fraxinus viridis*).

A form of the southern states with remarkably small fruit has been described as—

var. **microcarpa**, Gray, Syn. Fl. N. America, ii[1], 75.

F. albicans, Buckley in Proc. Philadelphia Acad. 1862, 4, in part.

F. Curtissii, Vasey, Cat. Forest Trees, 20.

Wood heavy, hard, strong, ultimately brittle, coarse-grained, compact; layers of annual growth clearly marked by several rows of large open ducts, occupying in slowly-grown specimens nearly the entire width of the annual rings; medullary rays numerous, obscure; color, brown, the sap-wood much lighter, often nearly white; specific gravity, 0.6543; ash, 0.42; specific gravity of the heavier sap-wood, 0.7180; largely used in the manufacture of agricultural implements, carriages, handles, oars, and for interior and cabinet work.

Var. Texensis,

Gray, Syn. Fl. N. America, ii[1], 75.

F. albicans, Buckley in Proc. Philadelphia Acad. 1862, 4, in part.

F. coriacea, Watson in Am. Nat. vii, 302, in part.

F. pistaciæfolia, Gray, Hall's Pl. Texas, 19 [not Torrey].

Western Texas, Dallas (*Reverchon*), to the valley of the Devil's river.

A small tree, 10 to 12 meters in height, with a trunk sometimes 0.60 meter in diameter; dry, rocky hills and ridges.

Wood heavy, hard, strong, rather close-grained, compact; layers of annual growth marked by one or more rows of open ducts; medullary rays numerous, obscure; color, light brown, the sap-wood lighter; specific gravity, 0.7636; ash, 0.70; used for the same purposes as that of the species.

193.—Fraxinus pubescens, Lamarck,

Dict. ii, 548.—Walter, Fl. Caroliniana, 254.—Willdenow, Spec. iv, 1103; Enum. 1060; Berl. Baumz. 148.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 393.—Vahl, Enum. i, 51.—Persoon, Syn. ii, 604.—Desfontaines, Hist. Arb. i, 102.—Nouveau Duhamel, iv, 62.—Aiton, Hort. Kew. 2 ed. v, 476.—Pursh, Fl. Am. Sept. i, 9.—Rœmer & Schultes, Syst. 279.—Nuttall, Genera, ii, 231.—Hayne, Dend. Fl. 223.—Elliott, Sk. ii, 673.—Sprengel, Syst. i, 95.—Torrey, Compend. Fl. N. States, 371; Fl. N. York, ii, 126.—Beck, Bot. 232.—Eaton, Manual, 6 ed. 148.—Don, Miller's Dict. iv, 55.—Loudon, Arboretum, ii, 1233, f. 1056.—Penn. Cycl. x, 455.—Eaton & Wright, Bot. 247.—Hooker, Fl. Bor.-Am. ii, 51.—A. De Candolle, Prodr. viii, 278.—Emerson, Trees Massachusetts, 337; 2 ed. ii, 380.—Darlington, Fl. Cestrica, 3 ed. 239.—Darby, Bot. S. States, 429.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 370.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 54.—Wood, Cl. Book, 597; Bot. & Fl. 277.—Gray, Manual N. States, 5 ed. 402; Syn. Fl. N. America, ii[1], 75.—Young, Bot. Texas, 452.—Vasey, Cat. Forest Trees, 20.—Sears in Bull. Essex Inst. xiii, 177.—Ridgway in Proc. U. S. Nat. Mus. 1882, 69.

F. Pennsylvanica, Marshall, Arbustum, 51.—Koch, Dendrologie, ii, 253.

F. nigra, Du Roi, Harbk. 2 ed. i, 398 [not Marshall].

F. pubescens, var. *longifolia*, Willdenow, Spec. iv, 1104.—Vahl, Enum. i, 52.—Pursh, Fl. Am. Sept. ii, 9.—Loddiges, Cat. ed. 1836.—Loudon, Arboretum, ii, 1233.—A. De Candolle, Prodr. viii, 278.

F. pubescens, var. *latifolia*, Willdenow, Spec. iv, 1104.—Vahl, Enum. i, 52.—Pursh, Fl. Am. Sept. i, 9.—Hayne, Dend. Fl. 223.—Eaton, Manual, 6 ed. 148.—Loudon, Arboretum, ii, 1233.—A. De Candolle, Prodr. viii, 278.

F. pubescens, var. *subpubescens*, Persoon, Syn. ii, 605.—Pursh, Fl. Am. Sept. i, 9.—Eaton, Manual, 6 ed. 148.—Loudon, Arboretum, ii, 1234.—A. De Candolle, Prodr. viii, 278.—Browne, Trees of America, 395.

F. longifolia, Bosc in Mem. Inst. 1808, 209.

F. subvillosa, Bosc in Mem. Inst. 1808, 209.

F. tomentosa, Michaux f. Hist. Arb. Am. iii, 112, t. 9; N. American Sylva, 3 ed. iii, 53, t. 119.—Barton, Compend. Fl. Philadelph. ii, 192.

F. Americana, var. *pubescens*, Browne, Trees of America, 395.

F. oblongocarpa, Buckley in Proc. Philadelphia Acad. 1864, 4.

RED ASH.

New Brunswick to southern Ontario and northern Minnesota, south to northern Florida and central Alabama.

A tree 12 to 15 meters in height, with a trunk rarely exceeding 0.60 meter in diameter; borders of streams and swamps, in low ground; common and reaching its greatest development in the north Atlantic states; rare west of the Alleghany mountains, probably not extending west of the Mississippi river.

Wood heavy, hard, strong, brittle, coarse-grained, compact; medullary rays numerous, thin; color, rich brown, the sap-wood light brown streaked with yellow; specific gravity, 0.6251; ash, 0.26; specific gravity of the lighter sap-wood, 0.5609; somewhat used as a substitute for the more valuable white ash, with which it is often confounded.

194.—Fraxinus viridis, Michaux f.

Hist. Arb. Am. iii, 115, t. 10; N. American Sylva, 3 ed. iii, 54, t. 120 (excl. fruit).—Hayne, Dend. Fl. 222.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 370.—Gray in Pacific R. R. Rep. xii², 46; Manual N. States, 5 ed. 402; Hall's Pl. Texas, 19; Syn. Fl. N. America, ii¹, 75.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 54.—Lesquereux in Owen's 2d Rep. Arkansas, 382.—Wood, Cl. Book, 598; Bot. & Fl. 277.—Watson in King's Rep. v, 284.—Young, Bot. Texas, 453.—Vasey, Cat. Forest Trees, 20.—Macoun in Geological Rep. Canada, 1875-'76, 207.—Bell in Geological Rep. Canada, 1879-'80, 49.—Hemsley, Bot. Am.-Cent. ii, 305.—Burgess in Coulter's Bot. Gazette, vii, 95.

F. juglandifolia, Willdenow, Spec. iv, 1104; Enum. 1060; Berl. Baumz. 140 [not Lamarck].—Vahl, Enum. i, 50.—Persoon, Syn. ii, 604.—Nouveau Duhamel, iv, 63, t. 16.—Aiton, Hort. Kew. 2 ed. v, 476.—Pursh, Fl. Am. Sept. i, 9.—Rœmer & Schultes, Syst. i, 278; iii, Suppl. 255.—Eaton, Manual, 114.—Sprengel, Syst. i, 95.—Torrey, Compend. Fl. N. States, 371.—Beck, Bot. 233.—Don, Miller's Dict. iv, 55.—Loudon, Arboretum, ii, 1236, f. 1061, 1062 & t.—Eaton & Wright, Bot. 247.—Gray, Manual N. States, 1 ed. 373.

?*F. Caroliniana*, Willdenow, Spec. iv, 1103; Enum. 1060; Berl. Baumz. 148.—Vahl, Enum. i, 51.—Du Roi, Harbk. 2 ed. i, 400.—Persoon, Syn. ii, 605.—Desfontaines, Hist. Arb. i, 103.—Nouveau Duhamel, iv, 62.—Pursh, Fl. Am. Sept. i, 9.—Nuttall, Genera, ii, 231.—Elliott, Sk. ii, 673.—Hayne, Dend. Fl. 223.—Sprengel, Syst. i, 95.—Eaton, Manual, 6 ed. 148.—Don, Miller's Dict. iv, 55.—Eaton & Wright, Bot. 147.—Darby, Bot. S. States, 429.

F. juglandifolia, var. *subintegerrima*, Vahl, Enum. i, 50.

F. expansa, Willdenow, Berl. Baumz. 150.—Rœmer & Schultes, Syst. i, 279.—Don, Miller's Dict. iv, 55.—Loudon, Arboretum, ii, 1238.—A. De Candolle, Prodr. viii, 278.—Browne, Trees of America, 399.

F. Americana, var. *juglandifolia*, Browne, Trees of America, 398.

F. Novæ-Angliæ, Koch, Dendrologie, ii, 251 [not Miller nor Wangenheim]

GREEN ASH.

Shores of lake Champlain, Tiverton, Rhode Island, and southward to northern Florida, west to the valley of the Saskatchewan, the eastern ranges of the Rocky mountains of Montana, the Wahsatch mountains of Utah, and the ranges of eastern and northern Arizona.

A tree 15 to 18 meters in height, with a trunk rarely exceeding 0.60 meter in diameter; borders of streams or in low, rather moist soil; at the west confined to the bottom lands of the large streams and to high mountain cañons.

Wood heavy, hard, strong, brittle, rather coarse-grained, compact, satiny, containing numerous scattered, small, open ducts, the layers of annual growth marked by several rows of larger ducts; medullary rays numerous, obscure; color, brown, the sap-wood lighter; specific gravity, 0.7117; ash, 0.65; inferior in quality, although often used as a substitute for white ash.

Var. Berlandieriana, Torrey,

Bot. Mex. Boundary Survey, 166.—Gray, Syn. Fl. N. America, ii¹, 75.—Hemsley, Bot. Am.-Cent. ii, 305.—Watson in Proc. Am. Acad. xviii, 113.

F. Berlandieriana, De Candolle, Prodr. viii, 278.

F. trialata, Buckley in Proc. Philadelphia Acad. 1862, 5.

Texas, west of the Colorado river; southward into northern Mexico.

A small tree, 9 to 12 meters in height, with a trunk rarely exceeding 0.30 meter in diameter; borders of streams, in low, rich soil.

Wood light, soft, rather close-grained, compact, containing few small, scattered, open ducts, the layers of annual growth clearly marked by one or two rows of larger ducts; medullary rays numerous, obscure; color, light brown, the sap-wood lighter; specific gravity, 0.5780; ash, 0.54.

195.—Fraxinus platycarpa, Michaux,

Fl. Bor.-Am. ii, 256.—Vahl, Enum. i, 49.—Persoon, Syn. ii, 605.—Desfontaines, Hist. Arb. i, 103.—Nouveau Duhamel, iv, 64.—Michaux f. Hist. Arb. Am. iii, 128, t. 13; N. American Sylva, 3 ed. iii, 63, t. 124.—Poiret, Suppl. ii, 671.—Pursh, Fl. Am. Sept. i, 9.—Rœmer & Schultes, Syst. i, 278.—Nuttall, Genera, ii, 231.—Hayne, Dend. Fl. 225.—Elliott, Sk. ii, 673.—Sprengel, Syst, i, 96.—Eaton, Manual, 6 ed. 149.—Don, Miller's Dict. iv, 55.—Eaton & Wright, Bot, 247.—A. De Candolle, Prodr. viii, 277.—Darby, Bot. S. States, 429.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 370.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 53.—Lesquereux in Owen's 2d Rep. Arkansas, 382.—Wood, Cl. Book, 598; Bot. & Fl. 277.—Gray, Manual N. States, 5 ed. 402; Syn. Fl. N. America, ii[1], 75.—Young, Bot. Texas, 453.—Vasey, Cat. Forest Trees, 20.

?*F. Caroliniana*, Miller, Dict. No. 6.—Lamarck, Dict. ii, 518.—Rœmer & Schultes, Syst. i, 278.—Don, Miller's Dict, iv, 55.—Loudon, Arboretum, ii, 1237.—Koch, Dendrologie, ii, 258.

F. excelsior, Walter, Fl. Caroliniana, 254 [not Linnæus].

F. Americana, Marshall, Arbustum, 50 [not Linnæus].

F. pallida, Bosc in Mem. Inst. 1808, 209.

F. pubescens, Bosc in Mem. Inst. 1808, 210 [not Lamarck].

F. triptera, Nuttall, Genera, ii, 232; Sylva, iii, 62, t. 100; 2 ed. 127, t. 100.—Elliott, Sk. ii, 674.—Don, Miller's Dict, iv, 56.—Loudon, Arboretum, ii, 1240.—A. De Candolle, Prodr. viii, 274.—Darby, Bot. S. States, 429.

F. curvidens, Hoffmannsegg, Verz. d. Pflanzenkult. 29.

F. pauciflora, Nuttall, Sylva, iii, 61, t. 100; 2 ed. ii, 126, t. 100.

F. Americana, var. *Caroliniana*, Browne, Trees of America, 398

F. Americana, var. *triptera*, Browne, Trees of America, 399.

F. Nuttallii, Buckley in Proc. Philadelphia Acad. 1860, 444.

F. nigrescens, Buckley in Proc. Philadelphia Acad. 1862, 5.

WATER ASH.

Southeastern Virginia, south near the coast to cape Canaveral and the Caloosa river, Florida, west through the Gulf states to the valley of the Sabine river, Texas, and the Washita river, southwestern Arkansas; in the West Indies.

A small tree, 9 to 12 meters in height, with a trunk rarely exceeding 0.30 meter in diameter; deep river swamps.

Wood very light, soft, not strong, brittle, close-grained, compact, the open ducts not conspicuous; medullary rays few, obscure; color, nearly white, or sometimes tinged with yellow, the sap-wood lighter; specific gravity, 0.3541; ash, 0.73.

196.—Fraxinus quadrangulata, Michaux,

Fl. Bor.-Am. ii, 255.—Willdenow, Spec. iv, 1104.—Vahl, Enum. i, 50.—Persoon, Syn. ii, 605.—Bosc in Mem. Inst. 1808, 211.—Desfontaines, Hist. Arb. i, 103.—Nouveau Duhamel, iv, 64.—Michaux f. Hist. Arb. Am. iii, 118, t. 11; 2 ed. iii, 61, t. 123.—Poiret, Suppl. ii, 671.—Pursh, Fl. Am. Sept. i, 8.—Rœmer & Schultes, Syst. i, 278.—Nuttall, Genera, ii, 231.—Hayne, Dend. Fl. 223.—Sprengel, Syst. i, 96.—Eaton, Manual, 6 ed. 149.—Don, Miller's Dict. iv, 55.—Loudon, Arboretum, ii, 1235, f. 1059, 1060.—Spach, Hist. Veg. viii, 296.—Penn. Cycl. x, 455.—Eaton & Wright, Bot. 247.—A. De Candolle, Prodr. viii, 278.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 370.—Lesquereux in Owen's 2d Rep. Arkansas, 382.—Wood, Cl. Book, 598; Bot. & Fl. 277.—Gray, Manual N. States, 5 ed. 402; Syn. Fl. N. America, ii[1], 75.—Koch, Dendrologie, ii, 259.—Young, Bot. Texas, 453.—Vasey, Cat. Forest Trees, 20.—Engelmann in Coulter's Bot. Gazette, v, 63.—Ridgway in Proc. U. S. Nat. Mus. 1882, 69.—Burgess in Coulter's Bot. Gazette, vii, 95.

F. tetragona, Cels in Nouv. Cours, Agr. vii, 73.

F. quadrangularis, Loddiges, Cat. 1836.

F. nervosa, Loddiges, Cat. 1836.

F. quadrangulata, var. *nervosa*, Loudon, Arboretum, ii, 1235.

F. Americana, var. *quadrangulata*, Browne, Trees of America, 397.

F. Americana, var. *quadrangulata nervosa*, Browne, Trees of America, 397.

BLUE ASH.

Southern Michigan to central Minnesota, south to northern Alabama, and through Iowa and Missouri to northeastern Arkansas (Duvall's bluff, *Letterman*).

A tree 18 to 25 or, exceptionally, 37 meters in height, with a trunk rarely exceeding 0.60 meter in diameter; generally on limestone hills, rarely extending into the bottom lands, and reaching its greatest development in the basin of the lower Wabash river.

Wood heavy, hard, not strong, brittle, close-grained, compact, satiny; layers of annual growth clearly marked by one to three rows of large open ducts; medullary rays numerous, obscure; color, light yellow streaked with brown, the sap-wood lighter; specific gravity, 0.7184 ; ash, 0.78; largely used for flooring, in carriage-building, etc.

The inner bark, macerated, dyes blue.

197.—Fraxinus Oregana, Nuttall,

Sylva, iii, 59, t. 99; 2 ed. ii, 124, t. 99.—Torrey in Pacific R. R. Rep. iv, 128.—Newberry in Pacific R. R. Rep. vi, 25, 87.—Cooper in Smithsonian Rep. 1858, 260; Pacific R. R. Rep. xii², 28, 68; Am. Nat. iii, 407.—Koch, Dendrologie, ii, 260.—Gray in Bot. California, i, 472; Syn. Fl. N. America, ii¹, 76.—Vasey, Cat. Forest Trees, 20.

F. pubescens, var. Hooker, Fl. Bor.-Am. ii, 51.

F. grandifolia, Bentham, Bot. Sulphur, 33.

OREGON ASH.

Shores of Puget sound, south through Washington territory and Oregon west of the eastern valleys of the Cascade mountains, along the California Coast ranges to San Francisco bay and the western slopes of the Sierra Nevada to the San Bernardino and Hot Spring mountains, California.

A tree sometimes 24 meters in height, with a trunk rarely exceeding 0.60 meter in diameter; moist soil, generally along streams, and reaching its greatest development in the bottom lands of southwestern Oregon.

Wood light, hard, not strong, brittle, coarse-grained, compact, containing many large, open, scattered ducts, the layers of annual growth strongly marked with several rows of similar ducts; medullary rays numerous, thin; color, brown, the sap-wood lighter; specific gravity, 0.5731; ash, 0.34; specific gravity of the lighter sap-wood, 0.5630; used in the manufacture of furniture, for the frames of carriages and wagons, in cooperage, for fuel, etc.

198.—Fraxinus sambucifolia, Lamarck,

Dict. ii, 549.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 393.—Willdenow, Spec. iv, 1099; Enum. 1059; Berl. Baumz. 150.—Vahl, Enum. i, 51.—Persoon, Syn. ii, 605.—Desfontaines, Hist. Arb. i, 103.—Bosc in Mem. Inst. 1808, 211.—Nouveau Duhamel, iv, 60.—Aiton, Hort. Kew. v, 475.—Michaux f. Hist. Arb. Am. iii, 122, t. 12; N. American Sylva, 3 ed. iii, 159, t. 122.—Pursh, Fl. Am. Sept. i, 8.—Rœmer & Schultes, Syst. i, 279.—Nuttall, Genera, ii, 231.—Barton, Compend. Fl. Philadelph. ii, 192.—Hayne, Dend. Fl. 224.—Torrey, Compend. Fl. N. States, 371; Fl. N. York, ii, 126.—Beck, Bot. 232.—Eaton, Manual, 6 ed. 148.—Don, Miller's Dict. iv, 54.—Loudon, Arboretum, ii, 1234, f. 1057, 1058.—Spach, Hist. Veg. viii, 299.—Hooker, Fl. Bor.-Am. ii, 50.—Eaton & Wright, Bot. 147.—A. De Candolle, Prodr. viii, 278.—Emerson, Trees Massachusetts, 338; 2 ed. ii, 381 & t.—Darlington, Fl. Cestrica, 3 ed. 239.—Cooper in Smithsonian Rep. 1858, 253.—Lesquereux in Owen's 2d Rep. Arkansas, 382.—Wood, Cl. Book, 598; Bot. & Fl. 277.—Gray, Manual N. States, 5 ed. 402; Syn. Fl. N. America, ii¹, 76.—Vasey, Cat. Forest Trees, 20.—Ridgway in Proc. U. S. Nat. Mus. 1882, 69.—Bell in Geological Rep. Canada, 1879–'80, 48ᶜ.

F. nigra, Marshall, Arbustum, 51.

F. Novæ-Angliæ, Wangenheim, Amer. 51.

F. crispa, Hort.

F. sambucifolia, var. *crispa*, Loddiges, Cat. 1836.—Loudon, Arboretum, ii, 1234.

F. Americana, var. *sambucifolia*, Browne, Trees of America, 393.

BLACK ASH. HOOP ASH. GROUND ASH.

Southern Newfoundland, along the northern shores of the gulf of Saint Lawrence, southwesterly to the eastern shores of lake Winnipeg, south through the northern states to New Castle county, Delaware, the mountains of Virginia, southern Illinois, and northwestern Arkansas.

A tree 25 to 30 meters in height, with a trunk 0.30 to 0.60 meter in diameter; swamps and low river banks; the most northern representative of the genus in America.

Wood heavy, soft, not strong, tough, rather coarse-grained, compact, durable, separating easily into thin layers; layers of annual growth strongly marked by several rows of large open ducts; medullary rays numerous, thin; color, dark brown, the sap-wood light brown, or often nearly white; specific gravity, 0.6318; ash, 0.72; specific gravity of the heavier sap-wood, 0.7465; largely used for interior finish, fencing, barrel hoops, in cabinet-making, and the manufacture of baskets.

NOTE.—*Fraxinus dipetala*, Hooker & Arnott, of the California Coast ranges and the western slopes of the southern Sierra Nevadas, and *F. cuspidata*, Torrey, of the valley of the Rio Grande, do not attain arborescent habit or dimensions.

The following, characterized by Bosc in Mem. Inst. 1808, mainly from the foliage of garden specimens of supposed North American origin, cannot be safely referred to our species: *F. alba, cinerea, elliptica, fusca, mixta, nigra, ovata, pannosa, pulverulenta, Richardi, rubicunda,* and *rufa*.

199.—Forestiera acuminata, Poiret,

Soppl. ii, 664.—Hayne, Dend. Fl. 194.—Nuttall in Trans. Am. Phil. Soc. new ser. v, 176.—Torrey in Nicollet's Rep. 154.—Engelmann & Gray in Jour. Boston Soc. Nat. Hist. v, 262.—Chapman, Fl. S. States, 370.—Lesquereux in Owen's 2d Rep. Arkansas, 382.—Wood, Cl. Book, 600; Bot. & Fl. 277.—Gray, Manual N. States, 5 ed. 402; Proc. Am. Acad. iv, 363 (excl. var.); Syn. Fl. N. America, ii[1], 76.—Koch, Dendrologie, ii, 224.—Vasey, Cat. Forest Trees, 20.

Adelia acuminata, Michaux, Fl. Bor.-Am. ii, 225, t. 48.

Borya acuminata, Willdenow, Spec. iv, 711.—Aiton, Hort. Kew. 2 ed. 366.—Elliott, Sk. ii, 675.—Eaton, Manual, 6 ed. 57.—Eaton & Wright, Bot. 159.

Borya ligustrina, Willdenow, Spec. iv, 711, in part.—Aiton, Hort. Kew. 2 ed. 366, in part.—Gray, Manual N. States, 2 ed. 358, in part.

Borya nitida, Willdenow, Enum. Suppl. 66.

Bigelovia acuminata, Smith in Rees' Cycl. xxxix, No. 4.

PRIVET.

Western Georgia, western Florida, through the Gulf states to the valley of the Colorado river, Texas, and northward through Arkansas to southern Missouri and Cahokia creek, Illinois (opposite Saint Louis).

A small tree, 6 to 8 meters in height, with a trunk rarely 0.20 meter in diameter; borders of swamps and streams, in low, wet soil; common in the Gulf region, near the coast, and reaching its greatest development in southern Arkansas.

Wood heavy, soft, not strong, brittle, close-grained, compact; medullary rays numerous, thin, rather conspicuous; color, light yellow streaked with brown; the sap-wood lighter; specific gravity, 0.6345; ash, 0.72.

200.—Chionanthus Virginica, Linnæus,

Spec. 1 ed. 8.—Marshall, Arbustum, 33.—Walter, Fl. Caroliniana, 60.—Wangenheim, Amer. 92.—Aiton, Hort. Kew. iii, 14; 2 ed. i, 23.—Lamarck, Ill. i, 30, t. 9, f. 1.—Willdenow, Spec. i, 46; Enum. 14; Berl. Baumz. 87.—Abbot, Insects Georgia, ii, t. 98.—Michaux, Fl. Bor.-Am. i, 3.—Vahl, Enum. i, 44.—Persoon, Syn. i, 9.—Desfontaines, Hist. Arb. i, 111.—Pursh, Fl. Am. Sept. i, 7.—Rœmer & Schultes, Syst. i, 72.—Nuttall, Genera, i, 5; Sylva, iii, 56, t. 88; 2 ed. ii, 122, t. 88.—Elliott, Sk. i, 6.—Hayne, Dend. Fl. 2.—Torrey, Fl. U. S. i, 7; Compend. Fl. N. States, 17.—Sprengel, Syst. i, 34.—Loddiges, Bot. Cab. t. 1264.—Guimpel, Otto & Hayne, Abb. Holz. 93, t. 73.—Beck, Bot. 232.—Eaton, Manual, 6 ed. 92.—Don, Miller's Dict. iv, 50.—Loudon, Arboretum, ii, 1206, f. 1029, 1030.—Spach, Hist. Veg. viii, 259.—Dietrich, Syn. i, 37.—Eaton & Wright, Bot. 193.—A. De Candolle, Prodr. viii, 295.—Browne, Trees of America, 371.—Darlington, Fl. Cestrica, 3 ed. 238.—Darby, Bot. S. States, 429.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 369.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 95.—Lesquereux in Owen's 2d Rep. Arkansas, 382.—Wood, Cl. Book, 599; Bot. & Fl. 276.—Porcher, Resources S. Forests, 494.—Gray, Manual N. States, 5 ed. 401; Hall's Pl. Texas, 19; Syn. Fl. N. America, ii[1], 77.—Koch, Dendrologie, ii, 262.—Young, Bot. Texas, 452.—Vasey, Cat. Forest Trees, 20.

C. trifida, Mœnch, Meth. 437.

C. Virginica, var. *latifolia*, Vahl, Enum. i, 44.—Aiton, Hort. Kew. 2 ed. i, 23.—Pursh, Fl. Am. Sept. i, 8.—Hayne, Dend. Fl. 2.—Don, Miller's Dict. iv, 50.

C. Virginica, var. *angustifolia*, Vahl, Enum. i, 44.—Aiton, Hort. Kew. 2 ed. i, 23.—Hayne, Dend. Fl. 2.—Watson, Dend. Brit. i, t. 1.—Don, Miller's Dict. iv, 50.

C. Virginica, var. *montana*, Pursh, Fl. Am. Sept. i, 8.—Torrey, Fl. U. S. i, 7; Compend. Fl. N. States, 17.—Beck, Bot. 232.—Eaton, Manual, 6 ed. 92.—Eaton & Wright, Bot. 194.—A. De Candolle, Prodr. viii, 295.

C. Virginica, var. *maritima*, Pursh, Fl. Am. Sept. i, 8.—Torrey, Fl. U. S. i, 7; Compend. Fl. N. States, 17.—Beck, Bot. 232.—Eaton, Manual, 6 ed. 92.—Don, Miller's Dict. iv, 50.—Eaton & Wright, Bot. 194.—A. De Candolle, Prodr. viii, 295.—Regel, Gartenflora, xvi, t. 564.

C. maritima, Loddiges, Cat. 1836.

C. heterophylla, Rafinesque, New Fl. & Bot. i, 86.

C. longifolia, Rafinesque, New Fl. & Bot. i, 87.

C. montana, Rafinesque, New Fl. & Bot. i, 88.

C. angustifolia, Rafinesque, New Fl. & Bot. i, 88.

FRINGE TREE. OLD MAN'S BEARD.

Lancaster county and the banks of the Brandywine, Chester county, Pennsylvania, south to Tampa bay, Florida, and through the Gulf states to southern Arkansas and the valley of the Brazos river, Texas.

A small tree, 6 to 10 meters in height, with a trunk 0.15 to 0.20 meter in diameter; generally along streams in low, rich soil; very common in cultivation.

Wood heavy, hard, close-grained, compact; layers of annual growth marked by several rows of large open ducts, connected as in that of *Bumelia* by branching groups of similar ducts; medullary rays numerous, obscure; color, light brown, the sap-wood lighter; specific gravity, 0.6372; ash, 0.51.

A decoction of the tonic and anti-periodic bark of the root sometimes employed in the treatment of intermittent fevers (*Am. Jour. Pharm.* xliv, 398.—*U. S. Dispensatory*, 14 ed. 1612).

201.—Osmanthus Americanus, Bentham & Hooker,

Genera, ii, 667.—Gray, Syn. Fl. N. America, ii[1], i, 78.

Olea Americana, Linnæus, Mant. 24.—Marshall, Arbustum, 98.—Lamarck, Dict. iv, 543; Ill. i, 28.—Aiton, Hort. Kew. 1, 14; 2 ed. i, 22.—Willdenow, Spec. i, 45; Enum. 13.—Michaux, Fl. Bor.-Am. ii, 222.—Vahl, Enum. i, 41.—Persoon, Syn. i, 9.—Desfontaines, Hist. Arb. i, 112.—Nouveau Duhamel, v, 67.—Michaux f. Hist. Arb. Am. iii, 50, t. 6; N. American Sylva, ii, 3 ed. 128, t. 86.—Pursh. Fl. Am. Sept. i, 7.—Rœmer & Schultes, Syst. i, 70.—Rafinesque, Fl. Ludoviciana, 38.—Nuttall, Genera, i, 5.—Elliott, Sk. i, 5.—Sprengel, Syst. i, 34.—Croom in Am. Jour. Sci. 1 ser. xxvi, 315.—Dietrich, Syn. i, 37.—Don, Miller's Dict. iv, 48.—Spach, Hist. Veg. viii, 267.—Eaton, Manual, 6 ed. 239.—Dietrich, Syn. i, 37.—Eaton & Wright, Bot. 333.—A. De Candolle, Prodr. viii, 286.—Browne, Trees of America, 381.—Darby, Bot. S. States, 429.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 369.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 57.—Lesquereux in Owen's 2d Rep. Arkansas, 382.—Wood, Cl. Book, 599; Bot. & Fl. 276.—Porcher, Resources S. Forests, 493.—Gray, Manual N. States, 5 ed. 401.—Young, Bot. Texas, 451.—Vasey, Cat. Forest Trees, 20.

DEVIL WOOD.

Southern Virginia, south to cape Canaveral and Tampa bay, Florida, and through the Gulf states to eastern Louisiana, near the coast.

A small tree, 10 to 15 meters in height, with a trunk sometimes 0.30 meter in diameter; borders of streams and pine-barren swamps, in moist, rich soil.

Wood heavy, very hard and strong, close-grained, unwedgeable, difficult to work, containing many radiating groups of open cells parallel to the thin, obscure, medullary rays; color, dark brown, the thick sap-wood light brown or yellow; specific gravity, 0.8111; ash, 0.46.

BORRAGINACEÆ.

202.—Cordia Sebestena, Linnæus,

Spec. 1 ed. 190.—Jacquin, Amer. t. 42.—Lamarck, Ill. i, 421, t. 96, f. 1.—Willdenow, Spec. i, 1073; Enum. 248.—Andrews, Bot. Rep. iii, 157, t. 157.—Poiret in Lamarck, Dict. vii, 45.—Persoon, Syn. i, 166.—Trattinick, Archiv. t. 354.—Rœmer & Schultes, Syst. iv, 452.—Sprengel, Syst. i, 649.—Bot. Mag. t. 794.—Aiton, Hort. Kew. 2 ed. ii, 8.—Descourtilz, Fl. Antilles, iv, 205, t. 277.—Chamisso in Linnæa, vi, 755.—Audubon, Birds, t. 177.—Don, Miller's Dict. iv, 375.—Dietrich, Syn. i, 611.—Nuttall, Sylva, iii, 81, t. 106; 2 ed. ii, 145, t. 106.—Cooper in Smithsonian Rep. 1858, 265.—Grisebach, Fl. British West Indies, 478.—Gray, Syn. Fl. N. America, ii[1], 180.

? *C. juglandifolia*, Jacquin, Amer. t. 43.

C. speciosa, Willdenow in Rœmer & Schultes, Syst. iv, 799.—A. De Candolle, Prodr. ix, 476.

Sebestena scabra, Rafinesque, Sylva Telluriana, 38.

GEIGER TREE.

Semi-tropical Florida, on the southern keys; rare; in the West Indies.

A small tree, sometimes 8 meters in height, with a trunk 0.06 to 0.08 meter in diameter; rich hummock soil; ornamental and becoming a large tree in cultivation.

Wood heavy, hard, close-grained, compact, satiny, containing few scattered, small, open ducts; medullary rays very numerous, thin, conspicuous; color, dark brown, the thick sap-wood light brown or yellow; specific gravity, 0.7108; ash, 4.22.

203.—Cordia Boissieri, A. De Candolle,

Prodr. ix, 478.—Torrey, Bot. Mex. Boundary Survey, 135.—Cooper in Smithsonian Rep. 1860, 442.—Gray, Syn. Fl. N. America, ii[1], 180.

Texas, valley of the Rio Grande, westward to New Mexico and southward into Mexico.

A small tree, rarely 8 meters in height, with a trunk 0.12 to 0.15 meter in diameter, or more often reduced to a low shrub.

Wood light, rather soft, close-grained, compact, containing many small scattered open ducts; medullary rays very numerous, thin, conspicuous; color, dark brown, the sap-wood light brown; specific gravity, 0.6790; ash, 3.53.

204.—Bourreria Havanensis, Miers,

Bot. Contrib. ii, 238.—Gray, Syn. Fl. N. America, ii[1], 181.

Ehretia Havanensis, Willdenow in Rœmer & Schultes, Syst. iv, 805.—Humboldt, Bonpland & Kunth, Nov. Gen. & Spec. vii, 206.—A. De Candolle, Prodr. ix, 508.

Ehretia tomentosa, Lamarck, Ill. i, 425.—Poiret, Suppl. ii, 1.—Sprengel, Syst. i, 648.—Dietrich, Syn. i, 630.

B. tomentosa, Don, Miller's Dict. iv, 390.

B. recurva, Miers, Bot. Contrib. ii, 238.

B. ovata, Miers, Bot. Contrib. ii, 238.

Ehretia Bourreria, Chapman, Fl. S. States, 329 [not Linnæus].—Vasey, Cat. Forest Trees, 19.

B. tomentosa, var. *Havanensis*, Grisebach, Fl. British West Indies, 482.

STRONG BARK.

Semi-tropical Florida, southern keys (Key Largo, Elliott's Key, etc.); in the West Indies.

A small tree, 10 or, exceptionally, 15 meters (Key Largo, *Curtiss*) in height, with a trunk 0.20 to 0.25 meter in diameter; the large specimens generally hollow and defective.

A form (generally shrubby in Florida) with scabrous or hispidulous leaves is—

var. radula, Gray, Syn. Fl. N. America, ii[1], 181.

Ehretia radula, Poiret, Suppl. ii, 2.—Dietrich, Syn. i, 630.—A. De Candolle, Prodr. ix, 506.—Chapman, Fl. S. States, 329.

B. radula, Don, Miller's Dict. iv, 390.—Chamisso in Linnæa, viii, 120.—Miers, Bot. Contrib. ii, 238.

Cordia Floridana, Nuttall, Sylva, iii, 83, t. 107; 2 ed. ii, 147, t. 107.—Cooper in Smithsonian Rep. 1858, 265.

Wood heavy, very hard, strong, very close-grained, compact, susceptible of a beautiful polish; medullary rays numerous, obscure; color, brown streaked with orange, the sap-wood not distinguishable; specific gravity, 0.8073; ash, 2.79.

205.—Ehretia elliptica, De Candolle,

Prodr. ix, 503.—Torrey, Bot. Mex. Boundary Survey, 136.—Cooper in Smithsonian Rep. 1858, 266.—Miers, Bot. Contrib. ii, 228, t. 85.—Gray, Syn. Fl. N. America, ii[1], 181.

KNACKAWAY. ANAQUA.

Texas, Corpus Christi to New Braunfels (*Mohr*), and southward to the valley of the lower Rio Grande.

A tree 10 to 15 meters in height, with a trunk sometimes 0.50 meter in diameter; generally along borders of streams, in rich loam, and reaching its greatest development between the Guadalupe and Nueces rivers, 50 to 75 miles from the Gulf coast.

Wood heavy, hard, not strong, very close-grained, compact, unwedgeable, containing many small open ducts arranged in numerous concentric rings within the layers of annual growth, these marked by several rows of larger ducts; medullary rays numerous, thin; color, light brown, the sap-wood a little lighter; specific gravity, 0.6440; ash, 1.31.

BIGNONIACEÆ.

206.—Catalpa bignonioides, Walter,

Fl. Caroliniana, 64.—De Candolle, Prodr. ix, 226.—Darlington, Fl. Cestrica, 3 ed. 182.—Cooper in Smithsonian Rep. 1858, 253.—Chapman, Fl. S. States, 285.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 50.—Wood, Cl. Book, 513; Bot. & Fl. 218.—Bureau, Mon. Bignoniaceæ, t. 25.—Gray, Manual N. States, 5 ed. 321, in part; Syn. Fl. N. America, ii[1], 319, in part.—Koch, Dendrologie, ii, 302.—Young, Bot. Texas, 385.—Vasey, Cat. Forest Trees, 19, in part.—Guibourt, Hist. Drogues, 7 ed. ii, 548.

Bignonia Catalpa, Linnæus, Spec. 1 ed. 622 (excl. syn.).—Lamarck, Dict. i, 417.—Marshall, Arbustum, 21.—Wangenheim, Amer. 58, t. 20, f. 45.—Willdenow, Spec. iii, 289; Enum. 649.—Michaux, Fl. Bor.-Am. ii, 25.—Desfontaines, Hist. Arb. i, 189.—Michaux f. Hist. Arb. Am. iii, 217, t. 6; N. American Sylva, 3 ed. ii, 55, t. 64.—Barton, Prodr. Fl. Philadelph. 66.—Rafinesque, Fl. Ludoviciana, 159.—Porcher, Resources S. Forests, 460.—Maout & Decaisne, Bot. English ed. 602 & f.

C. cordifolia, Jaume St. Hilaire in Nouveau Duhamel, ii, 13, in part (excl. t. 5).—Barton, Compend. Fl. Philadelph. i, 9.—Nuttall, Genera, i, 10.—Elliott, Sk. i, 24.—Torrey, Fl. U. S. i, 16; Compend. Fl. N. States, 20.—Beck, Bot. 245.—Eaton, Manual, 6 ed. 85.—Darlington, Fl. Cestrica, 2 ed. 363.—Spach, Hist. Veg. ix, 132.—Eaton & Wright, Bot. 184.—Darby, Bot. S. States, 439.

C. syringæfolia, Sims, Bot. Mag. t. 1094.—Schkuhr, Handb. t. 175.—Aiton, Hort. Kew. 2 ed. i, 24.—Pursh. Fl. Am. Sept. i, 10.—Eaton, Manual, 8; 6 ed. 85.—Meyer, Prim. Fl. Esseq. 3.—Hayne, Dend. Fl. 2.—Loddiges, Bot. Cab. t. 1285.—Sprengel, Syst. i, 70.—Sertum Botanicum, i, t.—Lindley, Fl. Med. 499; Penn. Cycl. vi, 363.—Don, Miller's Dict. iv, 230.—Loudon, Arboretum, iii, 1261 & t.—Dietrich, Syn. i, 82.—Nuttall, Sylva, iii, 77; 2 ed. ii, 140.—Torrey, Fl. N. York, ii, 25.—Browne, Trees of America, 406.

C. communis, Du Mont, Bot. Cult. 2 ed. iii, 242.

CATALPA. CATAWBA. BEAN TREE. CIGAR TREE. INDIAN BEAN.

Southwestern Georgia, valleys of the Little and Apalachicola rivers, western Florida, and through central Alabama and Mississippi.

A low, much-branched tree, 12 to 15 meters in height, with a trunk 0.50 to 0.75 meter in diameter; borders of streams and swamps, in rich loam; rare and local; long cultivated for ornament, and now extensively naturalized throughout the middle and southern Atlantic states.

Wood light, soft, not strong, coarse-grained, compact, very durable; layers of annual growth clearly marked by many rows of large open ducts; medullary rays numerous, obscure; color, light brown, the thin (one or two years') sap-wood lighter, often nearly white; specific gravity, 0.4474; ash, 0.38; used and highly valued for fence posts, rails, etc.; a reputed emetic.

A decoction of the seeds and dried bark occasionally used in cases of asthma and bronchitis (*Am. Jour. Pharm.* xlii, 204.—*U. S. Dispensatory*, 14 ed. 1608.—*Nat. Dispensatory*, 2 ed. 367).

207.—Catalpa speciosa, Warder;

Engelmann in Coulter's Bot. Gazette, v, 1.—Sargent in London Gard. Chronicle 1879, 784.—Ridgway in Proc. U. S. Nat. Mus. 1882, 70.—Barnes in Coulter's Bot. Gazette, ix, 74.

C. cordifolia, Jaume St. Hilaire in Nouveau Duhamel, ii, 13, in part, t. 5.—Nuttall in Trans. Am. Phil. Soc. 2 ser. v, 183.

C. bignonioides, Lesquereux in Owen's 2d Rep. Arkansas, 375 [not Walter.]—Gray, Manual N. States, 5 ed. 321, in part; Syn. Fl. N. America, ii[1], 319, in part.—Vasey, Cat. Forest Trees, 19, in part.—Broadhead in Coulter's Bot. Gazette, iii, 59.

WESTERN CATALPA.

Valley of the Vermilion river, Illinois, through southern Illinois and Indiana, western Kentucky and Tennessee, southeastern Missouri and western Arkansas.

A tree 20 to 35 or, exceptionally, 45 meters in height (*Ridgway*), with a trunk 1 to 2 meters in diameter; borders of streams and swamps, in rich bottom lands; common and reaching its greatest development in the valley of the lower Wabash river; cultivated and now widely naturalized through southern Arkansas, western Louisiana, and eastern Texas.

Wood light, soft, not strong, coarse-grained, compact, very durable in contact with the soil; layers of annual growth clearly marked by several rows of large open ducts; medullary rays numerous, obscure; color, brown, the thin sap-wood lighter; specific gravity, 0.4165; ash, 0.39; largely used for railway ties, fence posts, rails, etc., and adapted for cabinet work and interior finish.

208.—Chilopsis saligna, D. Don,

Edinburgh Phil. Jour. ix, 261.—Don, Miller's Dict. iv, 228.—Dietrich, Syn. iii, 566.—Gray in Bot. California, i, 587; Syn. Fl. N. America, ii[1], 320.—Vasey, Cat. Forest Trees, 19.—Rothrock in Wheeler's Rep. vi, 217.—Hemsley, Bot. Am.-Cent. ii, 494.—Rusby in Bull. Torrey Bot. Club, ix, 54.

Bignonia linearis, Cavanilles, Icon. iii, 35, t. 269.

C. linearis, De Candolle, Prodr. ix, 227.—Cooper in Smithsonian Rep. 1858, 266.

C. glutinosa, Engelmann in Wislizenus' Rep. 10.

DESERT WILLOW.

Valley of the Rio Grande, Texas (Laredo, *Letterman*), west through southern New Mexico and Arizona to the San Gorgonio pass and the San Felipe cañon, San Diego county, California; southward into northern Mexico.

A small tree, 6 to 8 meters in height, with a trunk sometimes 0.30 meter in diameter; *mesas* and banks of depressions and water-courses in the desert; the large specimens generally hollow and defective.

Wood light, soft, not strong, close-grained, checking in drying, containing many scattered, small, open ducts, the layers of annual growth marked by several rows of larger ducts; medullary rays numerous, obscure; color, brown streaked with yellow, the sap-wood much lighter; specific gravity, 0.5902; ash, 0.37.

209.—Crescentia cucurbitina, Linnæus,

Mant. 2 ed. 250.—Swartz, Obs. 234.—Willdenow, Spec. iii, 311.—Persoon, Syn. ii, 168.—Aiton, Hort. Kew. 2 ed. iv, 37.—Gærtner f. Fruct. Suppl. 230, t. 223.—Dietrich, Syn. iii, 567.—Don, Miller's Dict. iv, 232.—De Candolle, Prodr. ix, 246.—Seemann in Jour. Bot. & Kew Gard. Misc. vi, 274; ix, 142.—Walpers, Ann. v, 524.—Grisebach, Fl. British West Indies, 445.—Hemsley, Fl. Am. Cent. ii, 489.

C. ovata, Burmann, Fl. Ind. 132.

C. latifolia, Lamarck, Dict. i, 558; Ill. iii, 96, t. 547.—Descourtilz, Fl. Antilles, iii, 143, t. 182.

C. lethifera, Tussac, Fl. Antilles, iv, 50, t. 17.

C. toxicaria, Tussac, Fl. Antilles, iv, 50, t. 17.

C. obovata, Bentham, Bot. Sulphur, 130, t. 46.

BLACK CALABASH TREE.

Semi-tropical Florida, near Miami, and on Little river (*Garber*, *Curtiss*); in the West Indies.

A small tree, in Florida rarely exceeding 6 meters in height, with a trunk 0.10 to 0.12 meter in diameter.

Wood heavy, hard, very close-grained, compact, containing many small, regularly-distributed, open ducts; medullary rays thin, hardly distinguishable; color, light brown tinged with orange, the sap-wood lighter; specific gravity, 0.6319; ash, 1.35.

VERBENACEÆ.

210.—Citharexylum villosum, Jacquin,

Coll. i, 72; Icon. Rar. t. 118.—Persoon, Syn. ii, 142.—Aiton, Hort. Kew. 2 ed. iv, 36.—Dietrich, Syn. iii, 614.—Schauer in De Candolle, Prodr. xi, 610.—Walpers, Rep. iv, 76.—Chapman, Fl. S. States, 309.—Vasey, Cat. Forest Trees, 10.—Gray, Syn. Fl. N. America, ii[1], 340.—Hemsley, Bot. Am.-Cent. ii, 537.

FIDDLE WOOD.

Semi-tropical Florida, cape Canaveral to the southern keys (Pumpkin Key, *Curtiss*); and through the West Indies to Mexico.

A small tree, rarely exceeding in Florida 6 meters in height, with a trunk 0.10 to 0.15 meter in diameter, or north of bay Biscayne reduced to a low, much-branched shrub; common and reaching within the United States its greatest development on the shores of bay Biscayne, Lost Man's river, etc.

Wood heavy, exceedingly hard, strong, close-grained, compact, susceptible of a fine polish, containing numerous small, regularly-distributed, open ducts; color, clear bright red, the sap-wood lighter; specific gravity, 0.8710; ash, 0.52.

211.—Avicennia nitida, Jacquin,

Amer. 177, t. 112, f. 1.—Persoon, Syn. ii, 143.—Chamisso in Linnæa, vii, 370.—Sprengel, Syst. ii, 768.—Martius, Mat. Med. Brasil. 49; Bot. Brasil. ix, 303.—Dietrich, Syn. iii, 619.—Schauer in De Candolle, Prodr. xi, 699.—Grisebach, Fl. British West Indies, 502.—Gray, Syn. Fl. N. America, ii[1], 341.

A. tomentosa, Meyer, Prim. Fl. Esseq. 221 [not Jacquin].—Nuttall, Sylva, iii, 79, t. 105; 2 ed. ii, 143, t. 105.—Cooper in Smithsonian Rep. 1858, 265.—Chapman, Fl. S. States, 310.—Vasey, Cat. Forest Trees, 19.

A. oblongifolia, Nuttall ?; Chapman, Fl. S. States, 310.—Vasey, Cat. Forest Trees, 19.

BLACK MANGROVE. BLACK TREE. BLACK WOOD.

Florida coast, Saint Augustine to the southern keys, and from Cedar Keys to cape Sable; deltas of the Mississippi river; through the West Indies to Brazil.

A tree 6 to 9 meters in height, with a trunk 0.25 to 0.30 meter in diameter, or, exceptionally, 20 to 23 meters in height, with a trunk 0.60 meter in diameter; north of Mosquito inlet reduced to a low shrub; common along saline shores and swamps, throwing up many leafless, corky stems, and forming, with the red mangrove (*Rhizophora*), impenetrable thickets, or, more rarely, scattered and round-headed; reaching its greatest development in the United States on the west coast of Florida, north of cape Sable.

Wood very heavy, hard, rather coarse-grained, compact, the eccentric layers of annual growth marked by several rows of large open ducts; medullary rays numerous, thin; color, dark brown or nearly black, the sap-wood brown; specific gravity, 0.9138; ash, 2.51.

NYCTAGINACEÆ.

212.—Pisonia obtusata, Swartz,

Fl. Ind. Occ. 1960.—Jacquin, Hort. Schœnb. iii, 36, t. 314.—Lamarck, Ill. iii, 449, t. 861.—Dietrich, Syn. ii, 1226.—Choisy in De Candolle, Prodr. xiii[2], 443.—Chapman, Fl. S. States, 374.—Grisebach, Fl. British West Indies, 71.—Vasey, Cat. Forest Trees, 21.

PIGEON WOOD. BEEF WOOD. CORK WOOD. PORK WOOD.

Semi-tropical Florida, cape Canaveral to the southern keys; through the West Indies.

A tree 9 to 15 meters in height, with a trunk 0.25 to 0.45 meter in diameter; saline shores and beaches, reaching its greatest development in Florida on Elliott's and Old Rhodes Keys.

Wood heavy, rather soft, weak, coarse-grained, compact, containing numerous large open ducts; layers of annual growth and medullary rays hardly distinguishable; color, yellow tinged with brown, the sap-wood darker; specific gravity, 0.6529; ash, 7.62; probably of little value.

NOTE.—The semi-prostrate and vine-like trunks of *P. aculeata*, Linnæus, of the same region, although attaining a considerable size, cannot be properly considered arborescent.

POLYGONACEÆ.

213.—Coccoloba Floridana, Meisner;

De Candolle, Prodr. xiv, 165.—Chapman, Fl. S. States, 392.—Porcher, Resources S. Forests, 376.—Vasey, Cat. Forest Trees, 21.

C. parvifolia, Nuttall, Sylva, iii, 25, t. 89; 2 ed. ii, 95, t. 89 [not Poiret].—Cooper in Smithsonian Rep. 1858, 265.

PIGEON PLUM.

Semi-tropical Florida, cape Canaveral to the southern keys, and from cape Romano to cape Sable.

A tree 15 to 18 meters in height, with a trunk 0.30 to 0.60 meter in diameter; one of the largest and most common trees of the region.

Wood very heavy, exceedingly hard, strong, brittle, very close-grained, inclined to check in drying, containing few small, scattered, open ducts; layers of annual growth and numerous medullary rays obscure; color, rich dark brown tinged with red, the sap-wood lighter; specific gravity, 0.9835; ash, 5.03; valuable and somewhat used for cabinet-making.

The edible and abundant grape-like fruit, ripening in February and March, is eagerly devoured by raccoons and other animals.

214.—Coccoloba uvifera, Jacquin,

Amer. 112, t. 73.—Gærtner, Fruct. i, 214, t. 45, f. 3.—Aiton, Hort. Kew. ii, 34; 2 ed. ii, 421.—Lamarck, Ill. ii, 445, t. 316, f. 2.—Willdenow, Spec. ii, 457; Enum. 431.—Poiret in Lamarck, Dict. vi, 61.—Persoon, Syn. i, 442.—Titford, Hort. Bot. Am. 61.—Aiton, Hort. Kew. 2 ed. ii, 421.—Sprengel, Syst. ii, 252.—Descourtilz, Fl. Antilles, ii, 41, t. 77.—Bot. Mag. t. 3130.—Rafinesque, Fl. Telluriana, ii, 34.—Spach, Hist. Veg. x, 542.—Dietrich, Syn. Fl. ii, 1326.—Nuttall, Sylva, iii, 23, t. 88; 2 ed. ii, 93, t. 88.—Carson, Med. Bot. ii, 21, t. 67.—Meisner in De Candolle, Prodr. xiv, 152; Bot. Brasil. v[1], 42.—Cooper in Smithsonian Rep. 1858, 265.—Chapman, Fl. S. States, 391.—Porcher, Resources S. Forests, 376.—Grisebach, Fl. British West Indies, 161.

Polygonum uvifera, Linnæus, Spec. 1 ed. 365.

SEA GRAPE.

Semi-tropical Florida, Mosquito inlet to the southern keys, west coast, Tampa bay to cape Sable; through the West Indies to Brazil.

A low tree, rarely exceeding in Florida 4 meters in height, with a gnarled and contorted trunk often 0.90 to 1.20 meter in diameter, or reduced to a low, generally prostrate shrub; saline shores and beaches; common.

West Indian forms, differing in the shape of the leaves, etc., are—

var. **ovalifolia**, Meisner, *l. c.*

var. **Lœganensis**, Meisner, *l. c.*

C. Lœganensis, Jacquin, Amer. 113, t. 178, f. 33.

Wood very heavy, hard, very close-grained, inclined to check in drying, susceptible of a beautiful polish, containing few scattered, rather small, open ducts; layers of annual growth and numerous medullary rays hardly distinguishable; color, rich dark brown or violet, the sap-wood lighter; specific gravity, 0.9635; ash, 1.37; valuable for cabinet-making.

The edible fruit of agreeable subacid flavor.

LAURACEÆ.

215.—Persea Carolinensis, Nees,

Syst. Laurinarum, 150.—Spach, Hist. Veg. x, 492.—Dietrich, Syn. ii, 1339.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 63.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 63.—Wood, Cl. Book, 620; Bot. & Fl. 290.—Meisner in De Candolle, Prodr. xv[1], 50.—Gray, Manual N. States, 5 ed. 422; Hall's Pl. Texas, 473.—Young, Bot. Texas, 473.—Vasey, Cat. Forest Trees, 21.

Laurus Borbonia, Linnæus, Spec. 1 ed. 370, in part.—Marshall, Arbustum, 73.—Walter, Fl. Caroliniana, 133.—Aiton, Hort. Kew. ii, 39; 2 ed. ii, 429.—Lamarck, Dict. iii, 450.—Willdenow, Spec. ii, 481.—Desfontaines, Hist. Arb. i, 65.—Nouveau Duhamel, ii, 163.

Laurus Carolinensis, Catesby, Carol. i, 63, t. 63.—Michaux, Fl. Bor.-Am. i, 245.—Persoon, Syn. i, 449.—Desfontaines, Hist. Arb. i, 65.—Poiret, Suppl. iii, 321.—Willdenow, Enum. Suppl. 22.—Michaux f. Hist. Arb. Am. iii, 180, t. 2; N. American Sylva, 3 ed. ii, 116, t. 82.—Pursh, Fl. Am. Sept. i, 276.—Elliott, Sk. i, 461.—Sprengel, Syst. ii, 665.—Torrey, Compend. Fl. N. States, 174.—Beck, Bot. 305.—Eaton, Manual, 6 ed. 199.—Loudon, Aboretum, iii, 1299, f. 1168, 1169.—Eaton & Wright, Bot. 293.—Browne, Trees of America, 414.—Darby, Bot. S. States, 491.—Schnizlein, Icon. t. 106, f. 5-12.

Laurus Carolinensis, var. *glabra*, Pursh, Fl. Am. Sept. i, 276.

Laurus Carolinensis, var. *obtusa*, Pursh, Fl. Am. Sept. i, 276.

Laurus Caroliniana, Poiret, Suppl. iii, 323.—Nuttall, Genera, i, 258.

P. Borbonia, Sprengel, Syst. ii, 268.

P. Carolinensis, var. *glabriuscula*, Meisner in De Candolle, Prodr. xv[1], 51.

RED BAY.

Southern Delaware?, south to bay Biscayne and cape Romano, Florida, and through the Gulf states to southern Arkansas and the valley of the Trinity river, Texas, near the coast.

A tree 15 to 20 meters in height, with a trunk 0.60 to 0.90 meter in diameter; borders of streams and swamps, in low, rich soil.

Wood heavy, hard, very strong, brittle, very close-grained, compact, susceptible of a beautiful polish, containing many evenly-distributed open ducts; medullary rays numerous, thin; color, bright red, the sap-wood much lighter; specific gravity, 0.6429; ash, 0.76; formerly somewhat used in ship-building, interior finish, and for cabinet work.

Var. **palustris**, Chapman,

Fl. S. States, 393.

Laurus Carolinensis, var. *pubescens*, Pursh, Fl. Am. Sept. i, 276.

P. Carolinensis, var. *pubescens*, Meisner in De Candolle, Prodr. xv[1], 51.

North Carolina to Alabama, generally near the coast.

A small tree, 9 to 12 meters in height, with a trunk rarely exceeding 0.30 meter in diameter; low, sandy banks of pine-barren streams and swamps; well distinguished from the species by the longer peduncles densely clothed, as are the young shoots and under sides of the leaves, with short, brown tomentum, and by the somewhat coarser-grained orange-colored wood.

Wood heavy, soft, strong, close-grained, compact, containing numerous rather large open ducts; medullary rays numerous, thin; color, orange streaked with brown; the sap-wood light brown or gray; specific gravity, 0.6396; ash, 0.37.

216.—Nectandra Willdenoviana, Nees,

Syst. Laurinarum, 290, 321.—Meisner in De Candolle, Prodr. xvi[2], 165.

Laurus sanguinea, Swartz, Fl. Ind. Occ. ii, 707.

Laurus Catesbyana, Michaux, Fl. Bor.-Am. i, 244.—Poiret, Suppl. iii, 321.—Pursh, Fl. Am. Sept. i, 275.—Elliott, Sk. i, 462.—Sprengel, Syst. ii, 265.—Eaton, Manual, 6 ed. 199.—Eaton & Wright, Bot. 294.—Darby, Bot. S. States, 491.

Laurus Catesbœi, Persoon, Syn. i, 499.—Nuttall, Genera, i, 258.

Gymnobalanus Catesbyana, Nees, Syst. Laurinarum, 483.

N. Bredemeieriana, Nees in Linnæa, xxi, 505.

Persea Catesbyana, Chapman, Fl. S. States, 393.—Vasey, Cat. Forest Trees, 21.

LANCE WOOD.

Semi-tropical Florida, cape Canaveral and cape Romano to the southern keys; through the West Indies to Central America.

A small tree, 6 to 9 meters in height, with a trunk rarely exceeding 0.15 meter in diameter; common and reaching its greatest development in Florida on the shores of bay Biscayne and in the neighborhood of cape Romano.

Wood heavy, hard, close-grained, checking in drying, containing many small, regularly-distributed, open ducts; medullary rays numerous, thin; color, rich dark brown, the sap-wood bright yellow; specific gravity, 0.7693; ash, 0.60.

217.—Sassafras officinale, Nees,

Handb. der Med. Pharm. Bot. ii, 418; Syst. Laurinarum, 488.—Hayne, Arzn. i, 12, t. 19.—Lindley, Fl. Med. 338.—Dietrich, Syn. ii, 1357.—Spach, Hist. Veg. x, 503.—Torrey, Fl. N. York, ii, 158.—Emerson, Trees Massachusetts, 359; 2 ed. ii, 359 & t.—Griffith, Med. Bot. 551.—Darlington, Fl. Cestrica, 3 ed. 251.—Spruce in Hooker's London Jour. Bot. vii, 278.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 394.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 63.—Lesquereux in Owen's 2d Rep. Arkansas, 384.—Wood, Cl. Book, 620; Bot. & Fl. 290.—Porcher, Resources S. Forests, 350.—Meisner in De Candolle, Prodr. xv[1], 171.—Gray, Manual N. States, 5 ed. 423; Hall's Pl. Texas, 19.—Koch, Dendrologie, ii, 364.—Young, Bot. Texas, 473.—Vasey, Cat. Forest Trees, 21.—Broadhead in Coulter's Bot. Gazette, iii, 59.—Bentley & Trimen, Med. Pl. iii, 220, t. 220.—Ridgway in Proc. U. S. Nat. Mus. 1882, 70.—Bell in Geological Rep. Canada, 1879-'80, 55[c].

Laurus Sassafras, Linnæus, Spec. 1 ed. 371.—Du Roi, Harbk. i, 356.—Kalm, Travels, English ed. i, 146, 341.—Marshall, Arbustum, 74.—Wangenheim, Amer. 82, t. 27, f. 56.—Walter, Fl. Caroliniana, 134.—Aiton, Hort. Kew. ii, 40; 2 ed. ii, 429.—Lamarck, Dict. iii, 454.—Abbot, Insects Georgia, i, t. 11.—B. S. Barton, Coll. 11, 19; ii, 27.—Willdenow, Spec. ii, 485; Enum. 435; Berl. Baumz. 208.—Michaux, Fl. Bor.-Am. i, 243.—Schkuhr, Handb. 349.—Persoon, Syn. i, 450.—Robin, Voyages, iii, 361.—Desfontaines, Hist. Arb. i, 66.—Titford, Hort. Bot. Am. 130.—Michaux f. Hist. Arb. Am. iii, 173, t. 1; N. American Sylva, 3 ed. ii, 113, t. 81.—Pursh, Fl. Am. Sept. i, 277.—Rafinesque, Fl. Ludoviciana, 25.—Bigelow, Med. Bot. ii, 142, t. 35; Fl. Boston. 3 ed. 170.—Nuttall, Genera, i, 259; Sylva, i, 88; 2 ed. i, 104.—Elliott, Sk. i, 464.—Nees, Pl. Offic. t. 131.—Torrey, Fl. U. S. i, 408; Compend. Fl. N. States, 174.—Descourtilz, Fl. Antilles, vii, 51, t. 464.—Audubon, Birds, t. 144.—Stephenson & Churchill, Med. Bot. iii, t. 126.—Beck, Bot. 305.—Eaton, Manual, 6 ed. 199.—Darlington, Fl. Cestrica, 2 ed. 254.—Eaton & Wright, Bot. 293.—Browne, Trees of America, 416.—Darby, Bot. S. States, 492.

Persea Sassafras, Sprengel, Syst. ii, 270.—Schnizlein, Icon. t. 106, f. 15-23.

SASSAFRAS.

Eastern Massachusetts, southwestern Vermont, and west through southern Ontario and central Michigan to southeastern Iowa, eastern Kansas, and the Indian territory; south to Hernando county, Florida, and the valley of the Brazos river, Texas.

A tree 12 to 15 meters in height, with a trunk 0.60 to 0.90 meter in diameter, exceptionally 24 to 27 meters in height, with a trunk 1.80 to 2.25 meters in diameter, or toward its northern limits reduced to a small tree or shrub; rich, sandy loam, reaching its greatest development in southwestern Arkansas and the Indian territory; at the south often taking possession, with the persimmon, of abandoned fields in the middle districts.

Wood light, soft, not strong, brittle, coarse-grained, very durable in contact with the soil, slightly aromatic, checking in drying; layers of annual growth clearly marked with three or four rows of large open ducts; medullary rays numerous, thin; color, dull orange-brown, the thin sap-wood light yellow; specific gravity, 0.5042; ash, 0.10; used for light skiffs, ox yokes, etc., and largely for fence posts and rails, and in cooperage.

The root, and especially its bark, enters into commerce, affording a powerful aromatic stimulant; the oil of sassafras, distilled from the root, is largely used in imparting a pleasant flavor to many articles of domestic use; the pith of the young branches infused with water furnishes a mucilage used as a demulcent in febrile and inflammatory affections (*Sharpe in Am. Jour. Pharm.* 1863, 53.—*Proctor in Proc. Am. Pharm. Assoc.* 1866, 217.—*U. S. Dispensatory*, 14 ed. 814.—*Nat. Dispensatory*, 2 ed. 1274; *Flückiger & Hanbury, Pharmacographia*, 483).

"*Gumbo filet*," a powder prepared by the Choctaw Indians of Louisiana from the mucilaginous leaves, is used at the south in the preparation of "gumbo" soup.

218.—Umbellularia Californica, Nuttall,

Sylva, i, 87; 2 ed. i, 102.—Watson, Bot. California, ii, 61.

Laurus regia, Douglas in Companion Bot. Mag. ii, 137.

Oreodaphne Californica, Nees, Syst. Laurinarum, 463.—Bentham, Pl. Hartweg. 334; Bot. Sulphur, 49.—Dietrich, Syn. ii, 1356.—Hooker & Arnott, Bot. Beechey, 389.—Torrey in Pacific R. R. Rep. iv, 133; v, 364; Mex. Boundary Survey, 184.—Newberry in Pacific R. R. Rep. vi, 24, 88, f. 3.—Cooper in Smithsonian Rep. 1858, 260.—Bot. Mag. t. 5320.

Tetranthera Californica, Hooker & Arnott, Bot. Beechey, 159.—Meisner in De Candolle, Prodr. xv[1], 192.—Torrey in Bot. Wilkes Exped. 451.

Drimophyllum pauciflorum, Nuttall, Sylva, i, 85, t. 22; 2 ed. i, 102, t. 22.

MOUNTAIN LAUREL. CALIFORNIA LAUREL. SPICE TREE. CAGIPUT. CALIFORNIA OLIVE. CALIFORNIA BAY TREE.

Rogue River valley, Oregon, south through the California coast ranges to San Diego county, and along the western slopes of the Sierra Nevada to the San Bernardino mountains.

An evergreen tree, 24 to 30 meters in height, with a trunk 1.20 to 1.80 meter in diameter, or toward its southern limits and at high elevations a small tree or shrub; most common and reaching its greatest development in the rich valleys of southwestern Oregon.

Wood heavy, hard, strong, close-grained, compact, susceptible of a beautiful polish, containing numerous small, regularly-distributed, open ducts; medullary rays numerous, thin; color, rich light brown, the sap-wood lighter; specific gravity, 0.6517; ash, 0.39; used on the Oregon coast in ship-building, for jaws, bitts, cleats, cross-trees, etc.; the most valuable material produced by the Pacific forests for interior and cabinet work.

The leaves yield a volatile oil, *Oreodaphne* (*Am. Jour. Pharm.* xlvii, 105).

EUPHORBIACEÆ.

219.—Drypetes crocea, Poiteau,

Mem. Mus. i, 159, t. 8.—Nuttall, Sylva, ii, 66, t. 63; 2 ed. ii, 12, t. 63.—Cooper in Smithsonian Rep. 1858, 265.—Chapman, Fl. S. States, 410.—Grisebach, Fl. British West Indies, 32; Cat. Pl. Cuba, 15.—Müller in De Candolle, Prodr. xv[2], 455.

Schæfferia lateriflora, Swartz, Fl. Ind. Occ. i, 329.

D. sessiliflora, Baillon, Etud. Gen. Euphorbiaceæ, Atlas, 45, t. 24, f. 34–40.

D. glauca, Grisebach in Mem. Am. Acad. new ser. viii, 157 [not Vahl].

D. crocea, var. *longipes*, Müller in De Candolle, Prodr. xv[2], 456.

GUIANA PLUM. WHITE WOOD.

Semi-tropical Florida, bay Biscayne to the southern keys; in the West Indies.

A small tree, sometimes 9 meters in height, with a trunk 0.12 to 0.17 meter in diameter.

Wood heavy, hard, not strong, brittle, close-grained, checking in drying; medullary rays numerous, thin; color, rich dark brown, the sap-wood yellow; specific gravity, 0.9209; ash, 6.14.

Var. latifolia, Müller,

De Candolle, Prodr. xv², 456.

D. glauca, Nuttall, Sylva, ii, 68; 2 ed. ii, 14.—Chapman, Fl. S. States, 410.

D. alba, var. *latifolia*, Grisebach in Nachrich. d. Konigl. Gesell. Wiss. Univ. Götting. 1865, 165, in part.

Semi-tropical Florida, bay Biscayne to the southern keys; in the West Indies.

A tree sometimes 12 meters in height, with a trunk 0.30 to 0.35 meter in diameter.

Wood heavy, hard, not strong, brittle, very close-grained, checking in drying; medullary rays numerous, obscure; color, brown streaked with bright yellow, the sap-wood dull brown; specific gravity, 0.9346; ash, 8.29.

Perhaps a distinct species, the fruit and flowers not recently collected.

220.—Sebastiania lucida, Müller;

De Candolle, Prodr. xv², 1181.

Gymnanthes lucida, Swartz, Prodr. 96.

Excœcaria lucida, Swartz, Fl. Ind. Occ. ii, 1122.—Willdenow, Spec. iv, 865.—Poiret, Suppl. i, 155.—Persoon, Syn. ii, 634.—Nuttall, Sylva, ii, 60, t. 61; 2 ed. ii, 6, t. 61.—A. de Jussieu, Tent. Euphorb. t. 16, f. 55.—Richard, Fl. Cuba, 199.—Dietrich, Syn. v, 256.—Cooper in Smithsonian Rep. 1858, 265.—Chapman, Fl. S. States, 405.—Grisebach, Fl. British West Indies, 50.—Vasey, Cat. Forest Trees, 21.

CRAB WOOD. POISON WOOD.

Semi-tropical Florida, bay Biscayne to the southern keys; common; in the West Indies.

A small tree, sometimes 9 meters in height, with a trunk 0.15 to 0.20 meter in diameter; the large specimens generally hollow and decayed.

Wood very heavy, hard, very close-grained, compact, susceptible of a beautiful polish; medullary rays numerous, obscure; color, rich dark brown streaked with yellow, the sap-wood bright yellow; specific gravity, 1.0905; ash, 2.78; now largely manufactured into canes, and furnishing valuable fuel.

221.—Hippomane Mancinella, Linnæus,

Spec. 1 ed. 1191.—Jacquin, Amer. 250, t. 159.—Lamarck, Dict. ii, 694.—Aiton, Hort. Kew. iii, 378; 2 ed. v, 333.—Swartz, Obs. 369.—Willdenow, Spec. iv, 571.—Persoon, Syn. ii, 589.—Titford, Hort. Bot. Am. Suppl. 9, t. 12, f. 5.—Lamarck, Ill. iii, 374, t. 793, f. 1.—Sprengel, Syst. iii, 805.—Spach, Hist. Veg. ii, 524.—Nuttall, Sylva, ii, 54, t. 60; 2 ed. i, 202, t. 60.—Bentham, Bot. Sulphur, 163.—Richard, Fl. Cuba, 200.—Dietrich, Syn. v, 224.—Cooper in Smithsonian Rep. 1858, 265.—Baillon, Etud. Gen. Euphorbiaceæ, t. 6, f. 12-20.—Chapman, Fl. S. States, 404.—Porcher, Resources S. Forests, 120.—Grisebach, Fl. British West Indies, 50.—Regel, Gartenflora, xv, 163, t. 510.—Müller in De Candolle, Prodr. xv², 1201.—Schnizlein, Icon. t. 243, f. 3.—Maont & Decaisne, Bot. English ed. 693 & f.—Vasey, Cat. Forest Trees, 21.

Mancinella venenata, Tussac, Fl. Antilles, iii, 21, t. 5.

MANCHINEEL.

Semi-tropical Florida, on the southern keys; common; through the West Indies and Central America to the Pacific.

A small tree, in Florida rarely exceeding 4 meters in height, with a trunk 0.12 to 0.17 meter in diameter; abounding in white, milky, exceedingly caustic poisonous sap. "Rain washing the leaves becomes poisonous, and the smoke of the burning wood injures or destroys the eyes."—(*A. H. Curtiss*).

Wood light, soft, close-grained, compact, containing numerous evenly-distributed, small, open ducts; medullary rays numerous, obscure; color, dark brown, the thick sap-wood light brown or yellow; specific gravity (sap-wood), 0.5772; ash, 5.16.

URTICACEÆ.

222.—Ulmus crassifolia, Nuttall,

Trans. Am. Phil. Soc. 2 ser. v, 169.—Planchon in Ann. Sci. Nat. 3 ser. x, 279; De Candolle, Prodr. xvii, 162.—Walpers, Ann. iii, 426.—Cooper in Smithsonian Rep. 1858, 254.—Lesquereux in Owen's 2d Rep. Arkansas, 386.—Wood, Cl. Book, 633.—Gray, Hall's, Pl. Texas, 21.—Vasey, Cat. Forest Trees, 23.

U. opaca, Nuttall, Sylva, i, 35, t. 11; 2 ed. i, 51, t. 11.—Browne, Trees of America, 503.

CEDAR ELM.

Arkansas, south of the valley of the Arkansas river to the valley of the Rio Grande, Texas, extending west to Eagle Pass.

A tree 18 to 20 meters in height, with a trunk 0.60 to 0.90 meter in diameter, or toward its southern or southwestern limits much smaller; borders of streams, in rich soil; one of the most common and valuable timber trees of Texas west of the Trinity river, and reaching its greatest development in the valleys of the Guadalupe and Trinity rivers.

Wood heavy, hard, not strong, brittle, very close-grained, compact; layers of annual growth and medullary rays obscure; marked, in common with that of all the North American species, by concentric circles of irregularly-arranged groups of small open ducts; color, light brown tinged with red, the heavier sap-wood lighter; specific gravity, 0.7245; ash, 1.20; used in the manufacture of wagon hubs, saddle-trees, chairs, etc., and very largely for fencing.

223.—Ulmus fulva, Michaux,

Fl. Bor.-Am. i, 172.—Persoon, Syn. i, 291.—Willdenow, Enum. Suppl. 14.—Pursh, Fl. Am. Sept. i, 200.—Smith in Rees' Cycl. xxxix, No. 10.—Eaton, Manual, 31; 6 ed. 376.—Nuttall, Genera, i, 201.—Rœmer & Schultes, Syst. vi, 301.—Elliott, Sk. i, 333.—Hayne, Dend. Fl. 32.—Torrey, Fl. U. S. i, 299; Compend. Fl. N. States, 132; Fl. N. York, ii, 166; Fremont's Rep. 97.—Sprengel, Syst. i, 931.—Rafinesque, Med. Bot. ii, 271.—Beck, Bot. 333.—Hooker, Fl. Bor.-Am. ii, 142.—Bigelow, Fl. Boston. 3 ed. 114.—Eaton & Wright, Bot. 464.—London, Arboretum, iii, 1407, f. 1247.—Dietrich, Syn. ii, 992.—Spach in Ann. Sci. Nat. xv, 363; Hist. Veg. xi, 107.—Emerson, Trees Massachusetts, 297; 2 ed. ii, 334 & t.—Browne, Trees of America, 501.—Griffith, Med. Bot. 551.—Planchon in Ann. Sci. Nat. 3 ser. x, 276.—De Candolle, Prodr. xvii, 161.—Scheele in Rœmer, Texas, 446.—Walpers, Ann. iii, 426.—Richardson, Arctic Exped. 436.—Darlington, Fl. Cestrica, 3 ed. 255.—Darby, Bot. S. States, 502.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 416.—Curtis in Rep. Geological Surv. N. Carolina, iii, 1860, 55.—Lesquereux in Owen's 2d Rep. Arkansas, 386.—Wood, Cl. Book, 633; Bot. & Fl. 299.—Porcher, Resources S. Forests, 310.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 208.—Gray, Manual N. States, 5 ed. 442.—Koch, Dendrologie, ii, 422.—Young, Bot. Texas, 496.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 22.—Bentley & Trimen, Med. Pl. iv, 233, t. 233.—Ridgway in Proc. U. S. Nat. Mus. 1882, 72.—Bell in Geological Rep. Canada, 1879-'80, 55c.

U. pubescens, Walter, Fl. Caroliniana, 111.

U. Americana, var. *rubra*, Aiton, Hort. Kew. i, 319; 2 ed. ii, 107.—Willdenow, Spec. i, 1325.—Hayne, Dend. Fl. 31.

? *U. crispa*, Willdenow, Enum. 295; Berl. Baumz. 520.

U. rubra, Michaux f. Hist. Arb. Am. iii, 278, t. 6; N. American Sylva, 3 ed. iii, 73, t. 128.

RED ELM. SLIPPERY ELM. MOOSE ELM.

Valley of the lower Saint Lawrence river to Ontario and northern Dakota, south to the Chattahoochee region of northern Florida, central Alabama and Mississippi, and the valley of the San Antonio river, Texas.

A tree 15 to 20 meters in height, with a trunk 0.45 to 0.60 meter in diameter; borders of streams and hillsides, in rich soil.

Wood heavy, hard, strong, very close-grained, compact, durable in contact with the ground, splitting readily when green; layers of annual growth clearly marked by several rows of large open ducts; medullary rays numerous, thin; color, dark brown or red, the thin sap-wood lighter; specific gravity, 0.6956; ash, 0.83; largely used for wheel stock, fence posts, rails, railway ties, sills, etc.

The inner bark mucilaginous, nutritious, and extensively used in various medicinal preparations (*Am. Jour. Pharm.* xxiv, 180.—*Philadelphia Med. Times*, 1874, 303.—*U. S. Dispensatory*, 14 ed. 913.—*Nat. Dispensatory*, 2 ed. 1480.—*Flückiger & Hanbury, Pharmacographia*, 501).

224.—Ulmus Americana, Linnæus,

Spec. 1 ed. 226.—Kalm, Travels, English ed. ii, 298.—Marshall, Arbustum, 156.—Wangenheim, Amer. 46.—Gærtner, Fruct. i, 225, t. 49, f. 5.—Walter, Fl. Caroliniana, 111.—Aiton, Hort. Kew. i, 319; 2 ed. ii, 107.—Willdenow, Spec. i, 1325; Enum. 295; Suppl. 14; Berl. Baumz. 519.—Nouveau Duhamel, ii, 147.—Schkuhr, Handb. 179.—Michaux, Fl. Bor.-Am. i, 173.—Persoon, Syn. ii, 191.—Desfontaines, Hist. Arb. ii, 442.—Michaux f. Hist. Arb. Am. iii, 269, t. 4; N. American Sylva, 3 ed. iii, 67, t. 126.—Pursh, Fl. Am. Sept. i, 199.—Smith in Rees' Cycl. xxxix, No. 7.—Eaton, Manual, 31; 6 ed. 376.—Barton, Compend. Fl. Philadelph. i, 150.—Nuttall, Genera, i, 201.—Rœmer & Schultes, Syst. vi, 300.—Elliott, Sk. i, 333.—Hayne, Dend. Fl. 31.—Torrey, Fl. U. S. i, 298; Compend. Fl. N. States, 132; Fl. N. York, ii, 165; Nicollet's Rep. 160; Emory's Rep. 412.—Sprengel, Syst. i, 930.—Beck, Bot. 333.—Loudon, Arboretum, iii, 1406, f. 1236.—Hooker, Fl. Bor.-Am. ii, 142.—Bigelow, Fl. Boston. 3 ed. 114.—Dietrich, Syn. ii, 992.—Eaton & Wright, Bot. 464.—Spach in Ann. Sci. Nat. 2 ser. xv, 364; Hist. Veg. xi, 108.—Emerson, Trees Massachusetts, 286; 2 ed. ii, 322 & t.—Browne, Trees of America, 499.—Planchon in Ann. Sci. Nat. 3 ser. x, 268; De Candolle, Prodr. xvii, 155.—Scheele in Rœmer, Texas, 446.—Walpers, Ann. iii, 424.—Buckley in Am. Jour. Sci. 2 ser. xiii, 398.—Richardson, Arctic Exped. 436.—Darlington, Fl. Cestrica, 3 ed. 255.—Darby, Bot. S. States, 502.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 416.—Curtis in Rep. Geological Surv. N. Carolina, iii, 1860, 55.—Lesquereux in Owen's 2d Rep. Arkansas, 386.—Wood, Cl. Book, 633; Bot. & Fl. 298.—Porcher, Resources S. Forests, 311.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 208.—Gray, Manual N. States, 5 ed. 442.—Hall's Pl. Texas, 21.—Koch, Dendrologie, ii, 421.—Young, Bot. Texas, 496.—Winchell in Ludlow's Rep. Black Hills, 68.—Vasey, Cat. Forest Trees, 22.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Macoun in Geological Rep. Canada, 1875–'76, 209.—Sears in Bull. Essex Inst. xiii, 177.—Ridgway in Proc. U. S. Nat. Mus. 1882, 71.—Bell in Geological Rep. Canada, 1879–'80, 48c.

U. mollifolia, Marshall, Arbustum, 156.

U. Americana, var. *pendula*, Aiton, Hort. Kew. i, 320; 2 ed. ii, 107.—Willdenow, Spec. i, 1326.—Pursh, Fl. Am. Sept. i, 200.—Eaton, Manual, 31.—Spach in Ann. Sci. Nat. 2 ser. xv, 364; Hist. Veg. xi, 109.

U. Americana, var. *alba*, Aiton, Hort. Kew. i, 320; 2 ed. ii, 107.—Hayne, Dend. Fl. 32.

U. pendula, Willdenow, Berl. Baumz. 519.—Hayne, Dend. Fl. 33.

U. alba, Rafinesque, Fl. Ludoviciana, 115; New Fl. & Bot. i, 38.

U. Americana, var. *scabra*, Spach in Ann. Sci. Nat. 2 ser. xv, 364; Hist. Veg. ix, 109.—Walpers, Ann. iii, 424.

U. Americana, var. *Bartramii*, Walpers, Ann. iii, 424.

U. Americana, var. ?*aspera*, Chapman, Fl. S. States, 416.

U. Floridana, Chapman, Fl. S. States, 416.

WHITE ELM. AMERICAN ELM. WATER ELM.

Southern Newfoundland to the northern shores of lake Superior and the eastern slope of the Rocky mountains, in about latitude 52° N.; south to cape Canaveral and Pease creek, Florida, extending west in the United States to the Black hills of Dakota, central Nebraska, the Indian territory, in about longitude 100° W., and the valley of the Rio Concho, Texas.

A large tree, 30 to 35 meters in height, with a trunk 1.80 to 2.70 meters in diameter; rich, moist soil, borders of streams, etc.; toward its western and southwestern limits only in river bottoms.

Wood heavy, hard, strong, tough, rather coarse-grained, compact, difficult to split; layers of annual growth clearly marked by several rows of large open ducts; medullary rays numerous, thin; color, light brown, the sap-wood somewhat lighter; specific gravity, 0.6506; ash, 0.80; largely used for wheel stock, saddle-trees, flooring, in cooperage, and now largely exported to Great Britain and used in boat- and ship-building.

225.—Ulmus racemosa, Thomas,

Am. Jour. Sci. 1 ser. xix, 170 & t.—Beck, Bot. 334.—Eaton, Manual, 6 ed. 376.—Eaton & Wright, Bot. 464.—Nuttall, Sylva, i, 37, t. 12; 2 ed. i, 53, t. 12.—Torrey, Fl. N. York, ii, 166, t. 96.—Browne, Trees of America, 500.—Cooper in Smithsonian Rep. 1858, 254.—Wood, Cl. Book, 633; Bot. & Fl. 299.—Gray, Manual N. States, 5 ed. 442.—Vasey, Cat. Forest Trees, 22.—Sargent in Rep. Massachusetts Board Ag. 1878, 271.—Bell in Geological Rep. Canada, 1879–'80, 55c.—Chapman, Fl. S. States, Suppl. 649.

U. Americana, Planchon in De Candolle, Prodr. xvii, 155, in part.

ROCK ELM. CORK ELM. HICKORY ELM. WHITE ELM. CLIFF ELM.

Southwestern Vermont (*Robbins*), west through western New York, Ontario, and southern Michigan to northeastern Iowa (Waverly, *Bessey*), and south through Ohio to central Kentucky.

A large tree of great economic value, 20 to 30 meters in height, with a trunk sometimes 0.90 meter in diameter; low, wet clay, rich uplands, rocky declivities, or river cliffs; common and reaching its greatest development in southern Ontario and the southern peninsula of Michigan.

Wood heavy, hard, very strong, tough, very close-grained, compact, susceptible of a beautiful polish; layers of annual growth marked with one to two rows of small open ducts; medullary rays numerous, obscure; color, light clear brown often tinged with red, the thick sap-wood much lighter; specific gravity, 0.7263; ash, 0.60; largely used in the manufacture of heavy agricultural implements, wheel stock, and for railway ties, bridge timbers, sills, etc.

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226.—Ulmus alata, Michaux,

Fl. Bor.-Am. i, 173.—Persoon, Syn. i, 291.—Michaux f. Hist. Arb. Am. iii, 275, t. 5; N. American Sylva, 3 ed. iii, 71, t. 127.—Pursh, Fl. Am. Sept. i, 200.—Nuttall, Genera, i, 201.—Rœmer & Schultes, Syst. vi, 209.—Elliott, Sk. i, 333.—Sprengel, Syst. i, 931.—Audubon, Birds, t. 18.—Eaton, Manual, 6 ed. 376.—Loudon, Arboretum, iii, 1408, f. 1248.—Dietrich, Syn. ii, 992.—Eaton & Wright, Bot. 464.—Penn. Cycl. xxv, 493.—Browne, Trees of America, 502.—Planchon in Ann. Sci. Nat. 3 ser. x, 270; De Candolle, Prodr. xvii, 155.—Walpers, Ann. iii, 425.—Darby, Bot. S. States, 503.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 417.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 55.—Lesquereux in Owen's 2d Rep. Arkansas, 386.—Wood, Cl. Book, 633; Bot. & Fl. 299.—Porcher, Resources S. Forests, 311.—Gray, Manual N. States, 5 ed. 443; Hall's Pl. Texas, 21.—Young, Bot. Texas, 496.—Vasey, Cat. Forest Trees, 22.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Ridgway in Proc. U. S. Nat. Mus. 1882, 70.

U. pumila, Walter, Fl. Caroliniana, 111 [not Linnæus].

U. Americana, var. *alata*, Spach in Ann. Sci. Nat. 2 ser. xv, 364; Hist. Veg. xi, 109.

WAHOO. WINGED ELM.

Southern Virginia, south through the middle districts to the Chattahoochee region of western Florida; southern Indiana and Illinois, south to the Gulf coast, and southwest through southern Missouri, Arkansas, the eastern portions of the Indian territory to the valley of the Trinity river, Texas.

A small tree, 7 to 12 meters in height, with a trunk 0.30 to 0.60 meter in diameter; generally in dry, gravelly soil, or, rarely, along the borders of swamps and river bottoms; most common and reaching its greatest development in southern Missouri and Arkansas.

Wood heavy, hard, not strong, very close-grained, compact, unwedgeable; medullary rays distant, not conspicuous; color, brown, the sap-wood lighter; specific gravity, 0.7491; ash, 0.99; largely used for hubs, blocks, etc.

227.—Planera aquatica, Gmelin,

Syst. ii, 150.—Willdenow, Spec. iv, 967; Enum. Suppl. 14; Berl. Baumz. 281.—Persoon, Syn. i, 291.—Nuttall, Genera, i, 202.—Hayne, Dend. Fl. 202.—Eaton, Manual, 6 ed. 266.—Eaton & Wright, Bot. 360.—Spach in Ann. Sci. Nat. 2 ser. xv, 355; Hist. Veg. xi, 116.—Planchon in Ann. Sci. Nat. 3 ser. x, 261; De Candolle, Prodr. xvii, 167.—Walpers, Ann. iii, 428.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 417.—Wood, Cl. Book, 633; Bot. & Fl. 299.—Gray, Manual N. States, 5 ed. 443.—Koch, Dendrologie, ii, 424.—Young, Bot. Texas, 497.—Vasey, Cat. Forest Trees, 23.

Anonymos aquatica, Walter, Fl. Caroliniana, 230.

P. Gmelini, Michaux, Fl. Bor.-Am. ii, 248.—Desfontaines, Hist. Arb. ii, 446.—Rœmer & Schultes, Syst. vi, 305.—Elliott, Sk. i, 334.—Sprengel, Syst. i, 493.—Dietrich, Syn. i, 551.—Penn. Cycl. xxv, 490.—Darby, Bot. S. States, 503.

P. ulmifolia, Michaux f. Hist. Arb. Am. iii, 283, t. 7; N. American Sylva, 3 ed. iii, 80, t. 130.—Poiret, Suppl. iv, 429.—Nouveau Duhamel, vii, 65, t. 21.—Loudon, Arboretum, iii, 1413, f. 1251.—Browne, Trees of America, 515.—Curtis in Rep. Geological Surv. N. Carolina, iii, 1860, 81.

? Ulmus nemoralis, Aiton, Hort. Kew. i, 319; 2 ed. ii, 108.—Willdenow, Spec. i, 1326; Berl. Baumz. 520.—Desfontaines, Hist. Arb. ii, 442.—Pursh, Fl. Am. Sept. i, 200.—Smith in Rees' Cycl. xxxix, No. 8.—Nuttall, Genera, i, 201.—Beck, Bot. 334.—Eaton, Manual, 6 ed. 376.—Eaton & Wright, Bot. 464.

Ulmus aquatica, Rafinesque, Fl. Ludoviciana, 165.

P. Richardi, Sprengel, Syst. i, 493, in part.—Torrey & Gray in Pacific R. R. Rep. ii, 175 [not Michaux].

Valley of the Cape Fear river, North Carolina, south to the Chattahoochee region of western Florida, and through central Alabama and Mississippi to western Louisiana and the valley of the Trinity river, Texas, extending north through Arkansas and southern Missouri to the valley of the lower Wabash river and central Kentucky.

A small tree, 9 to 12 meters in height, with a trunk 0.30 to 0.60 meter in diameter; cold, deep, inundated river swamps; rare in the Atlantic and eastern Gulf states; very common and reaching its greatest development in the Red River valley and southern Arkansas.

Wood light, soft, not strong, close-grained, compact, containing few scattered open ducts; medullary rays numerous, thin; color, light brown, the sap-wood nearly white; specific gravity, 0.5294; ash, 0.45.

228.—Celtis occidentalis, Linnæus,

Spec. 2 ed. 1478.—Du Roi, Harbk. i, 141.—Marshall, Arbustum, 29.—Wangenheim, Amer. 48.—Gærtner, Fruct. i, 374, t. 77, f. 3.—Walter, Fl. Caroliniana, 250.—Aiton, Hort. Kew. iii, 437; 2 ed. v, 449.—Lamarck, Dict. iv, 137; Ill. iii, 437, t. 844, f. 1.—Abbot, Insects Georgia, i, t. 36.—Willdenow, Spec. iv, 944; Enum. 1046; Berl. Baumz. 82.—Nouveau Duhamel, ii, 36, t. 9.—Michaux, Fl. Bor.-Am. ii, 249.—Persoon, Syn. i, 292.—Desfontaines, Hist. Arb. ii, 448.—Michaux f. Hist. Arb. Am. iii, 225, t. 8; N. American Sylva, 3 ed. iii, 38, t. 114.—Pursh, Fl. Am. Sept. i, 200.—Eaton, Manual, 31; 6 ed. 36.—Nuttall, Genera, i, 202.—Rœmer & Schultes, Syst. vi, 306.—Hayne, Dend. Fl. 216.—Elliott, Sk. ii, 584.—Torrey, Fl. U. S. i, 300; Compend. Fl. N. States, 132; Fl. N. York, ii, 167; Bot. Wilkes Exped. 456.—Guimpel, Otto & Hayne, Abb. Holz. 119, t. 96.—Sprengel, Syst. i, 932.—Watson, Dend. Brit. ii, 147.—Beck, Bot. 334.—Rafinesque, New Fl. & Bot. i, 32.—Loudon, Arboretum, iii, 1417 & t.—Hooker, Fl. Bor.-Am. ii, 142.—Eaton & Wright, Bot. 186.—Spach in Ann. Sci. Nat. 2 ser. xvi, 40; Hist. Veg. xi, 133.—Penn. Cycl. xxv, 490.—Browne, Trees of America, 517.—Emerson, Trees Massachusetts, 306, t. 16; 2 ed. ii, 344 & t.—Planchon in Ann. Sci. Nat. 3 ser. x, 288; De Candolle, Prodr. xvii, 174.—Walpers, Ann. iii, 396.—Richardson, Arctic Exped. 436.—Darlington, Fl. Cestrica, 3 ed. 256.—Darby, Bot. S. States, 503.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 417.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 61.—Lesquereux in Owen's 2d Rep. Arkansas, 386.—Wood, Cl. Book, 634; Bot. & Fl. 299.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 208.—Porcher, Resources S. Forests, 312.—Gray, Manual N. States, 5 ed. 443; Hall's Pl. Texas, 21.—Koch, Dendrologie, ii, 432.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 23.—Burbank in Proc. Boston Soc. Nat. Hist. xviii, 215.—Putzbys in Fl. des Serres, xxii, 206.—Macoun in Geological Rep. Canada, 1875-'76, 209.—Ridgway in Proc. U. S. Nat. Mus. 1882, 72.

C. crassifolia, Lamarck, Dict. iv, 138.—Nouveau Duhamel, ii, 37.—Michaux f. Hist. Arb. Am. iii, 228, t. 9; N. American Sylva, 3 ed. iii, 40, t. 115.—Pursh, Fl. Am. Sept. i, 200.—Nuttall, Genera, i, 202.—Rœmer & Schultes, Syst. vi, 307.—Torrey, Fl. U. S. i, 300; Compend. Fl. N. States, 132; Fremont's Rep. 97; Emory's Rep. 412.—Sprengel, Syst. i, 932.—Beck, Bot. 334.—Eaton, Manual, 6 ed. 85.—Rafinesque, New Fl. & Bot. i, 31.—Loudon, Arboretum, iii, 1418, f. 1254.—Eaton & Wright, Bot 186.—Spach in Ann. Sci. Nat. 2 ser. xvi, 39; Hist. Veg. xi, 130.—Penn. Cycl. xxv, 490.—Browne, Trees of America, 519.—Emerson, Trees of Massachusetts, 309; 2 ed. ii, 347 & t.

C. obliqua, Mœnch, Meth. 344.

C. occidentalis, var. *scabriuscula*, Willdenow, Spec. iv, 995; Berl. Baumz. 2 ed. 82.—Hayne, Dend. Fl. 217.—Loudon, Arboretum, iii, 1417.

C. occidentalis, var. *tenuifolia*, Persoon, Syn. i, 292.

C. cordata, Persoon, Syn. i, 292.—Desfontaines, Hist. Arb. ii, 448.—Du Mont, Cour. Bot. Cult. vi, 389.

C. lævigata, Willdenow, Berl. Baumz. 2 ed. 81; Enum. Suppl. 68.—Rœmer & Schultes, Syst. vi, 306.—Sprengel, Syst. i, 932.—Rafinesque, New. Fl. & Bot. i, 34.—Loudon, Arboretum, iii, 1420.—Koch, Dendrologie, ii, 432.

C. pumila, Pursh, Fl. Am. Sept. i, 200.—Rœmer & Schultes, Syst. vi, 306.—Torrey, Fl. U. S. i, 300; Compend. Fl. N. States, 132.—Beck, Bot. 334.—Eaton, Manual, 6 ed. 86.—Rafinesque, New Fl. & Bot. i, 35.—Loudon, Arboretum, iii, 1420.—Eaton & Wright, Bot. 186.

C. alba, Rafinesque, Fl. Ludoviciana, 25; New Fl. & Bot. i, 32.—Planchon in De Candolle, Prodr. xvii, 177.

C. canina and *C. maritima*, Rafinesque in Am. Monthly Mag. & Crit. Rev. ii, 43, 44.

C. occidentalis, var. *cordata*, Willdenow, Berl. Baumz. 2 ed. 82.—Hayne, Dend. Fl. 217.—Rœmer & Schultes, Syst. vi, 306.—London, Arboretum, iii, 1417.

C. tenuifolia, Nuttall, Genera, i, 202; Sylva, i, 135; 2 ed. i, 149.—Rafinesque, New Fl. & Bot. i, 36.

C. occidentalis, var. *integrifolia*, Nuttall, Genera, i, 202.—Chapman, Fl. S. States, 417.—Wood, Cl. Book, 634; Bot. & Fl. 299.

C. Mississippiensis, Bosc, Dict. Ag. new ed. x, 41.—Poiret, Suppl. iii, 688.—Spach in Ann. Sci. Nat. 2 ser. xvi, 42; Hist. Veg. xi, 136.—Planchon in Ann. Sci. Nat. 3 ser. x, 287; De Candolle, Prodr. xvii, 176.—Walpers, Ann. iii, 397.—Cooper in Smithsonian Rep. 1858, 254.—Lesquereux in Owen's 2d Rep. Arkansas, 386.—Gray, Manual N. States, 5 ed. 443; Hall's Pl. Texas, 21.—Vasey, Cat. Forest Trees, 23.—Ridgway in Proc. U. S. Nat. Mus. 1882, 72.

C. integrifolia, Nuttall in Trans. Am. Phil. Soc. new ser. v, 169.—Cooper in Smithsonian Rep. 1858, 254.

C. longifolia, Nuttall in Trans. Am. Phil. Soc. new ser. v, 169; Sylva, i, 134, t. 40; 2 ed. i, 148, t. 40.—Rafinesque, New Fl. & Bot. i, 33.—Planchon in De Candolle, Prodr. xvii, 177.

C. heterophylla, *C. patula*, *C. Floridiana*, *C. fuscata*, *C. salicifolia*, *C. morifolia*, *C. maritima*, Rafinesque, New Fl. & Bot. i. 31-37.

C. occidentalis, var. *grandidentata*, Spach in Ann. Sci. Nat. 2 ser. xvi, 40; Hist. Veg. xi, 133.—Walpers, Ann. iii, 396.

C. occidentalis, var. *serrulata*, Spach in Ann. Sci. Nat. 2 ser. xvi, 41; Hist. Veg. xi, 134.—Walpers, Ann. iii, 396.

C. crassifolia, var. *tiliæfolia*, Spach in Ann. Sci. Nat. 2 ser. xvi, 39; Hist. Veg. xi, 131.—Walpers, Ann. iii, 396.

C. crassifolia, var. *morifolia*, Spach in Ann. Sci. Nat. 2 ser. xvi, 39; Hist. Veg. xi, 131.—Walpers, Ann. iii, 396.

C. crassifolia, var. *eucalyptifolia*, Spach in Ann. Sci. Nat. 2 ser. xvi, 40; Hist. Veg. xi, 131.—Walpers, Ann. iii, 396.

C. Audibertiana, Spach in Ann Sci. Nat. 2 ser. xvi, 41; Hist. Pl. xi, 135.—Planchon in De Candolle, Prodr. xvii, 174.

C. Audibertiana, var. *ovata*, Spach in Ann. Sci. Nat. 2 ser. xvi, 41; Hist. Veg. xi, 135.

C. Audibertiana, var. *oblongata*, Spach in Ann. Sci. Nat. 2 ser. xvi, 41; Hist. Veg. xi, 135.

C. Lindheimeri, Engelmann in herb. A. Braun. (Koch, Drendrologie, ii, 434).

C. Berlandieri, Klotsch in Linnæa, xviii, 541.—Planchon in De Candolle, Prodr. xvii, 178.

C. Texana, Scheele in Linnæa, xx, 146; Rœmer, Texas, 446; Appx. 146.

C. occidentalis, var. *crassifolia*, Gray, Manual N. States, 2 ed. 395; 5 ed. 443.—Wood, Cl. Book, 634; Bot. & Fl. 299.

C. occidentalis, var. *pumila*, Gray, Manual N. States, 2 ed. 397; 5 ed. 443.—Chapman, Fl. S. States, 417.—Curtis in Rep. Geological Surv. N. Carolina, iii, 1860, 62.—Watson in King's Rep. v, 321.

SUGARBERRY. HACKBERRY.

Valley of the Saint Lawrence river west to eastern Dakota, south through the Atlantic region to bay Biscayne and cape Romano, Florida, and the valley of the Devil's river, Texas.

A large tree, 18 to 30 or, exceptionally, 36 to 39 meters (*Ridgway*) in height, with a trunk 0.60 to 1.50 meter in diameter; most common and reaching its greatest development in the Mississippi River basin; rich bottoms or dry hillsides; sometimes reduced to a low shrub (*C. pumila*), and varying greatly in the size, shape, and texture of the leaves (*C. Mississippiensis lævigata, integrifolia, crassifolia*, etc.); the extremes connected by innumerable intermediate forms, which, thus considered, make one polymorphous species of wide geographical range.

Wood heavy, rather soft, not strong, coarse-grained, compact, satiny, susceptible of a good polish; layers of annual growth clearly marked by several rows of large open ducts, containing many small groups of smaller ducts arranged in intermediate concentric rings; medullary rays numerous, thin; color, clear light yellow, the sap-wood lighter; specific gravity, 0.7287; ash, 1.09; largely used for fencing and occasionally in the manufacture of cheap furniture.

Var. reticulata.

C. reticulata, Torrey in Ann. Lyc. N. York, ii, 247.—Eaton, Manual. 6 ed. 86.—Rafinesque, New Fl. & Bot. i, 35.—Eaton & Wright, Bot. 186.—Nuttall, Sylva, i, 133, t. 39; 2 ed. i, 146, t. 39.—Browne, Trees of America, 518.—Planchon in Ann. Sci. Nat. 3 ser. x, 293; De Candolle, Prodr. xvii, 178.—Walpers, Ann. iii, 396.—Torrey & Gray in Pacific R. R. Rep. ii, 175.—Cooper in Smithsonian Rep. 1858, 260; Am. Nat. iii, 407.—Gray in Proc. Am. Acad. vii, 401.—Watson in Pl. Wheeler, 16.—Vasey, Cat. Forest Trees, 23.—Hall in Coulter's Bot. Gazette, ii, 91.—Rothrock in Wheeler's Rep. vi, 238.—Rusby in Bull. Torrey Bot. Club, ix, 54.

C. Douglasii, Planchon in Ann. Sci. Nat. 3 ser. x, 293; De Candolle, Prodr. xvii, 178.—Walpers, Ann. iii, 396.

?*C. occidentalis*, var. *pumila*, Watson in King's Rep. v, 321 [not Gray].

C. brevipes, Watson in Proc. Am. Acad. 3 ser. xiv, 297.—Rothrock in Wheeler's Rep. vi, 238.

HACKBERRY. PALO BLANCO.

Western Texas (Dallas, *Ravenel*) to the mountains of southern Arizona, and through the Rocky mountains to eastern Oregon; in the Tehachipi pass, California (*Pringle*).

A small tree, 12 to 15 meters in height, with a trunk rarely 0.60 meter in diameter; borders of streams, generally in high mountain cañons, or in the more arid regions reduced to a low shrub; well characterized by its small, thick, coriaceous leaves, slightly pubescent on the underside along the prominent reticulated veins, and by the light-colored, deeply-furrowed bark, but connected with the typical *C. occidentalis* by intermediate forms not rare in western Texas.

Wood not distinguishable in structure or color from that of the species; specific gravity, 0.7275; ash, 1.22.

229.—Ficus aurea, Nuttall,

Sylva, ii, 4, t. 43; 2 ed. i, 154, t. 43.—Cooper in Smithsonian Rep. 1858, 265.—Chapman, Fl. S. States, 415.—Vasey, Cat. Forest Trees, 22.

F. aurea, var. *latifolia*, Nuttall, Sylva, ii, 4; 2 ed. i, 154.

Semi-tropical Florida, Indian river to the southern keys.

A large parasitic tree, germinating on the trunks and branches of other trees, and sending down to the ground long aerial roots, which gradually grow together, kill the inclosed tree, and form a trunk sometimes 0.90 to 1.20 meter in diameter.

Wood exceedingly light, soft, very weak, coarse-grained, compact, not durable; medullary rays thin, hardly distinguishable; color, light brown, the sap-wood lighter; specific gravity, 0.2616; ash, 5.03.

230.—Ficus brevifolia, Nuttall,

Sylva, ii, 3, t. 42; 2 ed. i, 153, t. 42.—Cooper in Smithsonian Rep. 1858, 265.—Chapman, Fl. S. States, 415.—Vasey, Cat. Forest Trees, 22.

Semi-tropical Florida, bay Biscayne to the southern keys (Key Largo, Pumpkin Key, *Curtiss*).

A tree sometimes 15 meters in height, with a trunk rarely exceeding 0.30 meter in diameter.

Wood light, soft, close-grained, compact, containing few large, open, scattered ducts and many groups of much smaller ducts arranged in concentric circles; medullary rays numerous, thin, conspicuous; color, light brown or yellow, the sap-wood lighter; specific gravity, 0.6398; ash, 4.36.

231.—Ficus pedunculata, Aiton,

Hort. Kew. iii, 450; 2 ed. v, 486.—Chapman, Fl. S. States, 415.—Grisebach, Fl. British West Indies, 151.

F. complicata, Humboldt, Bonpland & Kunth, Nov. Gen. & Spec. ii, 48.

Urostigma pedunculatum, Miquel in Hooker, London Jour. Bot. vi, 450.—Walpers, Ann. i, 677.

WILD FIG. INDIA-RUBBER TREE.

Semi-tropical Florida, bay Biscayne to the southern keys (Key Largo, Umbrella and Boca Chica Keys, etc. *Curtiss*); in the West Indies.

A tree sometimes 12 meters in height, with a trunk rarely exceeding 0.50 meter in diameter, or often shrubby and much branched from the ground; rare.

Wood light, soft, weak, close-grained, compact, containing many large, open, scattered ducts, with many groups of small ducts arranged in concentric circles; medullary rays numerous, obscure; color, light orange-brown, the sap-wood undistinguishable; specific gravity, 0.4739; ash, 4.92.

232.—Morus rubra, Linnæus,

Spec. 1 ed. 986.—Marshall, Arbustum, 93.—Wangenheim, Amer. 37, t. 15, f. 35.—Walter, Fl. Caroliniana, 241.—Aiton, Hort. Kew. iii, 343; 2 ed. v, 266.—Mœnch, Meth. 343.—Lamarck, Dict. iv, 377.—Abbot, Insects Georgia, ii, t. 70.—Michaux, Fl. Bor.-Am. ii, 179.—Willdenow, Spec. iv, 369; Enum. 967; Berl. Baumz. 252.—Nouveau Duhamel, iv, 91, t. 23.—Persoon, Syn. ii, 558.—Desfontaines, Hist. Arb. ii, 416.—Michaux f. Hist. Arb. Am. iii, 232, t. 10; N. American Sylva, 3 ed. iii, 42, t. 116.—Pursh, Fl. Am. Sept. ii, 639.—Eaton, Manual, 105; 6 ed. 230.—Barton, Prodr. Fl. Philadelph. 89.—Nuttall, Genera, ii, 209.—Hayne, Dend. Fl. 155.—Elliott, Sk. ii, 574.—Sprengel, Syst. i, 492.—Torrey, Compend. Fl. N. States, 352; Nicollet's Rep. 160; Fl. N. York, ii, 220; Emory's Rep. 412.—Rafinesque, Med. Bot. ii, 243; New Fl. & Bot. i, 43; Am. Manual Mulberry Trees, 13.—Beck, Bot. 316.—Dietrich, Syn. i, 551.—Loudon, Arboretum, iii, 1359 & t.—Seringe, Descr. & Cult. du Mûr. 223, t. 20.—Eaton & Wright, Bot. 323.—Spach, Hist. Veg. xi, 48.—Browne, Trees of America, 457.—Emerson, Trees Massachusetts, 280; 2 ed. i, 314.—Darlington, Fl. Cestrica, 2 ed. 285.—Darby, Bot. S. States, 503.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 415.—Gray in Pacific R. R. Rep. xii[2], 47; Manual N. States, 5 ed. 444.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 71.—Lesquereux in Owen's 2d Rep. Arkansas, 386.—Wood, Cl. Book, 635; Bot. & Fl. 300.—Porcher, Resources S. Forests, 305.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 208.—Koch Dendrologie, ii, 447.—Young, Bot. Texas, 494.—Bureau in De Candolle, Prodr. xvii, 245.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 22.—Riley in Special Rep. U. S. Dept. Ag. No. 11, 34.—Ridgway in Proc. U. S. Nat. Mus. 1882, 73.—Burgess in Coulter's Bot. Gazette, vii, 95.

M. Canadensis, Lamarck, Dict. iv, 380.—Seringe, Descr. & Cult. du Mûr. 224.

M. scabra, Willdenow, Enum. 967; Berl. Baumz. 152.—Nuttall, Genera, ii, 209.—Rafinesque, Am. Manual Mulberry Trees, 29.—Hayne, Dend. Fl. 154.—Sprengel, Syst. i, 492.—Loddiges, Cat. 1836.

M. tomentosa, Rafinesque, Fl. Ludoviciana, 113; Am. Manual Mulberry Trees, 30.

M. reticulata, *M. Canadensis*, *M. parvifolia*, and *M. riparia*, Rafinesque, Am. Manual Mulberry Trees, 29–31.

M. rubra, var. *Canadensis*, Loudon, Arboretum, iii, 1360.

M. Missouriensis, Audibert, Cat. Jard. Tonnelle.

M. rubra, var. *tomentosa*, Bureau in De Candolle, Prodr. xvii, 246.

M. rubra, var. *incisa*, Bureau in De Candolle, Prodr. xvii, 247.

RED MULBERRY.

Western New England and Long Island, New York, west through southern Ontario and central Michigan to the Black hills of Dakota, eastern Nebraska and Kansas, south to bay Biscayne and cape Romano, Florida, and the valley of the Colorado river, Texas.

A large tree, 18 to 20 meters in height, with a trunk 0.90 to 1.20 meter or, exceptionally, 2.15 meters in diameter (*P. J. Berckmans*, Augusta, Georgia); generally in rich bottom lands; most common and reaching its greatest development in the basins of the lower Ohio and the Mississippi rivers.

Wood light, soft, not strong, rather tough, coarse-grained, compact, very durable in contact with the soil, satiny, susceptible of a good polish; layers of annual growth clearly marked by several rows of large open ducts; medullary rays numerous, thin; color, light orange-yellow, the sap-wood lighter; specific gravity, 0.5898; ash, 0.71; largely used in fencing, cooperage, for snaths, and at the south in ship- and boat-building.

The large dark purple fruit sweet and edible.

233.—Morus microphylla, Buckley,

Proc. Philadelphia Acad. 1862, 8.—Gray in Proc. Philadelphia Acad. 1862, 167.—Young, Bot. Texas, 494.

M. parvifolia, Engelmann in herb.—Gray, Hall's Pl. Texas, 21.—Vasey, Cat. Forest Trees, 22.—Riley in Special Rep. U. S. Dept. Ag. No. 11, 34.

MEXICAN MULBERRY.

Valley of the Colorado river, through western Texas to the valley of the Gila river, New Mexico; and southward into Mexico.

A small tree, sometimes 7 meters in height, with a trunk rarely 0.30 meter in diameter, or often reduced to a low shrub; most common and reaching its greatest development in the mountain cañons of southern New Mexico; in Texas generally on limestone formations.

Wood heavy, hard, close-grained, compact; layers of annual growth marked with several rows of small open ducts; medullary rays numerous, thin; color, orange or, rarely, dark brown, the sap-wood light yellow; specific gravity, 0.7715; ash, 0.68.

The small acid fruit hardly edible.

234.—Maclura aurantiaca, Nuttall,

Genera, ii, 234; Trans. Am. Phil. Soc. 2 ser. v, 169; Sylva, i, 126, t. 37, 38; 2 ed. i, 140, t. 37, 38.—James in Long's Exped. ii, 158.—Delile in Bull. Soc. Ag. Hér. 1835 & t.—Eaton, Manual, 6 ed. 217.—Seringe in Mem. Soc. Ag. Lyon, 1835, 125 & t; Descr. & Cult. du Mûr. 232, t. 273.—Lambert, Pinus, 2 ed. ii, Appx. 4, t. 3.—Loudon, Arboretum, iii, 1342, 1362, f. 1226–1228; Gard. Mag. xi, 312, f. 45–47.—Eaton & Wright, Bot. 311.—Spach, Hist. Veg. xi, 53.—Browne, Trees of America, 465.—Darby, Bot. S. States, 504.—Cooper in Smithsonian Rep. 1858, 254.—Miquel in Martius, Fl. Brasil. iv, 158.—Wood, Cl. Book, 635; Bot. & Fl. 299.—Porcher, Resources S. Forests, 101.—Koch, Dendrologie, ii, 437.—Bureau in De Candolle, Prodr. xvii, 227.—Dumen in Proc. California Acad. v, 398.—Vasey, Cat. Forest Trees, 22.—Guibourt, Hist. Drogues, 7 ed. ii, 325.—Riley in Special Rep. U. S. Dept. Ag. No. 11, 35.

Toxylon Maclura, Rafinesque, New Fl. & Bot. i, 43; Am. Manual Mulberry Trees, 13.

Ioxylon pomiferum, Rafinesque in Am. Monthly Mag. and Crit. Rev. ii, 118.

Broussonetia tinctoria, Torrey in Ann. Lyc. N. York, ii, 246 [not Kunth].

OSAGE ORANGE. BOIS D'ARC.

Southwestern Arkansas, south of the valley of the Arkansas river, southeastern portions of the Indian territory, and southward in northern Texas to about latitude 32° 50′ N. (Dallas, *Reverchon*, etc.).

A tree, sometimes 15 to 18 meters in height, with a trunk rarely exceeding 0.60 meter in diameter; rich bottom lands; most common and probably reaching its greatest development along the valley of the Red river in the Indian territory.

Wood heavy, exceedingly hard, very strong, flexible, close-grained, compact, very durable in contact with the ground, satiny, susceptible of a beautiful polish, containing numerous small open ducts, layers of annual growth clearly marked by broad bands of larger ducts; medullary rays thin, numerous, conspicuous; color, bright orange, turning brown with exposure, the sap-wood light yellow; specific gravity, 0.7736; ash, 0.68; largely used for fence posts, paving blocks, railway ties, wheel stock; extensively planted for hedges, especially in the western states.

PLATANACEÆ.

235.—Platanus occidentalis, Linnæus,

Spec. 1 ed. 999.—Du Roi, Harbk. ii, 134.—Marshall, Arbustum, 105.—Wangenheim, Amer. 31, t. 13, f. 31.—Walter, Fl. Caroliniana, 236.—Aiton, Hort. Kew. iii, 365; 2 ed. v, 305.—Mœnch, Meth. 358.—Abbot, Insects Georgia, ii, t. 55.—Michaux, Fl. Bor.-Am. ii, 163.—Lamarck, Dict. v, 438.—Nouveau Duhamel, ii, 6, t. 2.—Willdenow, Spec. iv, 474; Enum. 984; Berl. Baumz. 284.—Persoon, Syn. ii, 575.—Desfontaines Hist. Arb. ii, 545.—Schkuhr, Handb. iii, 274, t. 306.—Robin, Voyages, iii, 524.—Michaux f. Hist. Arb. Am. iii, 184, t. 3; N. American Sylva, 3 ed. ii, 48, t. 63.—Pursh, Fl. Am. Sept. ii, 635.—Barton, Prodr. Fl. Philadelph. 91; Compend. Fl. Philadelph. 176.—Eaton, Manual, 110; 6 ed. 267.—Nuttall, Genera, ii, 219.—Hayne, Dend. Fl. 171.—James in Long's Exped. i, 23.—Elliott, Sk. ii, 620.—Sprengel, Syst. iii, 865.—Watson, Dend. Brit. i, t. 100.—Torrey, Compend. Fl. N. States, 356; Fl. N. York, ii, 218; Bot. Mex. Boundary Survey, 205.—Audubon, Birds, t. 206.—Loudon, Arboretum, iv, 2043, f. 1959 & t.—Eaton & Wright, Bot. 361.—Hooker, Fl. Bor.-Am. ii, 158.—Bigelow, Fl. Boston. 3 ed. 384.—Emerson, Trees Massachusetts, 227; 2 ed. i, 261 & t.—Scheele in Rœmer, Texas, 446.—Buckley in Am. Jour. Sci. 2 ser. xiii, 399.—Darlington, Fl. Cestrica, 3 ed. 282.—Darby, Bot. S. States, 509.—Agardh, Theor. & Syst. Pl. t. xiii, f. 1, 2.—Cooper in Smithsonian Rep. 1858, 254.—Hartig, Forst. 446, t. 54.—Chapman, Fl. S. States, 418.—Curtis in Rep. Geological Surv. N. Carolina, 76.—Lesquereux in Owen's 2d Rep. Arkansas, 386.—Wood, Cl. Book, 640; Bot. & Fl. 303.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 209.—A. De Candolle, Prodr. xvi², 159.—Gray, Manual N. States, 5 ed. 447; Hall's Pl. Texas, 21.—Koch, Dendrologie, ii, 468.—Schnizlein, Icon. t. 97, f. 1-24.—Young, Bot. Texas, 498.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 22.—Ridgway in Proc. U. S. Nat. Mus. 1882, 73.—Bell in Geological Rep. Canada, 1879-'80, 55ᶜ.

P. lobata, Mœnch, Meth. 358.

P. hybridas, Brotero, Fl. Lus. ii, 487.

P. vulgaris, var. *angulosa*, Spach in Ann. Sci. Nat. 2 ser. xv, 293; Hist. Veg. xi, 79.

SYCAMORE. BUTTON WOOD. BUTTON-BALL TREE. WATER BEECH.

Southern Maine and southeastern New Hampshire to northern Vermont and the northern shores of lakes Ontario and Erie, west to eastern Nebraska and Kansas, south to northern Florida, central Alabama and Mississippi, and the valley of the Nueces river, Texas, extending southwest to the valley of the Devil's river.

The largest tree of the Atlantic forests, often 30 to 40 meters in height, with a trunk 2.40 to 4.20 meters in diameter; generally along streams and river bottoms, in rich, moist soil; very common and reaching its greatest development in the bottom lands of the Ohio and Mississippi rivers; the large specimens generally hollow.

Wood heavy, hard, not strong, very close-grained, compact, difficult to split and work; layers of annual growth clearly marked by broad bands of small ducts; the numerous medullary rays very conspicuous, as in that of all the North American species; color, brown tinged with red, the sap-wood lighter; specific gravity, 0.5678; ash, 0.46; largely used for tobacco boxes (its principal use), ox-yokes, butchers' blocks, and, rarely, in the manufacture of cheap furniture.

236.—Platanus racemosa, Nuttall;

Audubon, Birds, t. 362; Sylva, i, 47, t. 15; 2 ed. i, 63, t. 15.—Bentham, Pl. Hartweg. 336.—Newberry in Pacific R. R. Rep. vi, 33, 89, t. 11, f. 10.—Cooper in Smithsonian Rep. 1858, 260.—Torrey, Bot. Mex. Boundary Survey, 204; Ives' Rep. 27; Bot. Wilkes Exped. 457.—A. De Candolle, Prodr. xvi², 160.—Koch, Dendrologie, ii, 469.—Vasey, Cat. Forest Trees, 23.—Watson, Bot. California, ii, 66.

P. occidentalis, Hooker & Arnott, Bot. Beechey, 160, 380 [not Linnæus].

P. Californica, Bentham, Bot. Sulphur, 54.

P. Mexicana, Moricand, Pl. Rar. Amer. t. 13?—Torrey in Sitgreaves' Rep. 172; Pacific R. R. Rep. vii, 20.

SYCAMORE. BUTTON WOOD.

California, valley of the Sacramento river, south through the interior valleys and coast ranges to the southern boundary of the state.

A large tree, 24 to 30 meters in height, with a trunk 0.90 to 1.20 meter in diameter; borders of streams, in rich soil.

Wood light, soft, not strong, very close-grained, compact, difficult to split; layers of annual growth clearly marked by narrow bands of small ducts; medullary rays numerous, conspicuous; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.4880; ash, 1.11.

237.—Platanus Wrightii, Watson,

Proc. Am. Acad. x, 349.—Vasey, Cat. Forest Trees, 23.—Rusby in Bull. Torrey Bot. Club, ix, 54.

P. Mexicana, Torrey in Emory's Rep. 151 [not Moricand].

P. racemosa, Watson, Pl. Wheeler, 16 [not Nuttall].—Rothrock in Wheeler's Rep. vi, 239.

SYCAMORE.

Valleys of southwestern New Mexico to the valley of the San Pedro river, Arizona; southward into Mexico.

A tree sometimes 15 to 18 meters in height, with a trunk 0.45 to 0.60 meter in diameter; banks of streams and high mountain cañons.

Wood light, soft, weak, very close-grained, compact; layers of annual growth clearly marked by several rows of open ducts; medullary rays numerous, thin, very conspicuous; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.4736; ash, 1.35.

JUGLANDACEÆ.

238.—Juglans cinerea, Linnæus,

Spec. 2 ed. 1415.—Jacquin, Icon. Rar. i, t. 193.—Wangenheim, Amer. 21, t. 9, f. 21.—Walter, Fl. Caroliniana, 235.—Aiton, Hort. Kew. iii, 361; 2 ed. v, 296.—Lamarck, Dict. iv, 503; Ill. iii, 365, t. 781, f. 7.—B. S. Barton, Coll. i, 22, 31; ii, 43.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 388.—Michaux, Fl. Bor.-Am. ii, 191.—Willdenow, Spec. iv, 456; Enum. 978; Berl. Baumz. 193.—Persoon, Syn. ii, 556.—Desfontaines, Hist. Arb. ii, 347.—Pursh, Fl. Am. Sept. ii, 636.—Barton, Prodr. Fl. Philadelph. 92.—Bigelow, Med. Bot. ii, 115, t. 32; Fl. Boston. 3 ed. 378.—Eaton, Manual, 108; 6 ed. 192.—Nuttall, Genera, ii, 220; Sylva, i, 41; 2 ed. i, 37.—Hayne, Dend. Fl. 163.—Elliott, Sk. ii, 622.—Sprengel, Syst. iii, 865.—Torrey, Compend. Fl. N. States, 357; Fl. N. York, ii, 180.—Rafinesque, Med. Bot. ii, 234.—Audubon, Birds, t. 142.—Beck, Bot. 335.—Spach, Hist. Veg. ii, 170.—Lindley, Fl. Med. 307.—Loudon, Arboretum, iii, 1439, f. 1262.—Hooker, Fl. Bor.-Am. ii, 143.—Eaton & Wright, Bot. 287.—Emerson, Trees Massachusetts, 182; 2 ed. i, 207 & t.—Griffith, Med. Bot. 589.—Carson, Med. Bot. ii, 42, t. 86.—Parry in Owen's Rep. 618.—Darlington, Fl. Cestrica, 3 ed. 262.—Darby, Bot. S. States, 513.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 419.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 45.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 640; Bot. & Fl. 304.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 16, t. 4, f. 45; Prodr. xvi², 137.—Porcher, Resources S. Forests, 317.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 209.—Gray, Manual N. States, 5 ed. 447.—Koch, Dendrologie, i, 589.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 23.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Bentley & Trimen, Med. Pl. iv, 247, t. 247.—Beal in Am. Nat. xv, 36, f. 6.—Sears in Bull. Essex Inst. xiii, 178.—Bell in Geological Rep. Canada, 1878–'80, 53ᶜ.—Ridgway in Proc. U. S. Nat. Mus. 1882, 76.

J. oblonga, Miller, Dict. No. 3.—Du Roi, Harbk. i, 332—Mœnch, Meth. 696.—Retzius, Obs. i, 10.

J. oblonga alba, Marshall, Arbustum, 67.

J. cathartica, Michaux f. Hist. Arb. Am. i, 165, t. 2; N. American Sylva, 3 ed. i, 109, t. 31.

Carya cathartica, Barton, Compend. Fl. Philadelph. ii, 178.

Wallia cinerea, Alefeld in Bonplandia, 1861, 334.

BUTTERNUT. WHITE WALNUT.

Southern New Brunswick, valley of the Saint Lawrence river, Ontario and southern Michigan to northern Minnesota (lake Pokegoma, *Garrison*) and central Iowa, south to Delaware and along the Alleghany mountains to northern Georgia, central Alabama and Mississippi, northern Arkansas, and southeastern Kansas.

A tree 18 to 24 or, exceptionally, 30 to 35 meters (*Ridgway*) in height, with a trunk 0.60 to 0.90 meter in diameter; rich woodlands; rare at the south; most common and reaching its greatest development in the Ohio River basin.

Wood light, soft, not strong, rather coarse-grained, compact, easily worked, satiny, susceptible of a beautiful polish, containing numerous regularly-distributed, large, open ducts; medullary rays distant, thin, obscure; color, bright light brown, turning dark with exposure, the sap-wood lighter; specific gravity, 0.4086; ash, 0.51; largely used for interior finish, cabinet work, etc.

The inner bark, especially that of the root, is employed medicinally as a mild cathartic (*Am. Jour. Pharm.* 1874, 169.—*U. S. Dispensatory*, 14 ed. 526.—*Nat. Dispensatory*, 2 ed. 794), and furnishes a yellow dye.

239.—Juglans nigra, Linnæus,

Spec. 1 ed. 997.—Jacquin, Icon. Rar. i, t. 191.—Wangenheim, Amer. 20, t. 8, f. 20.—Walter, Fl. Caroliniana, 235.—Aiton, Hort. Kew, iii, 360; 2 ed. v, 296.—Mœnch, Meth. 696.—Lamarck, Dict. iv, 502; Ill. iii, 365, t. 781, f. 6.—Abbot, Insects Georgia, i, t. 88.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 388.—Michaux, Fl. Bor.-Am. ii, 191.—Willdenow, Spec. iv, 456; Enum. 978; Berl. Baumz. 193.—Smith in Rees' Cycl. xx, No. 3.—Persoon, Syn. ii, 566.—Desfontaines, Hist. Arb. ii, 347.—Nouveau Duhamel, iv, 179, t. 48.—Michaux f. Hist. Arb. Am. i, 158, t. 1; N. American Sylva, 3 ed. i, 140, t. 30.—Pursh, Fl. Am. Sept. ii, 636.—Barton, Prodr. Fl. Philadelph. 92; Compend. Fl. Philadelph. ii, 177.—Eaton, Manual, 108; 6 ed. 192.—Nuttall, Genera, ii, 220; Sylva, i, 41; 2 ed. i, 57.—Hayne, Dend. Fl. 163.—Elliott, Sk. ii, 622.—Sprengel, Syst. iii, 865.—Torrey, Compend. Fl. N. States, 357; Fl. N. York, ii, 179.—Watson, Dend. Brit. ii, t. 158.—Audubon, Birds, t. 84, 156.—Rafinesque, Med. Bot. ii, 233.—Beck, Bot. 335.—Spach, Hist. Veg. ii, 168.—Loudon, Arboretum, iii, 1435, f. 1260 & t.—Eaton & Wright, Bot. 287.—Emerson, Trees Massachusetts, 185; 2 ed. i, 211 & t.—Griffith, Med. Bot. 589.—Parry in Owen's Rep. 618.—Darlington, Fl. Cestrica, 3 ed. 262.—Darby, Bot. S. States, 513.—Cooper in Smithsonian Rep. 1858, 254.—Chapman, Fl. S. States, 419.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 45.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 640; Bot. & Fl. 304.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 34, t. 1, f. 1, 8–10; Prodr. xvi², 137.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 209.—Porcher, Resources S. Forests, 318.—Gray, Manual N. States, 5 ed. 447.—Koch, Dendrologie, i, 587.—Schnizlein, Icon. t. 244, f. 1, 8, 12, 13.—Young, Bot. Texas, 500.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 23.—Guibourt, Hist. Drogues, 7 ed. ii, 302.—Beal in Am. Nat. xv, 36, f. 5.—Sears in Bull. Essex Inst. xiii, 178.—Bell in Geological Rep. Canada, 1879–'80, 53c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 76.—Nicholson in London Gard. Chronicle, 1882, 780.—Watson in Proc. Am. Acad. xviii, 155.

J. nigra oblonga, Marshall, Arbustum, 67.

Wallia nigra, Alefeld in Bonplandia, 1861, 334.

BLACK WALNUT.

Western Massachusetts, west along the southern shores of lake Erie through southern Michigan to southern Minnesota, eastern Nebraska, and eastern Kansas, south to the Chattahoochee region of northern Florida, central Alabama and Mississippi, and the valley of the San Antonio river, Texas.

A large tree, often 30 to 45 meters in height, with a trunk 1.80 to 3 meters in diameter; rich bottom lands and hillsides; most common and reaching its greatest development on the western slopes of the southern Alleghany mountains and in the rich bottoms of southwestern Arkansas and the Indian territory; less common east of the Alleghany mountains, and now everywhere scarce.

Wood heavy, hard, strong, rather coarse-grained, liable to check if not carefully seasoned, easily worked, susceptible of a beautiful polish, durable in contact with the soil, containing numerous large, regularly-distributed, open ducts; medullary rays numerous, thin, not conspicuous; color, rich dark brown, the thin sap-wood much lighter; specific gravity, 0.6115; ash, 0.79; more generally used in cabinet-making, interior finish, and for gun stocks than that of any other North American tree.

240.—Juglans rupestris, Engelmann;

Sitgreaves' Rep. 171, t. 15.—Torrey, Bot. Mex. Boundary Survey, 205; Ives' Rep. 27.—Cooper in Smithsonian Rep. 1858, 260.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 28, t. 2, f. 11; Prodr. xvi², 138.—Vasey, Cat. Forest Trees, 24.—Watson, Bot. California, ii, 93; Proc. Am. Acad. xviii, 155.—Rusby in Bull. Torrey Bot. Club. ix, 54.

J. rupestris, var. *major*, Torrey in Sitgreaves' Rep. 171, t. 16; Bot. Mex. Boundary Survey, 205; Pacific R. R. Rep. vii, 20.—C. De Candolle, Prodr. xvi², 138.—Hemsley, Bot. Am.-Cent. iii, 164.

J. Californica, Watson in Proc. Am. Acad. x, 349; Bot. California, ii, 93.—Vasey, Cat. Forest Trees, 24.—Rothrock in Wheeler's Rep. vi, 249.

WALNUT.

Valley of the Colorado river (near Austin), west through western Texas, southern New Mexico, and Arizona from 5,000 to 7,000 feet elevation, and in the California Coast ranges from the San Bernardino mountains to the neighborhood of San Francisco bay and the valley of the Sacramento river.

A tree rarely 15 to 22 meters in height, with a trunk 0.30 to 0.90 meter in diameter, reaching its greatest development in the neighborhood of San Francisco bay; in Texas generally reduced to a low, much-branched shrub; borders of streams and mountain cañons, in rich soil.

Wood heavy, hard, not strong, coarse-grained, checking in drying, susceptible of a good polish, containing numerous regularly-distributed, large, open ducts; medullary rays distant, thin, obscure; color, rich dark brown, the sap-wood lighter; specific gravity, 0.6554; ash, 1.01.

The small nuts sweet and edible.

241.—Carya olivæformis, Nuttall,

Genera, ii, 221.—Sprengel, Syst. ii, 849.—Eaton, Manual, 6 ed. 83.—Spach. Hist. Veg. ii, 173.—Penn. Cycl. vi, 331.—Loudon, Arboretum, iii, 1441, f. 1263.—Eaton & Wright, Bot. 183.—Scheele in Rœmer, Texas, 447.—Belg. Hort. vi, 223, t. 45, f. 2.—Torrey, Bot. Mex. Boundary Survey 205.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 418.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 641; Bot. & Fl. 304.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 36, t. 1, f. 3, t. 5, f. 59; Prodr. xvi², 144.—Porcher, Resources S. Forests, 333.—Gray, Manual N. States, 5 ed. 448.—Young, Bot. Texas, 499.—Vasey, Cat. Forest Trees, 24.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Ridgway in Proc. U. S. Nat. Mus. 1882, 77.—Hemsley, Bot. Am.-Cent. iii, 163.—Watson in Proc. Am. Acad. xviii, 155.

Juglans Pecan, Marshall, Arbustum, 69.—Walter, Fl. Caroliniana, 236.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 392.

Juglans Illinoinensis, Wangenheim, Amer. 54, t. 18, f. 43.

Juglans angustifolia, Aiton, Hort. Kew. iii, 361; 2 ed. v, 296.

Juglans rubra, Gærtner, Fruct. ii, 51, t. 89, f. 1.—Lamarck, Ill. iii, 365, t. 781, f. 4.

Juglans cylindrica, Lamarck, Dict. iv, 505; Ill. iii, 365, t. 781, f. 5.—Nouveau Duhamel, iv, 179.

Juglans olivæformis, Michaux, Fl. Bor.-Am. ii, 192.—Willdenow, Spec. iv, 457; Enum. 979; Berl. Baumz. 194.—Persoon, Syn. ii, 566.—Desfontaines, Hist. Arb. ii, 348.—Michaux f. Hist. Arb. Am. i, 175, t. 3; N. American Sylva, 3 ed. i, 114, t. 32.—Muhlenberg, Cat. 88.—Aiton, Hort. Kew. 2 ed. v, 296.—Pursh, Fl. Am. Sept. ii, 636.—Hayne, Dend. Fl. 163.—Regel, Gartenflora, xviii, 89.

C. angustifolia, Nuttall, Sylva, i, 41; 2 ed. i, 57.

? C. tetraptera, Liebmann in Dansk. Vidensk. Selsk. Forhand. 1850, 80.

Hickorea species, LeConte in Proc. Philadelphia Acad. vi, 402.

C. Illinoensis, Koch, Dendrologie, i, 593.

PECAN. ILLINOIS NUT.

Near Davenport, Iowa (*C. C. Parry*), southern Illinois, and Indiana, northwestern Kentucky, south and southwest through Missouri and Arkansas to eastern Kansas, the Indian territory, and through western Louisiana and Texas to the valley of the Concho river.

A tree 30 to 52 meters in height, with a trunk 0.90 to 1.80 meter in diameter; borders of streams in low, rich soil; very common and reaching its greatest development in the bottom lands of Arkansas and the Indian territory; the largest species of the genus and the largest and most important tree of western Texas.

Wood heavy, hard, not strong, brittle, close-grained, compact; layers of annual growth marked by one or two rows of large open ducts; medullary rays numerous, thin; color, light brown tinged with red; the sap-wood lighter brown; specific gravity, 0.7180; ash, 1.13; less valuable than the wood of the other species and hardly used except for fuel.

The sweet, edible nuts are collected in great quantities, affording an important article of commerce.

242.—Carya alba, Nuttall,

Genera, ii, 221.—Elliott, Sk. ii, 624.—Watson, Dend. Brit. ii, t. 148.—Sprengel, Syst. ii, 849.—Torrey, Compend. Fl. N. States, 357; Fl. N. York, 181.—Beck, Bot. 336.—Eaton, Manual, 6 ed. 83.—Spach, Hist. Veg. ii, 174.—Penn. Cycl. vi, 332.—Loudon, Arboretum, iii, 1446, f. 1269 & t.—Eaton & Wright, Bot. 183.—Hooker, Fl. Bor.-Am. ii, 143.—Emerson, Trees Massachusetts, 191; 2 ed. i, 217 & t.—Darlington, Fl. Cestrica, 3 ed. 263.—Darby, Bot. S. States, 513.—Belg. Hort. vi, 223, t. 48, f. 8.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 418.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 43.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 641; Bot. & Fl. 304.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 36, t. 2, f. 13, 14, 18, t. 3, f. 24, t. 4, f. 44, 46; Prodr. xvi², 142.—Gray, Manual N. States, 5 ed. 448.—Young, Bot. Texas, 499.—Vasey, Cat. Forest Trees, 24.—Aldrich in Am. Nat. xv, 227.—Sears in Bull. Essex Inst. xiii, 179.—Ridgway in Proc. U. S. Nat. Mus. 1882, 72.—Bell in Geological Rep. Canada, 1879–'80, 55c.

Juglans ovata, Miller, Dict.

Juglans alba ovata, Marshall, Arbustum, 69.

Juglans oualis, Wangenheim, Amer. 24, t. 10, f. 23.

Juglans compressa, Gærtner, Fruct. ii, 50, t. 89, f. 1.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 390.—Willdenow, Spec. iv, 458; Enum. 979; Berl. Baumz. 195.—Persoon, Syn. ii, 566.—Desfontaines, Hist. Arb. ii, 347.—Aiton, Hort. Kew. 2 ed. v, 297.—Hayne, Dend. Fl. 164.—Lamarck, Ill. iii, 365, t. 781, f. 3.

? Juglans exaltata, Bartram, Travels, 2 ed. 38.

Juglans squamosa, Lamarck, Dict. iv, 504.—Desfontaines, Hist. Arb. ii, 348.—Michaux f. Hist. Arb. Am. i, 190, t. 7; N. American Sylva, 3 ed. i, 123, t. 36.—Barton, Prodr. Fl. Philadelph. 92; Compend. Fl. Philadelph. ii, 179.—Bigelow, Fl. Boston. 3 ed. 380.

Juglans alba, Michaux, Fl. Bor. Am. ii 193 [not Linnæus].—Pursh, Fl. Am. Sept. ii, 637.—Eaton, Manual, 108.

C. microcarpa, Nuttall, Genera, ii, 221; Sylva, i, 38, t. 13; 2 ed. i, 55, t. 13.—Sprengel, Syst. ii, 849.—Penn. Cycl. vi, 332.—London, Arboretum, iii, 1451.—Darlington, Fl. Cestrica, 3 ed. 264.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 419.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 44.—Wood, Cl. Book, 642; Bot. & Fl. 304.—C. De Candolle, Prodr. xvi², 143.—Gray, Manual N. States, 5 ed. 448.—Koch, Dendrologie, i, 596.—Young, Bot. Texas, 499.—Vasey, Cat. Forest Trees, 24.—Ridgway in Proc. U. S. Nat. Mus. 1882, 77.

SHELL-BARK HICKORY. SHAG-BARK HICKORY.

Valley of the Saint Lawrence river, along the northern shores of lakes Ontario and Erie to southern Michigan and southeastern Minnesota, south to the Chattahoochee region of western Florida, central Alabama and Mississippi, and west to eastern Kansas, the Indian territory, and eastern Texas.

A large tree of the first economic value, 24 to 30 or, exceptionally, 39 to 45 meters in height (*Ridgway*), with a trunk 0.90 to 1.20 meter in diameter; rich hillsides and sandy ridges; common and reaching its greatest development west of the Alleghany mountains; varying greatly in the size and shape of the fruit. A form with small, thin-shelled nuts (*C. microcarpa, Nuttall l. c.*) is not rare from Delaware southward, and in Michigan.

Wood heavy, very hard and strong, tough, close-grained, compact, flexible; layers of annual growth clearly marked with one to three rows of large open ducts; medullary rays numerous, thin; color, brown, the thin and more valuable sap-wood nearly white; specific gravity, 0.8372; ash, 0.73; largely used in the manufacture of agricultural implements, carriages, ax handles, baskets, etc.

The sweet and edible nuts afford an important article of commerce.

243.—Carya sulcata, Nuttall,

Genera, ii, 221.—Elliott, Sk. ii, 624.—Sprengel, Syst. ii, 849.—Torrey, Compend. Fl. N. States, 357.—Beck, Bot. 336.—Eaton, Manual, 6 ed. 83.—Spach, Hist. Veg. ii, 174.—Penn. Cycl. vi, 332.—London, Arboretum, iii, 1448, f. 1271.—Eaton & Wright, Bot. 183.—Darby, Bot. S. States, 513.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 418.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 43.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 641; Bot. & Fl. 304.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 36, t. 5, f. 51, 52; Prodr. xvi², 143.—Gray, Manual N. States, 5 ed. 449.—Young, Bot. Texas, 499.—Vasey, Cat. Forest Trees, 24.—Ridgway in Proc. U. S. Nat. Mus. 1882, 78.

Juglans sulcata, Willdenow, Berl. Baumz. 1 ed. 154, t. 7; Spec. iv, 457.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 391.—Persoon, Syn. ii, 566.—Desfontaines, Hist. Arb. ii, 348.—Pursh, Fl. Am. Sept. ii, 637.

Juglans mucronata, Michaux, Fl. Bor.-Am. ii, 192.

Juglans laciniosa, Michaux f. Hist. Arb. Am. i, 199, t. 8; N. American Sylva, 3 ed. i, 128, t. 37.—Barton, Prodr. Fl. Philadelph. 92.—Poiret, Suppl. iv, 112.—Audubon, Birds, t. 101.

C. cordiformis, Koch, Dendrologie, i, 597.

BIG SHELL-BARK. BOTTOM SHELL-BARK.

Chester county, Pennsylvania, west to southern Indiana and Illinois, eastern Kansas, and the Indian territory.

A tree 24 to 30 or, exceptionally, 37 (*Ridgway*) meters in height, with a trunk 0.60 to 1.20 meter in diameter; bottom lands, in low, rich soil; rare and local; most common and reaching its greatest development along the streams of southern Arkansas and the Indian territory.

Wood heavy, very hard, strong and tough, very close-grained, compact, flexible; layers of annual growth marked by one or two rows of large open ducts; medullary rays numerous, obscure; color, dark brown, the sap-wood nearly white; specific gravity, 0.8108; ash, 0.90; used for the same purposes as that of the shell-bark hickory.

The large nuts sweet and edible.

244.—Carya tomentosa, Nuttall,

Genera, ii, 221.—Barton, Compend. Fl. Philadelph. ii, 179.—Elliott, Sk. ii, 625.—Sprengel, Syst. ii, 849.—Torrey, Compend. Fl. N. States, 357; Fl. N. York, ii, 182.—Beck, Bot. 336.—Eaton, Manual, 6 ed. 83.—Spach, Hist. Veg. ii, 176.—Penn. Cycl. vi, 332.—Loudon, Arboretum, iii, 1444, f. 1267.—Eaton & Wright, Bot. 183.—Emerson, Trees Massachusetts, 194, t. 13; 2 ed. i, 222 & t.—Darlington, Fl. Cestrica, 3 ed. 263.—Darby, Bot. S. States, 513.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 419.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 43.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 641; Bot. & Fl. 304.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 36; Prodr. xvi², 143.—Gray, Manual N. States, 5 ed. 449.—Young, Bot. Texas, 499.—Vasey, Cat. Forest Trees, 24.—Ridgway in Proc. U. S. Nat. Mus. 1882, 78.

Juglans alba, Linnæus, Spec. 1 ed. 997.—Du Roi, Harbk. i, 333.—Kalm in Act. Holm. 1760, 117.—Wangenheim, Amer. 23, t. 10, f. 2.—Walter, Fl. Caroliniana, 235.—Aiton, Hort. Kew. iii, 360; 2 ed. v, 296.—Gærtner, Fruct. ii, 50, t. 89, f. 1.—Mœnch, Meth. 696.—Abbot, Insects Georgia, i, t. 29.—Lamarck, Dict. iv, 503; Ill. iii, 364, t. 781, f. 2.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 389.—Smith in Rees' Cycl. xx, No. 2.—Willdenow, Spec. iv, 457; Berl. Baumz. 154.—Desfontaines, Hist. Arb. ii, 347.—Bigelow, Fl. Boston. 3 ed. 379.

Juglans tomentosa, Lamarck, Dict. iv, 504.—Michaux, Fl. Bor.-Am. ii, 192.—Michaux f. Hist. Arb. Am. i, 184, t. 6; N. American Sylva, 3 ed. i, 120, t. 35.—Pursh, Fl. Am. Sept. ii, 637.—Barton, Prodr. Fl. Philadelph. 92.

C. tomentosa, var. *maxima*, Nuttall, Genera, ii, 221; Sylva, i, 40; 2 ed. i, 56.—Sweet, Hort. Brit. ed. 1830.—Beck, Bot. 336.—London, Arboretum, iii, 1445.—C. De Candolle, Prodr. xvi², 143.

C. alba, Koch, Dendrologie, i, 596 [not Nuttall].

MOCKER NUT. BLACK HICKORY. BULL NUT. BIG-BUD HICKORY. WHITE-HEART HICKORY. KING NUT.

Valley of the Saint Lawrence river, northern shores of lakes Ontario and Erie to eastern Nebraska, eastern Kansas, and the Indian territory, south to cape Canaveral and Tampa bay, Florida, and the valley of the Brazos river, Texas.

A tree 24 to 30 or, exceptionally, 33 (*Ridgway*) meters in height, with a trunk 0.90 to 1.20 meter in diameter; generally on rich upland hillsides—less commonly in low river bottom lands; very common in the Gulf states, and throughout the south the most widely-distributed species of the genus.

Wood heavy, very hard, strong, tough, very close-grained, checking in drying, flexible, containing few large, regularly-distributed, open ducts; medullary rays numerous, thin, obscure; color, rich dark brown, the thick sap-wood nearly white; specific gravity, 0.8216; ash, 1.06; used for the same purposes as that of the shell-bark hickory.

245.—Carya porcina, Nuttall,

Genera, ii, 222.—Barton, Compend. Fl. Philadelph. ii, 180.—Elliott, Sk. ii, 627.—Watson, Dend. Brit. ii, t. 167.—Sprengel, Syst. ii, 849.—Torrey, Compend. Fl. N. States, 358.—Beck, Bot. 336.—Eaton, Manual, 6 ed. 83.—Spach, Hist. Veg. ii, 178.—Penn. Cycl. vi, 332.—Darlington, Fl. Cestrica, 2 ed. 546.—London, Arboretum, iii, 1449, f. 1272–1274.—Eaton & Wright, Bot. 183.—Spach, Hist. Veg. ii, 178.—Emerson, Trees Massachusetts, 197, t. 14; 2 ed, i, 224 & t.—Wood, Bot. & Fl. 304.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 36, t. 1, f. 5, t. 5, f. 54; Prodr. xvi², 143.—Porcher, Resources S. Forests, 332.—Gray, Manual N. States, 5 ed. 449; Hall's Pl. Texas, 21.—Vasey, Cat. Forest Trees, 24.—Ridgway in Proc. U. S. Nat. Mus. 1882, 78.

Juglans glabra, Miller, Dict. No. 5.—Wangenheim, Amer. 25, t. 10, f. 24.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 391.—Willdenow, Spec. iv, 458; Berl. Baumz. 196.—Persoon, Syn. ii, 566.—Aiton, Hort. Kew. 2 ed. v, 297.—Eaton, Manual, 108.—Hayne, Dend. Fl. 164.

Juglans alba acuminata, Marshall, Arbustum, 68.

Juglans obcordata, Lamarck Dict. iv, 504.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 391.—Willdenow, Spec. iv, 458.—Persoon, Syn. 566.

Juglans porcina, Michaux f. Hist. Arb. Am. i, 206, t. 9; N. American Sylva, 3 ed. i, 132, t. 38.—Pursh, Fl. Am. Sept. ii, 638.—Barton, Prodr. Fl. Philadelph. 92.—Audubon, Birds, t. 91.

Juglans pyriformis, Muhlenberg, Cat. 92.

Juglans porcina, var. *obcordata*, Pursh, Fl. Am. Sept. ii, 638.—Barton, Compend. Fl. Philadelph. ii, 180.—Watson, Dend. Brit. ii, 167.

Juglans porcina, var. *pisiformis*, Pursh, Fl. Am. Sept. ii, 638.—Barton, Compend. Fl. Philadelph. ii, 180.

C. glabra, Torrey, Fl. N. York, ii, 182, t. 101.—Gray, Manual N. States, 1 ed. 412.—Darlington, Fl. Cestrica, 3 ed. 264.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 419.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 44.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Koch, Dendrologie, i, 594.—Young, Bot. Texas, 499.

C. amara, var. *porcina*, Darby, Bot. S. States, 513.

PIG NUT. BROWN HICKORY. BLACK HICKORY. SWITCH BUD HICKORY.

Southern Maine to southern Ontario, southern Michigan and Minnesota, eastern Nebraska, eastern Kansas, and the Indian territory, south to cape Canaveral and Pease creek, Florida, and the valley of the Nueces river, Texas.

A tree 24 to 30 or, exceptionally, 40 (*Ridgway*) meters in height, with a trunk 0.90 to 1.50 meter in diameter; dry hills and uplands; common.

Wood heavy, hard, very strong and tough, flexible, close-grained, checking in drying, containing many large open ducts; color, dark or light brown, the thick sap-wood lighter, often nearly white; specific gravity, 0.8217; ash, 0.99; used for the same purposes as that of the shell-bark hickory.

246.—Carya amara, Nuttall,

Genera, ii, 222.—Barton, Compend. Fl. Philadelph. ii, 180.—Elliott, Sk. ii, 626.—Sprengel, Syst. ii, 849.—Torrey, Compend. Fl. N. States, 358; Fl. N. York, ii, 183.—Beck, Bot. 336.—Spach, Hist. Veg. ii, 177.—Penn. Cycl. vi, 332.—Loudon, Arboretum, iii, 1443, f. 1264.—Hooker, Fl. Bor.-Am. ii, 144.—Emerson, Trees Massachusetts, 199, t. 15; 2 ed. i, 226 & t.—Darlington, Fl. Cestrica, 3 ed. 264.—Darby, Bot. S. States, 513.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 419.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 44.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 641; Bot. & Fl. 304.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 36, t. 1, f. 2, t. 5, f. 53–55; Prodr. xvi^2, 144.—Gray, Manual N. States, 5 ed. 449; Hall's Pl. Texas, 21.—Koch, Dendrologie, i, 592.—Young, Bot. Texas, 500.—Vasey, Cat. Forest Trees, 24.—Sears in Bull. Essex Inst. xiii, 178.—Bell in Geological Rep. Canada, 1879–'80, 52^c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 77.

Juglans alba minima, Marshall, Arbustum, 68.

Juglans cordiformis, Wangenheim, Amer. 25, t. 10, f. 25.

Juglans angustifolia, Lamarck, Dict. iv, 504 [not Aiton].

Juglans amara, Michaux f. Hist. Arb. Am. i, 177, t. 4; 3 ed. i, 116, t. 33.—Pursh, Fl. Am. Sept. ii, 638.

Hickorius amara, Rafinesque, Fl. Ludoviciana, 109.

BITTER NUT. SWAMP HICKORY.

Southern Maine to the valley of the Saint Lawrence river, west through Ontario, central Michigan and Minnesota to eastern Nebraska, eastern Kansas, and the Indian territory, south to the Chattahoochee region of western Florida and the valley of the Trinity river, Texas.

A tree 18 to 24 meters in height, with a trunk 0.60 to 0.90 meter in diameter; borders of streams and swamps, in low ground, or often on dry, rich uplands.

Wood heavy, very hard, strong, tough, close-grained, checking in drying; layers of annual growth marked by several rows of large open ducts; medullary rays numerous, obscure; color, dark brown, the thick sap-wood light brown, or often nearly white; specific gravity, 0.7552; ash, 1.03; largely used for hoops, ox-yokes, etc.

247.—Carya myristicæformis, Nuttall,

Genera, ii, 222.—Elliott, Sk. ii, 626.—Sprengel, Syst. ii, 849.—Eaton, Manual, 6 ed. 83.—Spach, Hist. Veg. ii, 179.—Penn. Cycl. v, 332.—Loudon, Arboretum, iii, 1451, f. 1275.—Eaton & Wright, Bot. 1833.—Chapman, Fl. S. States, 419.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 36, t. 6, f. 58; Prodr. xvi^2, 145.—Koch, Dendrologie, i, 595.—Young, Bot. Texas, 500.—Vasey, Cat. Forest Trees, 24.—Ravenel in Bull. Torrey Bot. Club. vi, 81.

Juglans myristicæformis, Michaux f. Hist. Arb. Am. i, 211, t. 10; N. American Sylva, 3 ed. i, 135, t. 39.—Pursh, Fl. Am. Sept. ii, 638.—Poiret, Suppl. iv, 112.—Rafinesque, Fl. Ludoviciana, 161.

C. amara, var. *myristicæformis*, Cooper in Smithsonian Rep. 1858, 255.

NUTMEG HICKORY.

South Carolina, "Goose creek" (*Michaux*), "Berkeley district" (*Ravenel*); Arkansas, valley of the Arkansas river (Pine Bluff, *Letterman*), south to the Red River valley.

A tree 24 to 30 meters in height, with a trunk 0.60 to 0.90 meter in diameter; sandy ridges along the borders of streams and swamps; rare and very local in South Carolina; more common and reaching its greatest development in southern Arkansas.

Wood heavy, hard, very strong and tough, close-grained, compact, containing numerous small open ducts, layers of annual growth marked by one or two rows of larger ducts; medullary rays numerous, thin, not conspicuous; color, light brown, the sap-wood lighter; specific gravity, 0.8016; ash, 1.06.

248.—Carya aquatica, Nuttall,

Genera, ii, 222.—Elliott, Sk. ii, 627.—Sprengel, Syst. ii, 849.—Eaton, Manual, 6 ed. 83.—Spach, Hist. Veg. ii, 179.—Penn. Cycl. vi, 332.—Loudon, Arboretum, iii, 1444, f. 1265, 1266.—Eaton & Wright, Bot. 183.—Scheele in Rœmer, Texas, 447.—Darby, Bot. S. States, 514.—Chapman, Fl. S. States, 419.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 44.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 641; Bot. & Fl. 304.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 36, t. 1, f. 4, t. 5, f. 56, 57; Prodr. xvi^2, 144.—Koch, Dendrologie, i, 593.—Young, Bot. Texas, 500.—Vasey, Cat. Forest Trees, 24.

Juglans aquatica, Michaux f. Hist. Arb. Am. i, 182, t. 5; N. American Sylva, 3 ed. i, 119, t. 34.—Pursh, Fl. Am. Sept. ii, 638.—Poiret, Suppl. iv, 112.

Hicorius integrifolia, Rafinesque, Fl. Ludoviciana, 109.

C. integrifolia, Sprengel, Syst. ii, 849.—Loudon, Arboretum, iii, 1451.

WATER HICKORY. SWAMP HICKORY. BITTER PECAN.

North Carolina, in the lower districts, south to cape Malabar and the Caloosa river, Florida (in Florida not detected within 8 or 10 miles of the coast), through the Gulf states to western Louisiana, northeastern Arkansas, and the valley of the Brazos river, Texas.

A tree 18 to 21 meters in height, with a trunk 0.60 to 0.90 meter in diameter, or generally much smaller; low river swamps; most common and reaching its greatest development in the bottom lands of the lower Mississippi and Yazoo rivers.

Wood heavy, soft, strong, rather brittle, very close-grained, compact, containing few scattered, open ducts; layers of annual growth less clearly marked than in the other species of the genus; medullary rays numerous, thin; color, dark brown, the sap-wood light, often nearly white; specific gravity, 0.7407; ash, 1.27; used for fencing, fuel, etc.

MYRICACEÆ.

249.—Myrica cerifera, Linnæus,

Spec. 1 ed. 1024.—Kalm, Travels, English ed. i, 92.—Marshall, Arbustum, 94.—Lamarck, Dict. ii, 592; Ill. iii, 402, t. 809, f. 1.—Gærtner, Fruct. i, 190, t. 39, f. 7.—Walter, Fl. Caroliniana, 242.—Aiton, Hort. Kew. iii, 396; 2 ed. v, 379.—Mœnch, Meth. 362.—B. S. Barton, Coll. ii, 4.—Nouveau Duhamel, ii, 190.—Schkuhr, Handb. iii, 465, t. 322.—Michaux, Fl. Bor.-Am. ii, 227.—Willdenow, Spec. iv, 745; Enum. 1011; Berl. Baumz. 254.—Persoon, Syn. ii, 614.—Desfontaines, Hist. Arb. ii, 472.—Titford, Hort. Bot. Am. 100.—Pursh, Fl. Am. Sept. ii, 620.—Nuttall, Genera, ii, 235; Trans. Am. Phil. Soc. 2 ser. v, 167.—Bigelow, Med. Bot. iii, 32, t. 43; Fl. Boston. 3 ed. 394.—Hayne, Dend. Fl. 197.—Elliott, Sk. ii, 678.—Sprengel, Syst. i, 493.—Torrey, Compend. Fl. N. States, 372; Fl. N. York, ii, 197.—Rafinesque, Med. Bot. ii, 244.—Eaton, Manual, 6 ed. 231.—Beck, Bot. 324.—Loudon, Arboretum, iv, 2057, f. 1968.—Lindley, Fl. Med. 305.—Dietrich, Syn. i, 551.—Eaton & Wright, Bot. 324.—Spach, Hist. Veg. xi, 263.—Emerson, Trees Massachusetts, 224; 2 ed. i, 256 & t.—Darby, Bot. S. States, 507.—Chapman, Fl. S States, 426.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 106.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 650; Bot. & Fl. 309.—Porcher, Resources S. Forests, 312.—C. De Candolle in Ann. Sci. Nat. 4 ser. xviii, 21, t. 3, f. 32; Prodr. xvi², 148.—Lawson in Trans. Bot. Soc. Edinburgh, viii, 108.—Gray, Manual N. States, 5 ed. 457.—Koch, Dendrologie, ii, 663.—Young, Bot. Texas, 511.—Vasey, Cat. Forest Trees, 28.

M. Pennsylvanica, Lamarck, Dict. ii, 592.—Desfontaines, Hist. Arb. ii, 472.—Nouveau Duhamel, ii, 190, t. 55.—Pursh, Fl. Am. Sept. ii, 620.—Sprengel, Syst. i, 493.—Eaton, Manual, 6 ed. 232.—Eaton & Wright, Bot. 325.—Spach, Hist. Veg. xi, 262.

M. Carolinensis, Miller, Dict. No. 3.—Wangenheim, Amer. 102.—Willdenow, Spec. iv, 746; Enum. 1011.—Aiton, Hort. Kew. 2 ed. v, 379.—Pursh, Fl. Am. Sept. ii, 620.—Nuttall, Genera, ii, 235.—Elliott, Sk. ii, 678.—Eaton, Manual, 6 ed. 232.—Eaton & Wright, Bot. 324.—Darby, Bot. S. States, 507.

M. cerifera humilis, Marshall, Arbustum, 95.

M. cerifera, var. *latifolia*, Aiton, Hort. Kew. iii, 396.

M. cerifera, var. *media*, Michaux, Fl. Bor.-Am. ii, 227.—Chapman, Fl. S. States, 427.

M. cerifera, var. *arborescens*, Michaux, Fl. Bor.-Am. ii, 227.

M. cerifera, var. *pumila*, Michaux, Fl. Bor.-Am. ii, 227.—Pursh, Fl. Am. Sept. ii, 620.—Chapman, Fl. S. States, 427.

M. cerifera, var. *angustifolia*, C. De Candolle, Prodr. xvi², 148.

M. cerifera sempervirens, Hort.

BAYBERRY. WAX MYRTLE.

Shores of lake Erie; Maine, and south near the coast to the Florida keys and southern Alabama.

A tree sometimes 12 meters in height, with a trunk 0.30 to 0.45 meter in diameter, or, except in the southern states, a low, much-branched shrub; usually on sandy beaches and dry hillsides, reaching its greatest development in the bottoms and rich hummocks of the Georgia and Florida coasts.

Wood light, soft, strong, brittle, very close-grained, compact; medullary rays numerous, thin; color, dark brown, the sap-wood lighter; specific gravity, 0.5637; ash, 0.51.

The leaves and stimulant and astringent bark of the roots sometimes employed by herbalists (*Am. Jour. Pharm.* 1863, 193.—*U. S. Dispensatory*, 14 ed. 257, 1706.—*Nat. Dispensatory*, 2 ed. 944). The wax which covers the small globular fruit, formerly largely collected and made into candles, and now, under the name of myrtle-wax, a popular remedy in the treatment of dysentery.

250.—Myrica Californica, Chamisso,

Linnæa, vi, 535.—Bentham, Pl. Hartweg. 336; Bot. Sulphur, 55.—Hooker, Fl. Bor.-Am. ii, 160.—Hooker & Arnott, Bot. Beechey, 390.—Lindley in Jour. London Hort. Soc. vii, 282.—Torrey in Pacific R. R. Rep. iv, 137; Bot. Wilkes Exped. 465.—Newberry in Pacific R. R. Rep. vi, 89.—Cooper in Pacific R. R. Rep. xii², 68.—C. De Candolle, Prodr. xvi², 153.—Gray in Proc. Am. Acad. vii, 401.—Vasey, Cat. Forest Trees, 28.—Hall in Coulter's Bot. Gazette, ii, 91.—Watson, Bot. California, ii, 81.

? *M. Xalapensis*, Hooker & Arnott, Bot. Beechey, 160.

Cape Foulweather, Oregon, south near the coast to the bay of Monterey, California.

A small evergreen tree, rarely exceeding 9 meters in height, with a trunk 0.30 to 0.45 meter in diameter, or toward its northern limits reduced to a low shrub; sandy beaches and gravelly hillsides.

Wood heavy, very hard, strong, brittle, very close-grained, compact; medullary rays numerous, thin, conspicuous; color, light rose, the sap-wood lighter; specific gravity, 0.6703; ash, 0.33.

CUPULIFERÆ.

251.—Quercus alba, Linnæus,

Spec. 1 ed. 996.—Du Roi, Harbk. ii, 270, t. 5, f. 5.—Lamarck, Dict. i, 720.—Marshall, Arbustum, 119.—Wangenheim, Amer. 12, t. 3, f. 6.—Walter, Fl. Caroliniana, 235.—Aiton, Hort. Kew. iii, 358; 2 ed. v, 293.—Abbot, Insects Georgia, ii, t. 80, 87.—Michaux, Fl. Bor.-Am. ii, 195.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 395.—Willdenow, Spec. iv, 448; Enum. 977; Berl. Baumz. 346.—Persoon, Syn. ii, 570.—Desfontaines, Hist. Arb. ii, 508.—Michaux f. Hist. Arb. Am. ii, 13, t. 1; N. American Sylva, 3 ed. i, 22, t. 1.—Pursh, Fl. Am. Sept. ii, 633.—Barton, Prodr. Fl. Philadelph. 91; Compend. Fl. Philadelph. ii, 17.—Eaton, Manual, 108; 6 ed. 293.—Nuttall, Genera, ii, 215; Sylva, i, 14; 2 ed. i, 24.—Nouveau Duhamel, vii, 175.—Hayne, Dend. Fl. 158.—Elliott, Sk. ii, 607.—Sprengel, Syst. iii, 864.—Torrey, Compend. Fl. N. States, 359; Fl. N. York, ii, 192.—Audubon, Birds, t. 107, 147.—Beck, Bot. 330.—London, Arboretum, iii, 1864, f. 1723-1726 & t.—Hooker, Fl. Bor.-Am. ii, 158.—Eaton & Wright, Bot. 385.—Bigelow, Fl. Boston. 3 ed. 375.—Spach, Hist. Veg. xi, 155.—Emerson, Trees Massachusetts, 127, t. 1; 2 ed. i, 145 & t.—Griffith, Med. Bot. 585.—Penn. Cycl. xix, 216.—Richardson, Arctic Exped. 437.—Darlington, Fl. Cestrica, 3 ed. 266.—Darby, Bot. S. States, 511.—Cooper in Smithsonian Rep. 1858, 255.—Brendel in Trans. Illinois Ag. Soc. iii, 613, t. 1.—Chapman, Fl. S. States, 423.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 31.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 645; Bot. & Fl. 306.—Porcher, Resources S. Forests, 257.—A. De Candolle, Prodr. xvi², 22.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 66.—Liebmann, Chênes Am. Trop. t. xxxiii, 29, 30, 58, 59.—Gray, Manual N. States, 5 ed. 450; Hall's Pl. Texas, 21.—Koch, Dendrologie, ii², 50.—Young, Bot. Texas, 505.—Vasey, Cat. Forest Trees, 25.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Sears in Bull. Essex Inst. xiii, 179.—Britton in Bull. Torrey Bot. Club, viii, 126.—Bell in Geological Rep. Canada, 1879-'80, 52ᶜ.—Ridgway in Proc. U. S. Nat. Mus. 78.

? *Q. sinuata*, Walter, Fl. Caroliniana, 235.

Q. alba, var. *pinnatifida*, Michaux, Hist. Chênes Am. No. 4, t. 5, f. 1; Fl. Bor.-Am. ii, 195.—London, Arboretum, iii, 1864.

Q. alba, var. *repanda*, Michaux, Hist. Chênes Am. No. 4, t. 5, f. 2.—Pursh, Fl. Am. Sept. ii, 633.—Hayne, Dend. Fl. 159.—London, Arboretum, iii, 1864.

Q. alba, var. *pinnatifido-sinuata*, Hayne, Dend. Fl. 158.

Q. alba, var. *sinuata*, Hayne, Dend. Fl. 159.

Q. alba, var. *microcarpa*, A. De Candolle, Prodr. xvi², 22.

WHITE OAK.

Northern Maine, valley of the Saint Lawrence river, Ontario, lower peninsula of Michigan to southeastern Minnesota, south to the Saint John's river and Tampa bay, Florida, west to the valley of Nodaway river, Missouri, western Arkansas, and the valley of the Brazos river, Texas.

A large tree of the first economic value, 24 to 45 meters in height, with a trunk 1.20 to 2.40 meters in diameter; all soils; very common and reaching its greatest development along the western slopes of the Alleghany mountains and in the valley of the Ohio river and its tributaries, here often forming more than half the forest growth.

Wood strong, very heavy, hard, tough, close-grained, liable to check unless carefully seasoned, durable in contact with the soil; layers of annual growth strongly marked by several rows of large open ducts; medullary rays broad, prominent; color, brown, the sap-wood lighter brown; specific gravity, 0.7470; ash, 0.41; largely used in ship-building, construction of all sorts, cooperage, in the manufacture of carriages, agricultural implements, and baskets, and for railway ties, fencing, interior finish, cabinet-making, fuel, etc.

A decoction of the astringent inner bark is employed medicinally in cases of hemorrhage, dysentery, etc. (*U. S. Dispensatory*, 14 ed. 755.—*Nat. Dispensatory*, 2 ed. 1196).

252.—Quercus lobata, Née,

Ann. Cienc. Nat. iii, 278.—Smith in Rees' Cycl. xxx, No. 77.—Persoon, Syn. ii, 571.—Nouveau Duhamel, vii, 180.—Poiret, Suppl. ii, 224.—Bentham, Pl. Hartweg. 337.—Liebmann in Dansk. Vidensk. Selsk. Forhandl. 1854, 14; Chênes Am. Trop. 23, t. 42, f. 1-3.—Torrey, Bot. Mex. Boundary Survey, 205; Bot. Wilkes Exped. 461, t. 15.—A. De Candolle, Prodr. xvi², 24.—Koch, Dendrologie, ii², 53.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 388; Wheeler's Rep. vi, 374; Bot. California. ii, 95.

Q. Hindsii, Bentham, Bot. Sulphur, 55.—Endlicher, Genera, Suppl. iv. 24.—Walpers, Ann. i, 635.—Torrey in Pacific R. R. Rep. iv, 138; v, 365.—Newberry in Pacific R. R. Rep. vi, 29, 89, t. 1, f. 7.—Cooper in Smithsonian Rep. 1858, 261.—Bolander in Proc. California Acad. iii, 230.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. 1866, Nos. 1-6, 66.—Liebmann, Chênes Am. Trop. t. 42, f. 4.—R. Brown Campst. Horæ Sylvanæ, 52, f. 1-3.

Q. longiglanda, Torrey in Fremont's Geographical Mem. California, 15, 17.

Q. Ransomi, Kellogg in Proc. California Acad. i, 25.

WHITE OAK. WEEPING OAK.

California, west of the Sierra Nevadas from the valley of the upper Sacramento river south through the foot-hills and interior valleys to the San Bernardino mountains.

The largest of the Pacific oaks, often 30 meters in height, with a trunk 0.90 to 2.40 meters in diameter; very common through the central part of the state.

Wood moderately hard, fine-grained, compact; layers of annual growth marked by few large open ducts and containing few smaller ducts arranged in lines parallel to the broad, conspicuous medullary rays; color, light brown, the sap-wood lighter; specific gravity, 0.7409; ash, 0.30; of little economic value, and only used for fuel.

253.—Quercus Garryana, Douglas;

Hooker, Fl. Bor.-Am. ii, 159.—Hooker & Arnott, Bot. Beechey, 391.—Nuttall, Sylva, i, 1, t. 1; 2 ed. i, 14, t. 1.—Torrey in Pacific R. R. Rep. iv, 138; Bot. Wilkes Exped. 462.—Newberry in Pacific R. R. Rep. vi, 89.—Cooper in Smithsonian Rep. 1858, 260; Pacific R. R. Rep. xii², 28, 68; Am. Nat. iii, 407.—Lyall in Jour. Linnæan Soc. vii, 131, 144.—A. De Candolle, Prodr. xvi², 24.—Bolander in Proc. California Acad. iii, 229.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. 1866, Nos. 1-6, 66.—Rothrock in Smithsonian Rep. 1858, 435.—Liebmann, Chênes Am. Trop. t. 40, f. 3.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 389; Bot. California, ii, 95.—Macoun in Geological Rep. Canada, 1875-'76, 210.—G. M. Dawson in Canadian Nat. new ser. ix, 330.

Q. Neæi, Liebmann in Dansk. Vidensk. Selsk. Forhandl. 1854, 173; Chênes Am. Trop. 23, t. xli, f. 1, 2.

Q. Douglasii, var. *?Neæi*, A. De Candolle, Prodr. xvi², 24.

Q. Œrstediana, R. Brown Campst. in Ann. & Mag. Nat. Hist. April, 1871, 2.

Q. Jacobi, R. Brown Campst. in Ann. & Mag. Nat. Hist. April, 1871, 7.

WHITE OAK.

Vancouver's island, shores of Puget sound, south through western Washington territory, Oregon, and California to San Francisco bay; in Washington territory and Oregon extending to the eastern slopes of the Cascade mountains.

A tree 21 to 30 meters in height, with a trunk 0.60 to 0.90 meter in diameter, or at high elevations reduced to a low shrub; dry, gravelly soil; common.

Wood strong, hard, that of the young trees tough, close-grained, compact; layers of annual growth marked by one to three rows of open ducts; medullary rays, varying greatly in width, often conspicuous; color, light brown or yellow, the sap-wood lighter, often nearly white; specific gravity, 0.7453; ash, 0.39; somewhat used for carriage and cooperage stock, in cabinet-making, ship-building, and very largely for fuel; the best substitute for eastern white oak produced in the Pacific forests.

254.—Quercus obtusiloba, Michaux,

Hist. Chênes Am. No. 1, t. 1; Fl. Bor.-Am. ii, 194.—Smith in Rees' Cycl. xxx, No. 78.—Michaux f. Hist. Arb. Am. ii, 36, t. 4; N. American Sylva, 3 ed. i, 36, t. 5.—Pursh, Fl. Am. Sept. ii, 632.—Nuttall, Genera, ii, 215.—Barton, Compend. Fl. Philadelph. ii, 171.—Elliott, Sk. ii, 606.—Torrey, Compend. Fl. N. States, 359; Fl. N. York, ii, 190.—Beck, Bot. 329.—Eaton, Manual, 6 ed. 293.—London, Arboretum, iii, 1870, f. 1732 & t.—Hooker, Fl. Bor.-Am. ii, 158.—Eaton & Wright, Bot. 384.—Scheele in Rœmer, Texas, 446.—Darlington, Fl. Cestrica, 3 ed. 265.—Darby, Bot. S. States, 511.—Cooper in Smithsonian Rep. 1858, 255.—Brendel in Trans. Illinois Ag. Soc. iii, 615, t. 11.—Chapman, Fl. S. States, 423.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 32.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 645; Bot. & Fl. 306.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 209.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. 1866, Nos. 1-6, 66.—Liebmann, Chênes Am. Trop. t. H, t. 33, f. 60.—Gray, Manual N. States, 5 ed. 451; Hall's, Pl. Texas, 21.—Young, Bot. Texas, 505.

Q. alba minor, Marshall, Arbustum, 120.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 395.

Q. stellata, Wangenheim, Amer. 78, t. 6, f. 15.—Abbot, Insects Georgia, ii, t. 77.—Willdenow, Spec. iv, 452; Enum, 977; Berl. Baumz. 349.—Persoon, Syn. ii, 570.—Aiton, Hort. Kew. 2 ed. v, 294.—Nouveau Duhamel, vii, 180.—Hayne, Dend. Fl. 161.—Nuttall, Sylva, i, 13; 2 ed. i, 23.—Spach, Hist. Veg. xi, 156.—Emerson, Trees Massachusetts, 133, t. 3; 2 ed. i, 151 & t.—A. De Candolle, Prodr. xvi², 22.—Koch, Dendrologie, iii, 52.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 389.—Ridgway in Proc. U. S. Nat. Mus. 1882, 84.—Watson in Proc. Am. Acad, xviii, 156.

? *Q. villosa*, Walter, Fl. Caroliniana, 235.

Q. lobulata, Abbot, Insects Georgia, i, 47.

? *Q. Drummondii*, Liebmann in Dansk. Vidensk. Selsk. Forhandl. 1854, 170.—A. De Candolle, Prodr. xvi², 24.

Q. obtusiloba, var. *parvifolia*, Chapman, Fl. S. States, 423.

Q. stellata, var. *Floridana*, A. De Candolle, Prodr. xvi², 22.

POST OAK. IRON OAK.

Martha's Vineyard, Massachusetts, south to northern Florida, west through southern Ontario and Michigan to eastern Nebraska, Kansas, the Indian territory, and extending to the one hundredth meridian in central Texas.

A tree rarely exceeding 24 meters in height, with a trunk 0.90 to 1.50 meter in diameter, or on the Florida coast reduced to a low shrub (var. *parvifolia*, etc.); dry, gravelly uplands, clay barrens, or in the southwest on Cretaceous formations; the most common and widely-distributed oak of the Gulf states west of the Mississippi river, forming the principal growth of the Texas "cross-timbers."

Wood heavy, hard, close-grained, compact, checking badly in drying, very durable in contact with the soil; layers of annual growth marked by one to three rows of not large open ducts; medullary rays numerous, conspicuous; color, dark or light brown, the sap-wood lighter; specific gravity, 0.8367; ash, 0.79; largely used, especially in the southwest, for fencing, railway ties, and fuel, and somewhat for carriage stock, cooperage, construction, etc.

255.—Quercus undulata, var. Gambelii, Engelmann, Wheeler's Rep. vi, 249.

Q. Gambelii, Nuttall in Jour. Philadelphia Acad. new ser. i, 179.—Torrey in Sitgreaves' Rep. 172, t. 18; Bot. Mex. Boundary Survey, 205.—Cooper in Smithsonian Rep. 1858, 260.—Liebmann, Chênes Am. Trop. 22, t. 40, f. 1.—Hemsley, Bot. Am.-Cent. iii, 171.

Q. alba, var. ? *Gunnisonii*, Torrey in Pacific R. R. Rep. ii, 130.—Watson in King's Rep. v, 321.—Porter in Hayden's Rep. 1871, 493.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 127.—Macoun in Geological Rep. Canada, 1875–'76, 209.

Q. Douglasii, var. *Gambelii*, A. De Candolle, Prodr. xvi², 23.

Q. stellata, var. *Utahensis*, A. De Candolle, Prodr. xvi², 22.

? *Q. Emoryi*, Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 127 [not Torrey].

SCRUB OAK.

Near the mouth of the Pecos river (*Havard*), through the mountains of western Texas, and New Mexico to the Santa Catalina (*Lemmon*, *Pringle*) and San Francisco mountains, Arizona, eastern slopes of the Rocky mountains of Colorado north to the valley of the Platte river, and through the Wahsatch mountains of Utah.

A small tree, rarely 15 meters in height, with a trunk sometimes 0.60 meter in diameter, or often a low shrub spreading from underground shoots and forming dense thickets, reaching its greatest development on the high mountains of southern New Mexico and Arizona; the large specimens generally hollow and defective.

Wood heavy, hard, strong, that of young trees quite tough, close-grained, checking badly in drying; layers of annual growth marked by few not large open ducts; medullary rays numerous, conspicuous; color, rich dark brown, the sap-wood lighter; specific gravity, 0.8407; ash, 0.99; largely used for fuel, and in Utah the bark in tanning.

256.—Quercus macrocarpa, Michaux,

Hist. Chênes Am. No. 2, t. 2, 3; Fl. Bor.-Am. ii, 194.—Willdenow, Spec. iv, 453; Enum. 977; Berl. Baumz. 350.—Smith in Rees' Cycl. xxx, No. 80.—Persoon, Syn. ii, 570.—Poiret, Suppl. ii, 224.—Michaux f. Hist. Arb. Am. ii, 34, t. 3; N. American Sylva, 3 ed. i, 35, t. 4.—Pursh, Fl. Am. Sept. ii, 632.—Nuttall, Genera, ii, 215.—Nouveau Duhamel, vii, 182.—Hayne, Dend. Fl. 161.—Sprengel, Syst. iii, 863.—Torrey, Compend. Fl. N. States, 359; Nicollet's Rep. 160; Fl. N. York, ii, 191, t. 108.—Beck, Bot. 330.—Eaton, Manual, 6 ed. 293.—Loudon, Arboretum, iii, 1869, f. 1731 & t.—Eaton & Wright, Bot. 385.—Spach, Hist. Veg. xi, 159.—Emerson, Trees Massachusetts, 132, t. 2; 2 ed. i, 149 & t.—Scheele in Rœmer, Texas, 446.—Richardson, Arctic Exped. 437.—Cooper in Smithsonian Rep. 1858, 255.—Brendel in Trans. Illinois Ag. Soc. 131, t. 5, f. 21.—Chapman, Fl. S. States, 423.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 645; Bot. & Fl. 306.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 209; Trans. St. Louis Acad. iii, 389.—A. De Candolle, Prodr. xvi², 20.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 67.—Liebmann, Chênes Am. Trop. t. G, t. 33, f. 27, 28.—Gray, Manual N. States, 5 ed. 451.—Koch, Dendrologie, ii², 51.—Young, Bot. Texas, 506.—Winchell in Ludlow's Rep. Black Hills, 68.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 24.—Broadhead in Coulter's Bot. Gazette, iii, 60.—J. F. James in Jour. Cincinnati Soc. Nat. Hist. iv, 1 & t.—Ridgway in Proc. U. S. Nat. Mus. 1882, 81.—Bell in Geological Rep. Canada, 1879–'80, 49c.—Watson in Proc. Am. Acad. xviii, 156.

Q. olivæformis, Michaux f. Hist. Arb. Am, ii, 32, t. 2; N. American Sylva, 3 ed. i, 33, t. 3.—Smith in Rees' Cycl. xxx, No. 91.—Pursh, Fl. Am. Sept. ii, 632.—Nuttall, Genera, ii, 215; Sylva, i, 14; 2 ed. i, 24.—Nouveau Duhamel, vii, 181.—Sprengel, Syst. iii, 864.—Torrey, Compend. Fl. N. States, 359.—Fl. N. York, ii, 191.—Beck, Bot. 330.—Eaton, Manual, 6 ed. 293.—Loudon, Arboretum, iii, 1869, f. 1730.—Eaton & Wright, Bot. 385.—Spach, Hist. Veg. xi, 159.—Gray, Manual N. States, 1 ed. 414.—A. De Candolle, Prodr. xvi², 20.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 67.—Engelmann in Trans. St. Louis Acad. iii, 391.

Q. obtusiloba, var. *depressa*, Nuttall, Genera, ii, 215.

Q. macrocarpa, var. *olivæformis*, Gray, Manual N. States, 2 ed. 404; 5 ed. 451.

Q. macrocarpa, var. *abbreviata*, A. De Candolle, Prodr. xvi², 20.

Q. macrocarpa, var. *minor*, A. De Candolle, Prodr. xvi², 20.

Q. stellata, var. *depressa*, A. De Candolle, Prodr. xvi², 23.

BURR OAK. MOSSY-CUP OAK. OVER-CUP OAK.

Nova Scotia, New Brunswick, northern shores of lake Huron to lake Winnipeg, south to the valley of the Penobscot river, Maine (*C. E. Hamlin*), and along the shores of lake Champlain and the valley of the Ware river, Massachusetts, to Lancaster county, Pennsylvania, west to the eastern foot-hills of the Rocky mountains of Montana, central Nebraska and Kansas, southwest to the Indian territory and the valley of the Nueces river, Texas.

A large tree of the first economic value, 24 to 30 or, exceptionally, 50 meters in height, with a trunk 1.20 to 2.10 meters in diameter; rich bottoms and prairies; in the prairie region the principal growth of the "oak openings", and extending farther west and northwest than any oak of the Atlantic forests.

Wood heavy, strong, hard, tough, close-grained, compact, more durable in contact with the soil than that of other American oaks; layers of annual growth marked by one to three rows of small open ducts; medullary rays often broad and conspicuous; color, dark or rich light brown, the sap-wood much lighter; specific gravity, 0.7453; ash, 0.71; generally confounded with the less valuable white oak (*Q. alba*), and employed for the same purposes.

257.—Quercus lyrata, Walter,

Fl. Caroliniana, 235.—Abbot, Insects Georgia, ii, t. 83.—Michaux, Hist. Chênes Am. No. 3, t. 4; Fl. Bor.-Am. ii, 195.—Willdenow, Spec. iv, 453.—Smith in Rees' Cycl. xxx, No. 79.—Persoon, Syn. ii, 570.—Poiret, Suppl. ii, 224.—Michaux f. Hist. Arb. Am. ii, 42, t. 5; N. American Sylva, 3 ed. i, 39, t. 6.—Aiton, Hort. Kew. 2 ed. v, 295.—Pursh, Fl. Am. Sept. ii, 632.—Nouveau Duhamel, vii, 181.—Nuttall, Genera, ii, 215.—Elliott, Sk. ii, 607.—Sprengel, Syst. xi, 156.—Eaton, Manual, 6 ed. 295.—Loudon, Arboretum, iii, 1871, f. 1733, 1734.—Eaton & Wright, Bot. 386.—Spach, Hist. Veg. xi, 156.—Darby, Bot. S. States, 511.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 423.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 33.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Bot. & Fl. 306.—A. De Candolle, Prodr. xvi², 19.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1886, 66.—Koch, Dendrologie, ii², 53.—Gray, Hall's Pl. Texas, 21.—Young, Bot. Texas, 506.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 389.—Ridgway in Proc. U. S. Nat. Mus, 1882, 80.

OVER-CUP OAK. SWAMP POST OAK. WATER WHITE OAK.

North Carolina, south near the coast to the Chattahoochee region of northern Florida, west through Alabama, Mississippi, and Louisiana to the valley of the Trinity river, Texas, and through Arkansas and southeastern Missouri (Allenton, *Letterman*) to middle Tennessee, southern Indiana and Illinois.

A tree 24 to 30 meters in height, with a trunk 0.60 to 0.90 meter in diameter; deep, often submerged, river swamps; rare in the Atlantic states; more common and reaching its greatest development in the valley of the Red river and the adjacent portions of Arkansas and Texas.

Wood heavy, hard, strong, tough, very durable in contact with the ground, close-grained, inclined to check in drying; layers of annual growth marked by one to three rows of large open ducts; medullary rays broad, numerous, conspicuous; color, rich dark brown, the sap-wood much lighter; specific gravity, 0.8313; ash, 0.65; used for the same purposes as that of the white oak (*Q. alba*).

258.—Quercus bicolor, Willdenow,

Neue Schriften Gesell. Nat. Fr. Berlin, iii, 396; Spec. iv, 440.—Smith in Rees' Cycl. xxx, No. 50.—Persoon, Syn. ii, 569.—Poiret, Suppl. ii, 219.—Pursh, Fl. Am. Sept. ii, 633.—Eaton, Manual, 107; 6 ed. 294.—Barton, Compend. Fl. Philadelph. ii, 172.—Nuttall, Genera, ii, 215; Sylva, i, 13; 2 ed. i, 23.—Nouveau Duhamel, vii, 165.—Sprengel, Syst. iii, 860.—Torrey, Compend. Fl. N. States, 359; Fl. N. York, ii, 192.—Beck, Bot. 331.—Bigelow, Fl. Boston. 3 ed. 375.—Eaton & Wright, Bot. 385.—Emerson, Trees Massachusetts, 135, t. 4; 2 ed. i, 153 & t.—Buckley in Am. Jour. Sci. 2 ser. xiii, 397.—Darlington, Fl. Cestrica, 3 ed. 266.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 646; Bot. & Fl. 306.—A. De Candolle, Prodr. xvi², 20.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 67.—Gray, Manual N. States, 5 ed. 451.—Koch, Dendrologie, ii², 47.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 389.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Sears in Bull. Essex Inst. xiii, 179.—Bell in Geological Rep. Canada, 1879-'80, 55c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 79.

? *Q. Prinus platanoides*, Lamarck, Dict. i, 21.

Q. alba palustris, Marshall, Arbustum, 120.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 395.

Q. Prinus tomentosa, Michaux, Hist. Chênes Am. No. 5, t. 9, f. 2; Fl. Bor.-Am. ii, 196.—Loudon, Arboretum, iii, 1876, f. 1739.

Q. Prinus, var. *discolor*, Michaux f. Hist. Arb. Am. ii, 46, t. 6; N. American Sylva, 3 ed. i, 41, t. 7.—Cooper in Smithsonian Rep. 1858, 255.—Brendel in Trans. Illinois Ag. Soc. iii, 617, t. 3.—Chapman, Fl. S. States, 424.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 34.

Q. bicolor, var. *mollis*, Nuttall, Genera, ii, 215.—Torrey, Compend. Fl. N. States, 359.

Q. Prinus, var. *bicolor*, Spach, Hist. Veg. xi, 158.

? *Q. bicolor*, var. *platanoides*, A. De Candolle, Prodr. xvi², 21.

SWAMP WHITE OAK.

Southern Maine, valley of the upper Saint Lawrence river, Ontario, southern peninsula of Michigan to southeastern Iowa and western Missouri, south to Delaware, and along the Alleghany mountains to northern Georgia, northern Kentucky, and northern Arkansas.

A large tree, 24 to 36 meters in height, with a trunk 1.20 to 2.40 or, exceptionally, over 3 meters ("Wadsworth Oak", Geneseo, New York) in diameter; borders of streams and swamps, in deep alluvial soil; common and reaching its greatest development in the region south of the great lakes.

Wood heavy, hard, strong, tough, close-grained, inclined to check in seasoning; layers of annual growth marked by one to three rows of large open ducts; medullary rays broad and conspicuous; color, light brown, the sap-wood hardly distinguishable; specific gravity, 0.7662; ash, 0.58; used for the same purposes as that of the white oak (*Q. alba*).

259.—Quercus Michauxii, Nuttall,

Genera, ii, 215 (excl. syn.).—Elliott, Sk. ii, 609.—Sprengel, Syst. iii, 860.—Eaton, Manual, 6 ed. 295.—Eaton & Wright, Bot. 386.—Darby, Bot. S. States, 511.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 382.—Ward in Bull. U. S. Nat. Mus. No. 22, 113.—Ridgway in Proc. U. S. Nat. Mus. 1882, 81.

Q. Prinus palustris, Michaux, Hist. Chênes Am. No. 5, t. 6; Fl. Bor-Am. ii, 196.—Michaux f. Hist. Arb. Am. ii, 51, t. 7; N. American Sylva, 3 ed. i, 44, t. 8.—Barton, Prodr. Fl. Philadelph. 91.—Loudon, Arboretum, iii, 1872, f. 1735 & t.

Q. Prinus, var. *Michauxii*, Chapman, Fl. S. States, 424.

Q. Prinus, Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 33, in part.

Q. bicolor, var. *Michauxii*, Engelmann in Trans. St. Louis Acad. iii, 390.

BASKET OAK. COW OAK.

New Castle county, Delaware, south through the lower and middle districts to northern Florida, through the Gulf states to the valley of the Trinity river, Texas, and through Arkansas and southwestern Missouri to central Tennessee and Kentucky, and the valley of the lower Wabash river.

A tree 24 to 36 meters in height, with a trunk 1.20 to 2.10 meters in diameter; borders of streams and deep, often submerged, swamps; the common and most valuable white oak of the Gulf states, reaching its greatest development in the rich bottom lands of southeastern Arkansas and Louisiana.

Wood heavy, hard, very strong, tough, close-grained, compact, very durable in contact with the soil, easily split; layers of annual growth marked by few rather large open ducts; medullary rays broad, conspicuous; color, light brown, the sap-wood darker; specific gravity, 0.8039; ash, 0.45; largely used in the manufacture of agricultural implements, wheel stocks, baskets, for which it is unsurpassed, for cooperage, fencing, construction, and fuel.

The large, sweet, edible acorns eagerly devoured by cattle and other animals.

260.—Quercus Prinus, Linnæus,

Spec. 1 ed. 995.—Du Roi, Harbk. ii, 276, t. 6, f. 3.—Lamarck, Dict. i, 720.—Marshall, Arbustum, 125.—Wangenheim, Amer. 15, t. 4, f. 8.—Aiton, Hort. Kew. iii, 356; 2 ed. v, 290.—Mœnch, Meth. 348.—Abbot, Insects Georgia, ii, t. 82.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 397.—Michaux, Fl. Bor.-Am. ii, 195.—Willdenow, Spec. iv, 439; Enum. 975; Berl. Baumz. 339.—Smith in Rees' Cycl. xxx, No. 47.—Persoon, Syn. ii, 568.—Desfontaines, Hist. Arb. ii, 509.—Pursh, Fl. Am. Sept. ii, 633.—Barton, Compend. Fl. Philadelph. ii, 171.—Nuttall, Genera, ii, 215.—Nouveau Duhamel, vii, 164.—Hayne, Dend. Fl. 155.—Elliott, Sk. ii, 608.—Sprengel, Syst. iii, 859.—Torrey, Compend. Fl. N. States, 359.—Audubon, Birds, t. 50, 131.—Beck, Bot. 331.—Eaton, Manual, 6 ed. 294.—Loudon, Arboretum, iii, 1872.—Eaton & Wright, Bot. 385.—Spach, Hist. Veg. xi, 157.—Penn. Cycl. xix, 216.—Darlington, Fl. Cestrica, 3 ed. 267.—Darby, Bot. S. States, 511.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 423.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 645; Bot. & Fl. 306.—Porcher, Resources S. Forests, 264.—A. De Candolle, Prodr. xvi², 21.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 67.—Gray, Manual N. States, 5 ed. 451.—Young, Bot. Texas, 506.—Koch, Dendrologie, ii², 48.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 390.

Q. Prinus, var. *monticola*, Michaux, Hist. Chênes Am. No. 5, t. 7; Fl. Bor.-Am. ii, 196.—Michaux f. Hist. Arb. Am. ii, 55, t. 8; N. American Sylva, 3 ed. i, 46, t. 9.—Barton, Prodr. Fl. Philadelph. 91.—Loudon, Arboretum, iii, 1873, f. 1736.—Spach, Hist. Veg. xi, 158.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 424.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 34.—Wood, Cl. Book, 646.—A. De Candolle, Prodr. xvi², 21.—Gray, Manual N. States, 5 ed. 451.—Vasey, Cat. Forest Trees, 25.—Bailey in Am. Nat. xiv, 892, f. 1–4.

Q. montana, Willdenow, Spec. iv, 440; Enum. 975; Berl. Baumz. 340.—Persoon, Syn. ii, 569.—Smith in Rees' Cycl. xxx, No. 49.—Pursh, Fl. Am. Sept. ii, 634.—Eaton, Manual, 107, 6 ed. 294.—Barton, Compend. Fl. Philadelph. ii, 172.—Nuttall, Genera, ii, 216.—Nouveau Duhamel, vii, 165, t. 47, f. 2.—Hayne, Dend. Fl. 156.—Elliott, Sk. ii, 609.—Sprengel, Syst. iii, 860.—Torrey, Compend. Fl. N. States, 354; Fl. N. York, ii, 192.—Beck, Bot. 331.—Bigelow, Fl. Boston. 3 ed. 377.—Eaton & Wright, Bot. 385.—Emerson, Trees Massachusetts, 138, t. 6; 2 ed. i, 156 & t.—Gray, Manual N. States, 1 ed. 414.—Darlington, Fl. Cestrica, 3 ed. 266.—Darby, Bot. S. States, 511.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Porcher, Resources S. Forests, 263.—Burgess in Coulter's Bot. Gazette, vii, 95.

Q. Prinus, var. *lata*, Aiton, Hort. Kew. 2 ed. v, 290.

Q. Castanea, Emerson, Trees Massachusetts, 137, t. 5; 2 ed. i, 155 & t. [not Muhlenberg & Willdenow].

CHESTNUT OAK. ROCK CHESTNUT OAK.

Blue hills, eastern Massachusetts, west to the shores of lake Champlain, shores of Quinté bay, Ontario (*Macoun*), and the valley of the Genesee river, New York, south to Delaware, and through the Alleghany Mountain region to northern Alabama, extending west to central Kentucky and Tennessee.

A tree 24 to 30 meters in height, with a trunk 0.90 to 1.20 meter in diameter; rocky banks and hillsides; very common and reaching its greatest development in the southern Alleghany region, here often forming a large portion of the forest growth.

Wood heavy, hard, strong, rather tough, close-grained, inclined to check in drying, durable in contact with the soil, containing few open ducts; medullary rays very broad, conspicuous; color, dark brown, the sap-wood lighter; specific gravity, 0.7499; ash, 0.77; largely used in fencing, for railway ties, etc.

The bark, rich in tannin, is largely used in preference to that of other North American white oaks in tanning leather.

261.—Quercus prinoides, Willdenow,

Neue Schriften Gesell. Nat. Fr. Berlin, iii, 397; Spec. iv, 440.—Persoon, Syn. ii, 569.—Poiret, Suppl. ii, 219.—Nouveau Duhamel, vii, 166.—Torrey, Fl. N. York, ii, 193, t. 109.—Gray, Manual N. States, 1 ed. 415.—Darlington, Fl. Cestrica, 3 ed. 267.—Chapman, Fl. S. States, 424.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 35.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 646.—Koch, Dendrologie, ii², 49.—Young, Bot. Texas, 506.—Engelmann in Trans. St. Louis Acad. iii, 391.

Q. Prinus humilis, Marshall, Arbustum, 125.—Gray, Manual N. States, 5 ed. 452.

Q. Castanea, Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 396 [not Née].—Willdenow, Spec. iv, 441; Enum. 976; Berl. Baumz. 341.—Persoon, Syn. ii, 569.—Pursh, Fl. Am. Sept. ii, 634.—Smith in Rees' Cycl. xxx, No. 51.—Poiret, Suppl. ii, 219.—Eaton, Manual, 107; 6 ed. 294.—Barton, Compend. Fl. Philadelph. ii, 172.—Nuttall, Genera, ii, 216.—Hayne, Dend. Fl. 156.—Elliott, Sk. ii, 610.—Sprengel, Syst. iii, 860.—Torrey, Compend. Fl. N. States, 354; Fl. N. York, ii, 193.—Beck, Bot. 331.—Eaton & Wright, Bot. 385.—Gray, Manual N. States, 1 ed. 415.—Darlington, Fl. Cestrica, 3 ed. 267.—Darby, Bot. S. States, 511.—Brendel in Trans. Illinois Ag. Soc. iii, 619, t. 4.—Chapman, Fl. S. States, 424.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 34.—Lesquereux in Owen's 2d Rep. Arkansas, 387.—Wood, Cl. Book, 646.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 68.—Liebmann, Chênes Am. Trop. t. II, K. & 33, f. 31, 32.—Young, Bot. Texas, 506.

Q. Prinus, var. *acuminata*, Michaux, Hist. Chênes Am. No. 5, t. 8; Fl. Bor.-Am. ii, 196.—Michaux f. Hist. Arb. Am. ii, 61, t. 9; N. American Sylva, 3 ed. i, 49, t. 10.—Nouveau Duhamel, vii, 167.—Loudon, Arboretum, iii, 1875, f. 1637.—Cooper in Smithsonian Rep. 1858, 255.—Wood, Bot. & Fl. 306.—Gray, Manual N. States, 5 ed. 451.—Vasey, Cat. Forest Trees, 25.

Q. Prinus pumila, Michaux, Hist. Chênes Am. No. 5, t. 9, f. 1; Fl. Bor.-Am. ii, 196.—Loudon, Arboretum, iii, 1875, f. 1738.

Q. Prinus Chinquapin, Michaux f. Hist. Arb. Am. ii, 65, t. 10; N. American Sylva, 3 ed. i, 50, t. 11.—A. De Candolle, Prodr. xvi², 21.

Q. Chinquapin, Pursh, Fl. Am. Sept. ii, 634.—Smith in Rees' Cycl. xxx, No. 48.—Nuttall, Genera, ii, 216.—Elliott, Sk. ii, 611.—Torrey, Compend. Fl. N. States, 354.—Beck, Bot. 331.—Eaton, Manual, 6 ed. 294.—Darlington, Fl. Cestrica, 2 ed. 536.—Eaton & Wright, Bot. 385.—Bigelow, Fl. Boston. 3 ed. 377.—Emerson, Trees Massachusetts, 140; 2 ed. i, 158 & t.—Darby, Bot. S. States, 511.

Q. Prinus, var. *oblongata*, Aiton, Hort. Kew. v, 290.

Q. Prinus, var. *prinoides*, Wood, Bot. & Fl. 306.

Q. Muhlenbergii, Engelmann in Trans. St. Louis Acad. iii, 591.—G. D. Butler in Coulter's Bot. Gazette, iii, 77.—Ridgway in Proc. U. S. Nat. Mus. 1882, 82.

YELLOW OAK. CHESTNUT OAK. CHINQUAPIN OAK.

Eastern Massachusetts, shores of lake Champlain, west along the northern shores of lakes Ontario and Erie, through southern Michigan to eastern Nebraska, eastern Kansas, and the Indian territory; south to Delaware and through the Alleghany region to northern Alabama and Mississippi, southwest to the Guadalupe mountains, western Texas (*Havard*).

A tree 24 to 30 or, exceptionally, 39 meters (*Ridgway*) in height, with a trunk 0.60 to 0.90 meter in diameter (*Q. Muhlenbergii*), or often, especially toward the eastern and western limits of its range, reduced to a low, slender shrub (*Q. prinoides*); dry hillsides and low, rich bottoms; rare, except as a shrub, east of the Alleghany mountains; very common in the Mississippi River basin, and reaching its greatest development in southern Arkansas.

Wood heavy, hard, very strong, close-grained, checking badly in drying, very durable in contact with the soil; layers of annual growth marked by rows of small open ducts; medullary rays broad, conspicuous; color, dark brown, the sap-wood much lighter; specific gravity, 0.8605; ash, 1.14; used for cooperage, wheel stock, fencing, railway ties, etc.

The small acorns sweet and edible.

NOTE.—Differences in the size and habit of individuals of this species, thus enlarged, seem to be dependent upon soil and climate, numerous intermediate forms connecting the extremes of eastern Massachusetts and the Mississippi valley.

262.—Quercus Douglasii, Hooker & Arnott,

Bot. Beechey, 391.—Hooker, Icon. iv, t. 382, 383.—Bentham, Pl. Hartweg. 337; Bot. Sulphur, 55.—Nuttall, Sylva, i, 10, t. 4; 2 ed. i, 20, t. 4.—Torrey in Pacific R. R. Rep. v, 365; Bot. Wilkes Exped. 462.—Cooper in Smithsonian Rep. 1858, 260.—A. De Candolle, Prodr. xvi², 23.—Bolander in Proc. California Acad. iii, 230.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 66.—Liebmann, Chênes Am. Trop. t. 41, f. 3, 4.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 392; Bot. California, ii, 95.—Hall in Coulter's Bot. Gazette, ii, 91.

Q. oblongifolia, var. *brevilobata*, Torrey in Bot. Wilkes Exped. 460.

MOUNTAIN WHITE OAK. BLUE OAK.

California, from about latitude 39°, south along the western foot-hills of the Sierra Nevadas below 4,000 feet elevation, and through the Coast ranges to the San Gabriel mountains.

A tree 18 to 24 meters in height, with a trunk 0.60 to 1.20 meter in diameter; common on the low foot-hills of the sierras.

Wood very hard, heavy, strong, brittle, inclined to check in drying; layers of annual growth marked by several rows of small open ducts and containing many scattered groups of smaller ducts; medullary rays numerous, varying greatly in width; color, dark brown, becoming nearly black with exposure, the thick sap-wood light brown; specific gravity, 0.8928; ash, 0.84.

263.—Quercus oblongifolia, Torrey,

Sitgreaves' Rep. 173; Bot. Mex. Boundary Survey, 206; Ives' Rep. 28.—Cooper in Smithsonian Rep. 1858, 261.—A. De Candolle, Prodr. xvi², 36.—Watson, Pl. Wheeler, 17.—Vasey, Cat. Forest Trees, 26.—Engelmann in Trans. St. Louis Acad. iii, 393; Bot. California, ii, 96.

Q. undulata, var. *oblongata*, Engelmann in Wheeler's Rep. vi, 250.

WHITE OAK.

California, foot-hills of the San Gabriel mountains, and in San Diego county (here occupying a narrow belt, 30 miles in width some 30 miles from the coast, *Parish Brothers*); foot-hills of the mountain ranges of southern Arizona and New Mexico; southward into Mexico.

A small evergreen tree, 12 to 15 meters in height, with a trunk 0.45 to 0.60 meter in diameter; the large specimens generally hollow and defective.

Wood very heavy, hard, strong, brittle, very close-grained, checking badly in drying; layers of annual growth hardly distinguishable, containing few small open ducts arranged in many groups parallel to the bread and very conspicuous medullary rays; color, very dark brown or almost black, the thick sap-wood brown; specific gravity, 0.9441; ash, 2.61; of little economic value except as fuel.

264.—Quercus grisea, Liebmann,

Dansk. Vidensk. Selsk. Forhandl. 1854, 13; Chênes Am. Trop. t. 46, f. 1, 2.—A. De Candolle, Prodr. xvi², 35.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 69.—Rusby in Bull. Torrey Bot. Club, ix, 78.—Watson in Proc. Am. Acad. xviii, 156.

Q. pungens, Liebmann in Dansk. Vidensk. Selsk. Forhandl. 1854, 13; Chênes Am. Trop. 22, t. 45, f. 1–3.—A. De Candolle, Prodr. xvi², 36.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 69.—Rusby in Bull. Torrey Bot. Club ix, 78.

Q. undulata, var. *grisea*, Engelmann in Trans. St. Louis Acad. iii, 382; Wheeler's Rep. vi, 250.

Q. undulata, var. *pungens*, Engelmann in Trans. St. Louis Acad. iii, 392; Wheeler's Rep. vi, 250; Bot. California, ii, 96.—Palmer in Am. Nat. xii, 596.

Q. undulata, var. *Wrightii*, Engelmann in Trans. St. Louis Acad. iii, 382, 392.

WHITE OAK.

Mountains of southern Colorado and western Texas (*Havard*), southern New Mexico and Arizona from 5,000 to 10,000 feet elevation, west to the Colorado desert of California; southward into northern Mexico.

A tree 15 to 24 meters in height, with a trunk rarely exceeding 0.60 meter in diameter, or reduced to a low, much-branched shrub; a polymorphous species, varying greatly in habit and in the shape and texture of the leaves, but apparently well characterized by its connate cotyledons; the large specimens generally hollow and defective.

Wood very heavy, strong, hard, close-grained, checking badly in drying; layers of annual growth marked by one or two rows of small open ducts, these connected by rows of similar ducts parallel to the numerous conspicuous medullary rays; color, very dark brown, the thick sap-wood much lighter; specific gravity, 1.0092; ash, 1.82.

265.—Quercus reticulata, Humboldt & Bonpland,

Pl. Æquin. ii, 40, t. 86.—Poiret, Suppl. v, 609.—Sprengel, Syst. iii, 860.—Loudon, Arboretum, iii, 1944, f. 1865.—Michaux f. N. American Sylva, 3 ed. i, 90.—A. De Candolle, Prodr. xvi², 33.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 67.—Liebmann, Chênes Am. Trop. t. II, t. 34, f. 10–16, t. 35, f. 15–22.—Vasey, Cat. Forest Trees, 26.—Engelmann in Trans. St. Louis Acad. iii, 383; Wheeler's Rep. vi, 250.—Hemsley, Bot. Am.-Cent. iii, 176.—Watson in Proc. Am. Acad. xviii, 156.?

Q. spicata, Humbolt & Bonpland, Pl. Æquin. ii, 46, t. 89.—Bentham, Pl. Hartweg. No. 429.

Q. decipiens, Martens & Galeotti in Bull. Brux. v, 10.

? *Q. reticulata*, var. *Greggii*, A. De Candolle, Prodr. xvi², 34.—Hemsley, Bot. Am.-Cent. iii, 176.

Southeastern Arizona, San Francisco and Santa Rita mountains from 7,000 to 10,000 feet elevation; southward into northern Mexico.

A small tree, 9 to 12 meters in height, with a trunk 0.30 to 0.45 meter in diameter; dry, gravelly slopes.

Wood very heavy, hard, close-grained, checking badly in drying, containing many small, scattered, open ducts; medullary rays numerous, very broad; color, dark brown, the sap-wood lighter; specific gravity, 0.9479; ash, 0.52.

266.—Quercus Durandii, Buckley,

Proc. Philadelphia Acad. 1860, 445; 1881, 121.—Gray, Hall's Pl. Texas, 21.—Young, Bot. Texas, 507.—Vasey, Cat. Forest Trees, 26.—Watson in Proc. Am. Acad. xviii, 156.

Q. obtusifolia, var. ? *breviloba*, Torrey, Bot. Mex. Boundary Survey, 206.

Q. annulata, Buckley in Proc. Philadelphia Acad. 1860, 445.

Q. San-Sabeana, Buckley in Young, Bot. Texas, 507.

Q. undulata, Engelmann in Trans. St. Louis Acad. iii, 392, in part [not Torrey].

Alabama, Wilcox county (*Buckley*), valley of the Little Cahaba river, Bibb county (*Mohr*); Shreveport, Louisiana?, (*Buckley*); Texas, Dallas (*Reverchon*), valley of the Colorado river (*Buckley, Mohr, Sargent*), west and south.

A tree 21 to 24 meters in height, with a trunk 0.60 to 1.20 meter in diameter; rich bottom lands or dry *mesas* and limestone hills, then reduced to a low shrub, forming dense, impenetrable thickets of great extent (*Q. San-Sabeana*); rare and local in Alabama; the common and most valuable white oak of western Texas.

Wood very heavy and hard, strong, brittle, close-grained, inclined to check in drying; layers of annual growth marked by few large open ducts; medullary rays numerous, conspicuous; color, brown, the sap-wood lighter; specific gravity, 0.9507; ash, 1.78; used for the same purposes as that of the white oak (*Q. alba*).

267.—Quercus virens, Aiton,

Hort. Kew. iii, 356; 2 ed. v, 287.—Bartram, Travels, 2 ed. 82.—Michaux, Hist. Chênes Am. No. 6, t. 10, 11; Fl. Bor.-Am. ii, 196.—Willdenow, Spec. iv, 425; Enum. 974.—Robin, Voyages, iii, 264.—Smith in Rees' Cycl. xxx, No. 5.—Persoon, Syn. ii, 567.—Desfontaines, Hist. Arb. ii, 507.—Poiret, Suppl. ii, 213.—Michaux f. Hist. Arb. Am. ii, 67, t. 11; N. American Sylva, 3 ed. i, 52, t. 12.—Pursh, Fl. Am. Sept. ii, 626.—Nuttall, Genera, ii, 214; Sylva, i, 16; 2 ed, i, 28.—Nouveau Duhamel, vii, 151.—Elliott, Sk. ii, 595.—Sprengel, Syst. iii, 858.—Cobbett, Woodlands, 446.—Eaton, Manual, 6 ed. 294.—Loudon, Arboretum, iii, 1918, f. 1802, 1803 & t.—Eaton & Wright, Bot. 385.—Spach, Hist. Veg. xi, 177.—Engelmann & Gray in Jour. Boston Soc. Nat. Hist. v, 234.—Scheele in Rœmer, Texas, 446; Appx. 147.—Penn. Cycl. xix, 216.—Darby, Bot. S. States, 510.—Torrey, Bot. Mex. Boundary Survey, 206.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 421.—Curtis in Rep. Geological Surv. N. Carolina, 35.—Wood, Cl. Book, 643; Bot. & Fl. 305.—Porcher, Resources S. Forests, 263.—A. De Candolle, Prodr. xvi², 37.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 69.—Gray, Manual N. States, 5 ed. 452; Hall's Pl. Texas, 21.—Liebmann, Chênes Am. Trop. t. 33, f. 50-57.—Young, Bot. Texas, 503.—Vasey, Cat. Forest Trees, 26.—Engelmann in Trans. St. Louis Acad. iii, 383; iv, 191.—Hemsley, Bot. Am.-Cent. iii, 178.—Watson in Proc. Am. Acad. xviii, 155.

Q. Virginiana, Miller, Dict. 7 ed. No. 17.—Koch, Dendrologie, ii², 57.

Q. Phellos, var. *sempervirens*, Marshall, Arbustum, 124.

Q. sempervirens, Walter, Fl. Caroliniana, 234.

Q. oleoides, Chamisso & Schlechtendal in Linnæa, v, 79.—Martens & Galeotti in Bull. Brux. x, No. 3.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 69.

Q. retusa, Liebmann in Dansk. Vidensk. Selsk. Forhandl. 1854, 187.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 69.

LIVE OAK.

Mob Jack bay, Virginia, south along the coast to bay Biscayne and cape Romano, Florida, along the Gulf coast to Mexico, extending through western Texas to the valley of the Red river, the Apache and Gaudalupe mountains and the mountains of northern Mexico south of the Rio Grande at 6,000 to 8,000 feet elevation (*Havard*); in Costa Rica (*Q. retusa*).

An evergreen tree of great economic value, 15 to 18 meters in height, with a trunk 1.50 to 2.10 meters in diameter, or in the interior of Texas much smaller, often shrubby; on the coast, rich hummocks and ridges, a few feet above water-level; common and reaching its greatest development in the south Atlantic states.

Wood very heavy, hard, strong, tough, very close-grained, compact, difficult to work, susceptible of a beautiful polish; layers of annual growth obscure, often hardly distinguishable, containing many small open ducts arranged in short broken rows parallel to the broad, conspicuous medullary rays; color, light brown or yellow, the sap-wood nearly white; specific gravity, 0.9501; ash, 1.14; formerly very largely and now occasionally used in ship-building.

268.—Quercus chrysolepis, Liebmann,

Dansk. Vidensk. Selsk. Forhandl. 1854, 173; Chênes Am. Trop. 23, t. 47.—Torrey, Bot. Mex. Boundary Survey, 206; Bot. Wilkes Exped. 458.—Cooper in Smithsonian Rep. 1858, 260.—Kellogg in Proc. California Acad. ii, 45.—A. De Candolle, Prodr. xvi², 37.—Bolander in Proc. California Acad. iii, 231.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 69.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 383, 393; Wheeler's Rep. vi, 374; Bot. California, ii, 97.—Watson in Proc. Am. Acad. xi, 119.—Palmer in Am. Nat. xii, 596.

Q. fulvescens, Kellogg in Proc. California Acad. i, 67, 71.—Newberry in Pacific R. R. Rep. vi, 27, 89.

Q. crassipocula, Torrey in Pacific R. R. Rep. iv, 137; v, 365, t. 9.

? *Q. oblongifolia*, R. Brown Campst. in Ann. & Mag. Nat. Hist. April, 1871, 4 [not Torrey].

LIVE OAK. MAUL OAK. VALPARAISO OAK.

Cow Creek valley, Oregon, south through the California Coast ranges and along the western slopes of the Sierra Nevada and San Bernardino mountains between 3,000 and 8,000 feet elevation, and south into Lower California; southeastern Arizona, San Francisco (*Greene*) and Santa Catalina mountains (*Pringle*).

An evergreen tree of great economic value, 18 to 27 meters in height, with a trunk sometimes 1.50 meter in diameter, or at high elevations reduced to a low, narrow-leaved shrub (var. *vaccinifolia, Engelmann in Trans. St. Louis Acad.* iii, 393; *Bot. California*, ii, 97.—*Q. vaccinifolia, Kellogg in Trans. California Acad.* ii, 96).

Wood heavy, very strong and hard, tough, close-grained, compact, difficult to work, containing many rather small open ducts arranged in wide bands parallel to the broad, conspicuous medullary rays; color, light brown, the sap-wood darker; specific gravity, 0.8493; ash, 0.60; somewhat used in the manufacture of agricultural implements, wagons, etc.; the most valuable oak of the Pacific forests.

269.—Quercus Emoryi, Torrey,

Emory's Rep. 151, t. 9; Bot. Mex. Boundary Survey, 206; Pacific R. R. Rep. iv, 138; Ives' Rep. 28.—Watson in Pl. Wheeler, 17.—Vasey, Cat. Forest Trees, 26.—Engelmann in Trans. St. Louis Acad. iii, 382, 387, 394; Wheeler's Rep. vi, 250.—Palmer in Am. Nat. xii, 596.—Hemsley, Bot. Am.-Cent. iii, 170.

Q. hastata, Liebmann in Dansk. Vidensk. Selsk. Forhandl. 1854, 13; Chênes Am. Trop. 22.—A. De Candolle, Prodr. xvi², 36.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 69.

BLACK OAK.

Bexar and Comal counties, Texas, through the mountain ranges of western Texas, of southern New Mexico, and of eastern and southern Arizona.

A tree 12 to 15 meters in height, with a trunk 0.30 to 0.90 meter in diameter, or toward its eastern limits in Texas reduced to a low shrub; common and reaching its greatest development in southwestern New Mexico and southern Arizona between 5,000 and 7,000 feet elevation near streams in open cañons; dry, gravelly soil, the large specimens hollow and defective.

Wood very heavy, not hard, strong, brittle, close-grained, compact; layers of annual growth marked by several rows of small open ducts, these connected by narrow groups of similar ducts parallel to the broad, conspicuous medullary rays; color, dark brown or almost black, the thick sap-wood bright brown tinged with red; specific gravity, 0.9263; ash, 2.36.

270.—Quercus agrifolia, Née,

Ann. Cienc. Nat. iii, 271.—Fischer, Misc. Hisp. i, 108.—Willdenow, Spec. iv, 431.—Persoon, Syn. ii, 568.—Smith in Rees' Cycl. xxx, No. 29.—Pursh, Fl. Am. Sept. ii, 627.—Nuttall, Genera, ii, 214; Sylva, i, 5, t. 2; 2 ed. i, 16, t. 2.—Nouveau Duhamel, vii, 156.—Sprengel, Syst. iii, 859.—Eaton, Manual, 6 ed. 292.—Loudon, Arboretum, iii, 1894.—Bentham, Pl. Hartweg. 337; Bot. Sulphur, 55.—Eaton & Wright, Bot. 384.—Hooker, Icon. iv, t. 377.—Hooker & Arnott, Bot. Beechey, 391.—Jour. Hort. Soc. London, vi, 157 & t.—Carrière in Fl. des Serres, vii, 137 & f.—Torrey in Sitgreaves' Rep. 173; Pacific R. R. Rep. iv, 138; v, 365; vii, 20; Bot. Mex. Boundary Survey, 206; Ives' Rep. 28; Bot. Wilkes Exped. 460.—Paxton's Brit. Flower Gard. ii, 44.—Newberry in Pacific R. R. Rep. vi, 32, f. 9.—Bolander in Proc. California Acad. iii, 229.—A. De Candolle, Prodr. xvi², 37.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 69.—Liebmann, Chênes Am. Trop. t. 44.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 383; Wheeler's Rep. vi, 374; Bot. California, ii, 98.—Hemsley, Bot. Am.-Cent. iii, 167.

Q. oxyadenia, Torrey in Sitgreaves' Rep. 172, t. 17.—Cooper in Smithsonian Rep. 1858, 261.

Q. acutiglandis, Kellogg in Proc. California Acad. i, 25.

ENCENO. COAST LIVE OAK.

California, Mendocino county, south through the Coast Range valleys to Lower California.

A large evergreen tree, 24 to 30 meters in height, with a trunk 1.20 to 2.10 meters in diameter, or, rarely, reduced to a low shrub (var. *frutescens*, *Engelmann in Bot. California*, ii, 98); rare at the north; common south of San Francisco bay, and the largest and most generally distributed oak in the extreme southwestern part of the state; dry slopes and ridges.

Wood heavy, hard, strong, brittle, close-grained, compact; layers of annual growth hardly distinguishable, containing many large open ducts arranged in several rows parallel to the broad, conspicuous medullary rays; color, light brown or red, the sap-wood darker brown; specific gravity, 0.8253; ash, 1.28; of little value except as fuel.

271.—Quercus Wislizeni, A. De Candolle,

Prodr. xvi², 67.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 73.—Vasey, Cat. Forest Trees, 27.—Engelmann in Trans. St. Louis Acad. iii, 385, 396; Bot. California, ii, 98.

Q. Morehus, Kellogg in Proc. California Acad. ii, 36.

LIVE OAK.

California, mount Shasta region, south along the western slopes of the Sierra Nevadas to Tulare county, and in the Coast ranges south to the Santa Lucia mountains.

An evergreen tree, 15 to 18 meters in height, with a trunk 0.90 to 1.80 meter in diameter, or toward its northeastern limits reduced to a shrub 0.90 to 3 meters in height (var. *frutescens*, *Engelmann in Bot. California*, ii, 99); not common.

Wood heavy, very hard, strong, close-grained, compact, containing numerous large open ducts arranged in irregular bands parallel to the broad, conspicuous medullary rays; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.7855; ash, 1.02.

272.—Quercus rubra, Linnæus,

Spec. 1 ed. 996.—Du Roi, Harbk. ii, 265.—Lamarck, Dict. i, 720.—Walter, Fl. Caroliniana, 234.—Aiton, Hort. Kew. iii, 357; 2 ed. v, 292.—Mœnch, Meth. 343.—Abbot, Insects Georgia, ii, t. 103.—Michaux, Hist. Chênes No. 2, t. 35, 36; Fl. Bor.-Am. ii, 200.—Willdenow, Spec. iv, 445; Enum. 976; Berl. Baumz. 342.—Smith in Rees' Cycl. xxx, No. 60.—Persoon, Syn. ii, 569.—Desfontaines, Hist. Arb. ii, 511.—Michaux f. Hist. Arb. Am. ii, 126, t. 26; N. American Sylva, 3 ed. i, 84, t. 28.—Pursh, Fl. Am. Sept. ii, 630.—Eaton, Manual, 108; 6 ed. 293.—Nuttall, Genera, ii, 214.—Barton, Compend. Fl. Philadelph. ii, 169.—Nouveau Duhamel, vii, 170.—Hayne, Dend. Fl. 157.—Elliott, Sk. ii, 602.—Sprengel, Syst. iii, 863.—Torrey, Compend. Fl. N. States, 358; Nicollet's Rep. 160; Fl. N. York, 189, t. 106.—Beck, Bot. 329.—Loudon, Arboretum, iii, 1877, f. 1740–1744 & t.—Hooker, Fl. Bor.-Am. ii, 158.—Bigelow, Fl. Boston. 3 ed. 376.—Eaton & Wright, Bot. 384.—Spach, Hist. Veg. xi, 165.—Emerson, Trees Massachusetts, 48, t. 10; 2 ed. i, 163 & t.—Scheele in Rœmer, Texas, 446.—Penn. Cycl. xix, 216.—Darlington, Fl. Cestrica, 3 ed. 269.—Darby, Bot. S. States, 510.—Cooper in Smithsonian Rep. 1858, 255.—Brendel in Trans. Illinois Ag. Soc. iii, 369, t. 9.—Chapman, Fl. S. States, 422.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 41.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 644; Bot. & Fl. 306.—Porcher, Resources S. Forests, 262.—Engelmann in Trans. Am. Phil. Soc. new ser. v, 209; Trans. St. Louis Acad. iii, 394.—A. De Candolle, Prodr. xvi², 60.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 72.—Gray, Manual N. States, 5 ed. 454; Hall's Pl. Texas, 21.—Liebmann, Chênes Am. Trop. t. A, B.—Koch, Dendrologie, ii², 70.—Young, Bot. Texas, 504.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 26.—Macoun in Geological Rep. Canada, 1875–'76, 209.—Sears in Bull. Essex Inst. xiii, 179.—Ridgway in Proc. U. S. Nat. Mus. 1882, 83.—Bell in Geological Rep. Canada, 1879–'80, 51ᶜ.

Q. rubra maxima, Marshall, Arbustum, 122.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 395.

Q. rubra, var. *latifolia*, Lamarck, Dict. i, 720.—Aiton, Hort. Kew. 2 ed. v, 292.—Loudon, Arboretum, iii, 1877.

Q. rubra, var. *montana*, Aiton, Hort. Kew. 2 ed. v, 292.—Loudon, Arboretum, iii, 1877.

Q. ambigua, Michaux f. Hist. Arb. Am. ii, 120, t. 24; N. American Sylva, 3 ed. i, 81, t. 26 [not HBK.].—Pursh, Fl. Am. Sept. ii, 630.—Nuttall, Genera, ii, 214.—Eaton, Manual, 6 ed. 293.—Loudon, Arboretum, iii, 1881, f. 1749 & t.—Eaton & Wright, Bot. 384.

Q. coccinea, var. *rubra*, Spach, Hist. Veg. xi, 165.

Q. coccinea, var. *ambigua*, Gray, Manual N. States, 5 ed. 454.

Q. rubra, var. *runcinata*, A. De Candolle, Prodr. xvi², 60.—Engelmann in Trans. St. Louis Acad. iii, 542.

RED OAK. BLACK OAK.

Nova Scotia, southern New Brunswick to eastern Minnesota, western Iowa, eastern Kansas, and the Indian territory, south to northern Florida, southern Alabama and Mississippi, and the valley of the San Antonio river, Texas.

A large tree, 24 to 30 or, exceptionally, 45 meters (*Ridgway*) in height, with a trunk 1.20 to 2.10 meters in diameter; very common, especially at the north, in all soils and extending farther north than any Atlantic oak.

Wood heavy, hard, strong, coarse-grained, inclined to check in drying; layers of annual growth marked by several rows of very large open ducts; medullary rays few, conspicuous; color, light brown or red, the sap-wood somewhat darker; specific gravity, 0.6540; ash, 0.26; now largely used for clapboards, cooperage, and somewhat for interior finish, in the manufacture of chairs, etc.

Var. Texana, Buckley,

Proc. Philadelphia Acad. 1881, 123.—Engelmann in Coulter's Bot. Gazette, vii, 14.

Q. palustris, Torrey & Gray in Pacific R. R. Rep. ii, 175 [not Du Roi].

Q. coccinea, var. *microcarpa*, Torrey, Bot. Mex. Boundary Survey, 206.

Q. Texana, Buckley in Proc. Philadelphia Acad. 1860, 445.—Young, Bot. Texas, 507.

RED OAK.

Western Texas, valley of the Colorado river with the species and replacing it south and west, extending to the valley of the Nueces river and the Limpia mountains (*Havard*).

A tree 21 to 24 meters in height, with a trunk rarely exceeding 0.60 meter in diameter.

Wood heavier, harder, much closer-grained than the species, not checking in drying; layers of annual growth marked with fewer and smaller open ducts; specific gravity, 0.9080; ash, 0.85.

273.—Quercus coccinea, Wangenheim,

Amer. 44, t. 4. f. 9.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 398.—Michaux, Hist. Chênes Am. No. 18, t. 31, 32; Fl. Bor.-Am. ii, 199.—Willdenow, Spec. iv, 445; Enum. 976; Berl. Baumz. 343.—Smith in Rees' Cycl. xxx, 61.—Persoon, Syn. ii, 569.—Desfontaines, Hist. Arb. ii, 511.—Poiret, Suppl. ii, 221.—Michaux f. Hist. Arb. Am. ii, 116, t. 23; N. American Sylva, 3 ed. i, 79, t. 25.—Aiton, Hort. Kew. 2 ed. v, 292.—Pursh. Fl. Am. Sept. ii, 630.—Eaton, Manual, 108; 6 ed. 292.—Nuttall, Genera, ii, 214.—Barton, Compend. Fl. Philadelph. ii, 169.—Nouveau Duhamel, vii, 171.—Hayne, Dend. Fl. 157.—Elliott, Sk. ii, 602.—Sprengel, Syst. iii, 863.—Torrey, Compend. Fl. N. States, 358; Fl. N. York, ii, 189.—Beck, Bot. 329.—Loudon, Arboretum, iii, 1879, f. 1746–1748 & t.—Eaton & Wright, Bot. 384.—Bigelow, Fl. Boston. 3 ed. 376.—Spach, Hist. Veg. xi, 165.—Emerson, Trees Massachusetts, 144, t. 9; 2 ed. i, 163 & t.—Scheele in Rœmer, Texas, 446.—Penn. Cycl. xix, 216.—Darlington, Fl. Cestrica, 3 ed. 268.—Darby, Bot. S. States, 510.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 422.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 40.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 645; Bot. & Fl. 306.—A. De Candolle, Prodr. xvi², 61.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 72.—Gray, Manual N. States, 5 ed. 453.—Liebmann, Chênes Am. Trop. t. B.—Koch, Dendrologie, ii², 69.—Young, Bot. Texas, 504.—Vasey, Cat. Forest Trees, 26.—Engelmann in Trans. St. Louis Acad. iii, 385, 394.—Ridgway in Proc. U. S. Nat. Mus. 1882, 80.—Watson in Proc. Am. Acad. xviii, 156.

Q. rubra, *β.* Linnæus, Spec. 1 ed. 996.—Aiton, Hort. Kew. iii, 357.

SCARLET OAK.

Southern Maine to northern New York, Ontario, northern Michigan and Minnesota, eastern Iowa and northeastern Missouri, south to Delaware and southern Tennessee, and through the Alleghany region to northern Florida.

A tree 24 to 30 or, exceptionally, 54 meters (*Ridgway*) in height, with a trunk rarely exceeding 0.60 to 1.20 meter in diameter; at the east in dry, sandy soil or, less commonly, in rich, deep soil; in the northwestern prairie region with *Q. macrocarpa* forming the oak-opening growth; not common and reaching its greatest development in the basin of the lower Ohio river.

Wood heavy, hard, strong, coarse-grained; layers of annual growth strongly marked by several rows of large open ducts; medullary rays thin, conspicuous; color, light brown or red, the sap-wood rather darker; specific gravity, 0.7405; ash, 0.19; if used at all, confounded with that of *Q. rubra.*

274.—Quercus tinctoria, Bartram,

Travels, 2 ed. 37.—Abbot, Insects Georgia, ii, t. 56.—Michaux, Hist. Chênes Am. No. 13, t. 24, 25; Fl. Bor.-Am. ii, 198.—Willdenow, Spec. iv, 444; Enum. 976; Berl. Baumz. 344.—Desfontaines, Hist. Arb. ii, 509.—Poiret, Suppl. ii, 221.—Michaux f. Hist. Arb. Am. ii, 110, t. 22; N. American Sylva, 3 ed. i, 76, t. 24.—Aiton, Hort. Kew. 2 ed. v, 291.—Pursh, Fl. Am. Sept. ii, 629.—Smith in Rees' Cycl. xxx, No. 58.—Barton, Prodr. Fl. Philadelph. 91; Compend. Fl. Philadelph. ii, 168.—Eaton, Manual, 108; 6 ed. 292.—Nuttall, Genera, ii, 214; Sylva, i, 21; 2 ed. i, 32.—Nouveau Duhamel, vii, 169.—Hayne, Dend. Fl. 156.—Elliott, Sk. ii, 601.—Sprengel, Syst. iii, 862.—Torrey, Compend. Fl. N. States, 357; Fl. N. York, ii, 188.—Audubon, Birds, t. 82.—Beck, Bot. 328.—Loudon, Arboretum, iii, 1884, f. 1753, 1754.—Hooker, Fl. Bor.-Am. ii, 158.—Bigelow, Fl. Boston. 3 ed. 376.—Eaton & Wright, Bot. 384.—Spach, Hist. Veg. xi, 164.—Emerson, Trees Massachusetts, 141, t. 7; 2 ed. i, 160 & t.—Griffith, Med. Bot. 586.—Gray, Manual N. States, 1 ed. 416.—Darlington, Fl. Cestrica, 3 ed. 268.—Darby, Bot. S. States, 510.—Cooper in Smithsonian Rep. 1858, 255.—Brendel in Trans. Illinois Ag. Soc. iii, 627, t. 8.—Chapman, Fl. S. States, 422.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 39.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 645.—Engelmann in Proc. Am. Phil. Soc. new ser. xii, 209; Trans. St. Louis Acad. iii, 395.—Porcher, Resources S. Forests, 238.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 45, 72, f. 18.—Liebmann, Chênes Am. Trop. 9, f. 6.—Young, Bot. Texas, 504.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Guibourt, Hist. Drogues, 7 ed. ii, 288.—Vasey, Cat. Forest Trees, 27.—Bentley & Trimen, Med. Fl. iv, 251, t. 251.—Ridgway in Proc. U. S. Nat. Mus. 1882, 84.

? *Q. velutina*, Lamarck, Dict. i, 172.—Koch, Dendrologie, ii², 68.

Q. nigra, Marshall, Arbustum, 120 [not Linnæus].—Wangenheim, Amer. 79, t. 6, f. 16.

Q. rubra, Wangenheim, Amer. 14, t. 3, f. 7 [not Linnæus].—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 399.

Q. discolor, Aiton, Hort. Kew. iii, 358.—Abbot, Insects Georgia, ii, 111.—Willdenow, Spec. iv, 444; Berl. Baumz. 345.—Poiret, Suppl. ii, 221.—Smith in Rees' Cycl. xxx, No. 59.—Nuttall, Genera, ii, 214.—Elliott, Sk. ii, 601.—Sprengel, Syst. iii, 863.—Beck, Bot. 329.—Eaton, Manual, 6 ed. 292.—Eaton & Wright, Bot. 384.

Q. tinctoria, var. *angulosa*, Michaux, Fl. Bor.-Am. ii, 198.—Loudon, Arboretum, iii, 1858.

Q. tinctoria, var. *sinuosa*, Michaux, Fl. Bor.-Am. ii, 198.—Loudon, Arboretum, iii, 1885, f. 1755–1757.—Liebmann, Chênes Am. Trop. t. C.

? *Q. Shumardii*, Buckley in Proc. Philadelphia Acad. 1860, 445.

Q. coccinea, var. *tinctoria*, Gray, Manual N. States, 5 ed. 454.—Wood, Cl. Book, 306.—A. De Candolle, Prodr. xvi², 61.

BLACK OAK. YELLOW-BARK OAK. QUERCITRON OAK. YELLOW OAK.

Southern Maine to northern Vermont, Ontario, southern Minnesota, eastern Nebraska, eastern Kansas, and the Indian territory, south to the Chattahoochee region of western Florida, southern Alabama and Mississippi, and eastern Texas.

A large tree, 24 to 36 or, exceptionally, 48 meters (*Ridgway*) in height, with a trunk 0.90 to 1.80 meter in diameter; generally on dry or gravelly uplands; very common.

Wood heavy, hard, strong, not tough, coarse-grained, liable to check in drying; layers of annual growth marked by several rows of very large open ducts; color, bright brown tinged with red, the sap-wood much lighter; specific gravity, 0.7045; ash, 0.28; somewhat used for cooperage, construction, etc.

The bark largely used in tanning; the intensely bitter inner bark yields a valuable yellow dye, and is occasionally used medicinally in the form of decoctions, etc., in the treatment of hemorrhage (*U. S. Dispensatory*, 14 ed. 756.—*Nat. Dispensatory*, 2 ed. 1196).

275.—Quercus Kelloggii, Newberry,

Pacific R. R. Rep. vi, 89, 286, f. 6.—Torrey, Bot. Wilkes Exped. 466.—R. Brown Campst. Horæ Sylvanæ, 58, f. 4–6.—Engelmann in Bot. California, ii, 99.

Q. rubra, Bentham, Pl. Hartweg. 337 [not Linnæus].

Q. tinctoria, var. *Californica*, Torrey in Pacific R. R. Rep. iv, 138; Bot. Mex. Boundary Survey, 205; Ives' Rep. 28.

Q. Californica, Cooper in Smithsonian Rep. 1858, 261.

Q. Sonomensis, Bentham in De Candolle Prodr. xvi², 62.—Bolander in Proc. California Acad. iii, 230.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 72.—Vasey, Cat. Forest Trees, 27.—Engelmann in Wheeler's Rep. vi, 374.—Palmer in Am. Nat. xii, 596.

BLACK OAK.

Valley of the Mackenzie river, Oregon, south through the Coast ranges and along the western slopes of the Sierra Nevada and San Bernardino mountains to the southern borders of California.

A large tree, 18 to 24 meters in height, with a trunk 0.90 to 1.20 meter in diameter, or at high elevations reduced to a shrub; the most common and important oak of the valleys of southwestern Oregon and the California Sierras.

Wood heavy, hard, strong, very brittle, close-grained, compact; layers of annual growth marked by several rows of large open ducts; medullary rays few, broad, conspicuous; color, light red, the thin sap-wood lighter; specific gravity, 0.6435; ash, 0.26; of little value, except as fuel; the bark somewhat used in tanning.

276.—Quercus nigra, Linnæus,

Spec. 1 ed. 995.—Lamarck, Dict, i, 721.—Wangenheim, Amer. 77, t. 5, f. 13.—Walter, Fl. Caroliniana, 234.—Aiton, Hort. Kew. iii, 357; 2 ed. v, 291.—Abbot, Insects Georgia, i, 50; ii, 58.—Michaux, Hist. Chênes Am. No. 17, t. 22, 23; Fl. Bor.-Am. ii, 198.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 399.—Willdenow, Spec. iv, 442.—Smith in Rees' Cycl. xxx, No. 53.—Persoon, Syn. ii, 569.—Desfontaines, Hist. Arb. ii, 509.—Pursh, Fl. Am. Sept. ii, 629.—Eaton, Manual, 108; 6 ed. 292.—Barton, Compend. Fl. Philadelph. ii, 168.—Nouveau Duhamel, vii, 168.—Elliott, Sk. ii, 600.—Sprengel, Syst. iii, 862.—Torrey, Compend. Fl. N. States, 357; Fl. N. York, ii, 188; Bot. Mex. Boundary Survey, 206.—Audubon, Birds, t. 116.—Beck, Bot. 328.—London, Arboretum, iii, 1890, f. 1764, 1765.—Eaton & Wright, Bot. 384.—Spach, Hist. Veg. xi, 162.—Darlington, Fl. Cestrica, 3 ed. 267.—Darby, Bot. S. States, 510.—Cooper in Smithsonian Rep. 1858, 255.—Brendel in Trans. Illinois Ag. Soc. iii, 625, t. 7.—Chapman, Fl. S. States, 421.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 38.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 644; Bot. & Fl. 305.—A. De Candolle, Prodr. xvi², 63.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 72.—Gray, Manual N. States, 5 ed. 453; Hall's Pl. Texas, 21.—Liebmann, Chênes Am. Trop. t. A.—Koch, Dendrologie, ii², 61.—Young, Bot. Texas, 503.—Vasey, Cat. Forest Trees, 26.—Ridgway in Proc. Nat. Mus. 1882, 82.—Watson in Proc. Am. Acad. xviii, 156.

Q. nigra, var. *latifolia*, Lamarck, Dict. i, 721.

Q. nigra integrifolia, Marshall, Arbustum, 121.

? *Q. aquatica*, Walter, Fl. Caroliniana, 234.

Q. Marylandica, Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 399.

BLACK JACK. JACK OAK.

Long island, New York, west through northern Ohio and Indiana to about latitude 55° N. in Wisconsin, southern Minnesota, eastern Nebraska, Kansas, and the Indian territory to about 99° west longitude, south to Matanzas inlet and Tampa bay, Florida, and the valley of the Nueces river, Texas.

A small tree, sometimes 12 or even 18 meters in height, with a trunk rarely exceeding 0.60 meter in diameter, or more often much smaller; dry, barren uplands, or often on heavy clay soils; very common through the southern states, and reaching its greatest development in southwestern Arkansas, Indian territory, and eastern Texas, forming, with the post-oak (*Q. obtusiloba*), the growth of the Texas cross-timbers.

Wood heavy, hard, strong, checking badly in drying; layers of annual growth marked by several rows of large open ducts; medullary rays broad, conspicuous; color, rather dark rich brown, the sap-wood much lighter; specific gravity, 0.7324; ash, 1.16; of little value except as fuel.

277.—Quercus falcata, Michaux,

Hist. Chênes Am. No. 16, t. 28; Fl. Bor.-Am. ii, 199.—Persoon, Syn. ii, 569.—Poiret, Suppl. ii, 221.—Michaux f. Hist. Arb. Am. ii, 104, t. 21; N. American Sylva, 3 ed. i, 73, t. 23.—Pursh, Fl. Am. Sept. ii, 630.—Nuttall, Genera, ii, 214.—Barton, Compend. Fl. Philadelph. ii, 170.—Nouveau Duhamel, vii, 169.—Elliott, Sk. ii, 604.—Torrey, Compend. Fl. N. States, 358.—Beck, Bot. 329.—Eaton, Manual, 6 ed. 293.—Loudon, Arboretum, iii, 1882, f. 1750, 1751.—Lindley, Fl. Med. 292.—Eaton & Wright, Bot. 384.—Darlington, Fl. Cestrica, 3 ed. 269.—Darby, Bot. S. States, 510.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 422.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 39.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 644; Bot. & Fl. 306.—Porcher, Resources S. Forests, 256.—A. De Candolle, Prodr. xvi², 59.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 72.—Gray, Manual N. States, 5 ed. 453; Hall's Pl. Texas, 21.—Liebmann, Chênes Am. Trop. t. A, t. 22, f. 3.—Young, Bot. Texas, 505.—Vasey, Cat. Forest Trees, 26.—Ridgway in Proc. U. S. Nat. Mus. 1882, 80.

Q. rubra montana, Marshall, Arbustum, 123.

Q. nigra digitata, Marshall, Arbustum, 121.

Q. cuneata, Wangenheim, Amer. 78, t. 5, f. 14.—Koch, Dendrologie, ii², 64.

Q. elongata, Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 400.—Willdenow, Spec. iv, 444.—Smith in Rees' Cycl. xxx, 57.—Aiton, Hort. Kew. 2 ed. v, 291.

Q. triloba, Michaux, Hist. Chênes Am. No. 14, t. 26.—Willdenow, Spec. iv, 443; Berl. Baumz. 342.—Smith in Rees' Cycl. xxx, No. 54.—Persoon, Syn. ii, 569.—Poiret, Suppl. ii, 220.—Aiton, Hort. Kew. 2 ed. v, 291.—Pursh, Fl. Am. Sept. ii, 628.—Hayne, Dend. Fl. 156.—Sprengel, Syst. iii, 862.—Torrey, Compend. Fl. N. States, 357.—Beck. Bot. 328.—Eaton, Manual, 6 ed. 292.—Eaton & Wright, Bot. 384.—Wood, Cl. Book, 644; Bot. & Fl. 306.

Q. falcata, var. *triloba*, Nuttall, Genera, ii, 214.—Elliott, Sk. ii, 604.—Darby, Bot. S. States, 511.—A. De Candolle, Prodr. xvi², 59.

Q. falcata, var. *pagodæfolia*, Elliott, Sk. ii, 605.—Darby, Bot. S. States, 511.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 39.

Q. discolor, var. *triloba*, Spach, Hist. Veg. xi, 163.

Q. falcata, var. *Ludoviciana*, A. De Candolle, Prodr. xvi², 59.

SPANISH OAK. RED OAK.

Long island, New York, south to Hernando county, Florida, through the Gulf states to the valley of the Brazos river, Texas, and through Arkansas and southeastern Missouri to central Tennessee and Kentucky, southern Illinois and Indiana.

A large tree, 24 to 30 meters in height, with a trunk 0.90 to 1.80 meter in diameter; dry, gravelly uplands and barrens; in the north Atlantic states only near the coast; rare; most common and reaching its greatest development in the south Atlantic and Gulf states, where, in the middle districts, it is the most common forest tree.

Wood heavy, very hard and strong, not durable, coarse-grained, checking badly in drying; layers of annual growth strongly marked by several rows of large open ducts; medullary rays few, conspicuous; color, light red, the sap-wood lighter; specific gravity, 0.6928; ash, 0.25; somewhat used for cooperage, construction, etc., and very largely for fuel.

The bark rich in tannin.

278.—Quercus Catesbæi, Michaux,

Hist. Chênes Am. No. 17, t. 29, 30; Fl. Bor.-Am. ii, 199,—Abbot, Insects Georgia, i, 27, t. 14.—Willdenow, Spec. iv, 446.—Smith in Rees Cycl. xxx, No. 62.—Persoon, Syn. 569.—Desfontaines, Hist. Arb. ii, 511.—Poiret, Suppl. ii, 221.—Michaux f. Hist. Arb. Am. ii, 101, t. 20; N. American Sylva, 3 ed. i. 71, t. 22.—Pursh, Fl. Am. Sept. ii, 630.—Nuttall, Genera, ii, 214.—Nouveau Duhamel, vii, 172.—Elliott, Sk. ii, 603.—Sprengel, Syst. iii, 866.—Torrey, Compend. Fl. N. States, 358.—Beck, Bot. 329.—Eaton, Manual, 6 ed. 293.—London, Arboretum, iii, 1889, f. 1762, 1763.—Eaton & Wright, Bot. 384 —Spach, Hist. Veg. xi, 162.—Darby, Bot. S. States, 510.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 422.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 41.—Wood, Cl. Book, 644; Bot. & Fl. 306.—A. De Candolle, Prodr. xvi², 59.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 72.—Koch, Dendrologie, ii², 67.—Young, Bot. Texas, 503.—Vasey, Cat. Forest Trees, 26.

? Q. lævis, Walter, Fl. Caroliniana, 234.

TURKEY OAK. SCRUB OAK. FORKED-LEAF BLACK JACK. BLACK JACK.

North Carolina, south near the coast to cape Malabar and Pease creek, Florida, and along the coast of Alabama and Mississippi.

A small tree, 7 to 15 meters in height, with a trunk 0.45 to 0.60 meter in diameter; very common in the south Atlantic and east Gulf states upon barren sandy hills and ridges of the maritime pine belt; rare in Mississippi.

Wood heavy, hard, strong, close-grained, compact; layers of annual growth marked by several rows of large open ducts and containing many much smaller ducts arranged in short lines parallel to the broad, conspicuous medullary rays; color, light brown tinged with red, the sap-wood somewhat lighter; specific gravity, 0.7294; ash, 0.87; largely used for fuel.

279.—Quercus palustris, Du Roi,

Harbk. ii, 268, t. 5, f. 4.—Wangenheim, Amer. 76, t. 5, f. 10.—Michaux, Hist. Chênes Am. No. 19, t. 33, 34; Fl. Bor.-Am. ii, 200.—Willdenow, Spec. iv, 446; Enum. 976; Berl. Baumz. 343.—Persoon, Syn. ii, 569.—Desfontaines, Hist. Arb. ii, 511.—Poiret, Suppl. ii, 222.—Michaux f. Hist. Arb. Am. ii, 123, t. 25; N. American Sylva, i, 83, t. 27.—Aiton, Hort. Kew. 2 ed. v, 292.—Smith in Rees' Cycl. xxx, No. 6.—Pursh, Fl. Am. Sept. ii, 631.—Barton, Prodr. Fl. Philadelph. 91; Compend. Fl. Philadelph. ii, 170.—Eaton, Manual, 108; 6 ed. 293.—Nuttall, Genera, ii, 214.—Nouveau Duhamel, vii, 172.—Hayne, Dend. Fl. 158.—Sprengel, Syst. iii, 863.—Torrey, Compend. Fl. N. States, 358; Fl. N. York, ii, 190, t. 107.—Beck, Bot, 329.—Loudon, Arboretum, iii, 1887, f. 1758-1761 & t.—Eaton & Wright, Bot. 384.—Spach, Hist. Veg. xi, 166.—Darlington, Fl. Cestrica, 3 ed. 269.—Cooper in Smithsonian Rep. 1858, 255.—Brendel in Trans. Illinois Ag. Soc. iii, 631.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 644; Bot. & Fl. 306.—A. De Candolle, Prodr. xvi², 60.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 23, 72, f. 4.—Gray, Manual N. States, 5 ed. 454.—Liebmann, Chênes Am. Trop. t. A.—Koch, Dendrologie, ii², 71.—Emerson, Trees Massachusetts, 2 ed. i, 167 & t.—Vasey, Cat. Forest Trees, 27.—W. E. Stone in Bull. Torrey Bot. Club, ix, 57.—Ridgway in Proc. U. S. Nat. Mus. 1882, 83.—Burgess in Coulter's Bot. Gazette, vii, 95.—Chapman, Fl. S. States, Suppl. 649.

Q. rubra, var. *dissecta*, Lamarck, Dict. i, 120.

Q. rubra ramosissima, Marshall, Arbustum, 122.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, 398.

PIN OAK. SWAMP SPANISH OAK. WATER OAK.

Valley of the Connecticut river, Massachusetts (Amherst, *Stone*), to central New York, south to Delaware and the District of Columbia; southern Wisconsin to eastern Kansas, southern Arkansas, and southeastern Tennessee.

A tree 24 to 30 or, exceptionally, 36 meters (*Ridgway*) in height, with a trunk 0.90 to 1.50 meter in diameter; low, rich soil, generally along the borders of streams and swamps; most common and reaching its greatest development west of the Alleghany mountains.

Wood heavy, hard, very strong, coarse-grained, inclined to check badly in drying; layers of annual growth marked by several rows of large open ducts; medullary rays broad, numerous, conspicuous; color, light brown, the sap-wood rather darker; specific gravity, 0.6938; ash, 0.81; somewhat used for shingles, clapboards, construction, and in cooperage.

280.—Quercus aquatica, Walter,

Fl. Caroliniana, 234.—Aiton, Hort. Kew. iii, 357; 2 ed. v, 290.—Abbot, Insects Georgia, ii, t. 59, 79.—Michaux, Hist. Chênes Am. No. 11, t. 19, 20, 21; Fl. Bor.-Am. ii, 198.—Muhlenberg & Willdenow in Neue Schriften Gesell. Nat. Fr. Berlin, iii, 399.—Persoon, Syn. ii, 569.—Desfontaines, Hist. Arb. ii, 509.—Poiret, Suppl. ii, 220.—Michaux f. Hist. Arb. Am. ii, 89, t. 17; N. American Sylva, 3 ed. i, 65, t. 19.—Smith in Rees' Cycl. xxx, No. 52.—Pursh, Fl. Am. Sept. ii, 628.—Barton, Compend. Fl. Philadelph. ii, 168.—Nouveau Duhamel, vii, 167.—Elliott, Sk. ii, 599.—Sprengel, Syst. iii, 862.—Torrey, Compend. Fl. N. States, 357.—Audubon, Birds, t. 24.—Beck, Bot. 328.—Eaton, Manual, 6 ed. 292.—Loudon, Arboretum, iii, 1892, f. 1767.—Eaton & Wright, Bot. 384.—Spach, Hist. Veg. xi, 161.—Darby, Bot. S. States, 510.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 421.—Curtis in Rep. Geological Surv. N. Carolina, 37.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 613; Bot. & Fl. 305.—A. De Candolle, Prodr. xvi², 67.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 72.—Gray, Manual N. States, 5 ed. 452; Hall's Pl. Texas, 21.—Liebmann, Chênes Am. Trop. t. D.—Young, Bot. Texas, 503.—Vasey, Cat. Forest Trees, 26.

Q. nigra aquatica, Lamarck, Dict. i, 721.

Q. nigra trifida, Marshall, Arbustum, 121.

? *Q. uliginosa*, Wangenheim, Amer. 80, t. 6, f. 18.

Q. hemisphærica, Willdenow, Spec. iv, 443.—Poiret, Suppl. ii, 628.—Pursh, Fl. Am. Sept. ii, 628.—Smith in Rees' Cycl. xxx, No. 56, 628.—Nuttall, Genera, ii, 214.—Eaton, Manual, 6 ed. 295.—Eaton & Wright, Bot. 385.—Michaux f. N. American Sylva, 3 ed. 187.

Q. nana, Willdenow, Spec. 448.—Elliott, Sk. ii, 599.

Q. aquatica, vars. *cuneata*, *elongata*, *indivisa*, *attenuata*, Aiton, Hort. Kew. 2 ed. v, 290.

Q. hemisphærica, var. *nana*, Nuttall, Genera, ii, 214.

Q. aquatica, var. *hybrida*, Chapman, Fl. S. States, 421.

Q. nigra, Koch, Dendrologie, ii², 61, in part.

WATER OAK. DUCK OAK. POSSUM OAK. PUNK OAK.

Sussex county, Delaware, south through the coast and middle districts to cape Malabar and Tampa bay, Florida, through the Gulf states to the valley of the Colorado river, Texas, and through Arkansas to the valley of the Black river, southeastern Missouri (Poplar Bluffs, *Letterman*), middle Kentucky and Tennessee.

A tree 15 to 24 meters in height, with a trunk 0.60 to 1.20 meter in diameter; generally along streams and bottoms in heavy, undrained soil, or, more rarely, upon uplands; very common and reaching its greatest development along the large streams in the maritime pine belt of the eastern Gulf states.

Wood heavy, hard, strong, coarse-grained, compact; layers of annual growth marked by several rows of large open ducts; medullary rays thin, conspicuous; color, rather light brown, the sap-wood lighter; specific gravity, 0.7244; ash, 0.51; probably not used except as fuel.

281.—Quercus laurifolia, Michaux,

Hist. Chênes Am. No. 10, t. 17; Fl. Bor.-Am. ii, 197.—Willdenow, Spec. iv, 427.—Persoon, Syn. ii, 567.—Smith in Rees' Cycl. xxx, No. 14.—Aiton, Hort. Kew. 2 ed. v, 288.—Pursh, Fl. Am. Sept. ii, 627.—Nuttall, Genera, ii, 214.—Nouveau Duhamel, vii, 153.—Elliott, Sk. ii, 597.—Sprengel, Syst. iii, 857.—Eaton, Manual, 6 ed. 294.—Loudon, Arboretum, iii, 1897, f. 1775, 1776.—Eaton & Wright, Bot. 385.—Darby, Bot. S. States, 510.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 36.—Liebmann, Chênes Am. Trop. t. D.—Wood, Cl. Book, 643.—Vasey, Cat. Forest Trees, 26.—Engelmann in Trans. St. Louis Acad. iii, 385, 395.

Q. laurifolia hybrida, Michaux, Hist. Chênes Am. No. 10, t. 18.

Q. laurifolia, var. *obtusa*, Willdenow, Spec. iv, 428.—Aiton, Hort. Kew. 2 ed. v, 288.—Wood, Cl. Book, 343.

Q. laurifolia, var. *acuta*, Willdenow, Spec. iv, 428.—Aiton, Hort. Kew. 2 ed. v, 288.

Q. obtusa, Pursh, Fl. Am. Sept. ii, 627.

Q. Phellos, var. *laurifolia*, Chapman, Fl. S. States, 420.—Wood, Bot. & Fl. 305.—Young, Bot. Texas, 502.

Q. aquatica, var. *laurifolia*, A. De Candolle, Prodr. xvi², 68.

LAUREL OAK.

North Carolina, south near the coast to Mosquito inlet and cape Romano, Florida, and along the Gulf coast to the shores of Mobile bay.

A large tree, 18 to 24 meters in height, with a trunk 0.90 to 1.20 meter in diameter; most common and reaching its greatest development on the rich hummocks of the Florida coast.

Wood heavy, very strong and hard, coarse-grained, inclined to check in drying; layers of annual growth marked by several rows of rather small open ducts; medullary rays broad, conspicuous; color, dark brown tinged with red, the sap-wood lighter; specific gravity, 0.7673; ash 0.82.

282.—Quercus heterophylla, Michaux f.

Hist. Arb. Am. ii, 87, t. 16; N. American Sylva, 3 ed. i, 64, t. 18.—Pursh, Fl. Am. Sept. ii, 627.—Barton, Compend. Fl. Philadelph. ii, 167.—Nuttall, Genera, ii, 214; Sylva, i, 15; 2 ed. i, 24.—Green in Universal Herbal, ii, 442.—Torrey, Compend. Fl. N. States, 357.—Sweet, Cat. 2 ed. 466.—Beck, Bot. 328.—Eaton, Manual, 6 ed. 292.—Loudon, Arboretum, iii, 1894.—Eaton & Wright, Bot. 383.—Gale in Proc. Nat. Inst. 1855, 70, f. 1.—Wood, Cl. Book, 645.—Buckley in Proc. Philadelphia Acad. 1862, 361; 1862, 100.—Gray, Hall's Pl. Texas, 21.—Liebmann, Chênes Am. Trop. t. B.—Meehan in Proc. Philadelphia Acad. 1875, 437, 465; Coulter's Bot. Gazette, vii, 10.—Leidy in Proc. Philadelphia Acad. 1875, 415.—Engelmann in Trans. St. Louis Acad. iii, 385, 391.—Martindale, Notes on the Bartram Oak, 3; Coulter's Bot. Gazette, vi, 303.—Ward in Bull. U. S. Nat. Mus. No. 22, 114.

Q. aquatica, var. *heterophylla*, Aiton, Hort. Kew. 2 ed. v, 290.—A. De Candolle, Prodr. xvi², 68.

Q. nigra, var. Cooper in Smithsonian Rep. 1858, 255.

Q. Phellos × *tinctoria*, Gray, Manual N. States, 4 ed. 406.

Q. Phellos, var. Gray, Manual N. States, 5 ed. 453.

Q. Phellos × *coccinea*, Engelmann in Trans. St. Louis Acad. iii, 541.

BARTRAM'S OAK.

New Jersey, Salem and Cumberland counties, "restricted to a line or belt bordering extreme tidal points of streams entering the Delaware river where the alluvial terminates and the upland commences," (*Commons*); Delaware, near Townsend station and Wilmington; North Carolina (*M. A. Curtis* in herb. *Canby*); eastern Texas (*E. Hall*); this perhaps *Q. Durandii*.

A small tree, 12 to 15 meters in height, with a trunk 0.45 to 0.60 meter in diameter; rare and very local.

Wood heavy, hard, very strong, close-grained, compact; layers of annual growth marked by several rows of small open ducts; medullary rays numerous, conspicuous; color, light brown tinged with red, the sap-wood somewhat darker; specific gravity, 0.6834; ash, 0.17.

283.—Quercus cinerea, Michaux,

Hist. Chênes Am. No. 8, t. 14; Fl. Bor.-Am. ii, 197.—Willdenow, Spec. iv, 425.—Persoon, Syn. ii, 567.—Poiret, Suppl. ii, 212.—Michaux f. Hist. Arb. Am. ii, 82, t. 14; N. American Sylva, 3 ed. i, 61, t. 16.—Aiton, Hort. Kew, 2 ed. v, 288.—Pursh, Fl. Am. Sept. ii, 626.—Smith in Rees' Cycl. xxx, No. 6.—Nuttall. Genera, ii, 214.—Nouveau Duhamel, vii, 151.—Elliott, Sk. ii, 594.—Sprengel, Syst. iii, 857.—Eaton, Manual, 6 ed. 294.—Eaton & Wright, Bot. 6 ed. 294.—Engelmann & Gray in Jour. Boston Soc. Nat. Hist. v, 262.—Scheele in Rœmer, Texas, 446.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 421.—Curtis in Rep. Geological Surv. N. Carolina, 37.—Wood, Cl. Book, 643; Bot. & Fl. 305.—A. De Candolle, Prodr. xvi², 73.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 73.—Gray, Manual N. States, 5 ed. 452; Hall's Pl. Texas, 21.—Young, Bot. Texas, 502.—Koch, Dendrologie, ii², 58.—Vasey, Cat. Forest Trees, 26.—Engelmann in Trans. St. Louis Acad. iii, 385, 395.

Q. Prinus, β. Linnæus, Spec. 1 ed. 995.

Q. humilis, Walter, Fl. Caroliniana, 234.

Q. Phellos, var. *cinerea*, Aiton, Hort. Kew. iii, 354.—Loudon, Arboretum, iii, 1895, f. 1773.—Spach, Hist. Veg. xi, 161.

UPLAND WILLOW OAK. BLUE JACK. SAND JACK.

North Carolina, south near the coast to cape Malabar and Pease creek, Florida, west along the Gulf coast to the valley of the Brazos river, Texas, extending north through eastern Texas to about latitude 33°.

A tree 9 to 15 meters in height, with a trunk rarely exceeding 0.20 meter in diameter; sandy barrens and dry upland ridges.

Wood heavy, hard, strong, close grained, compact; layers of annual growth marked by several rows of not large open ducts; medullary rays distant, thin, conspicuous; color, light brown tinged with red, the sap-wood darker; specific gravity, 0.6420; ash, 1.21.

284.—Quercus hypoleuca, Engelmann,

Trans. St. Louis Acad. iii, 384; Wheeler's Rep. vi, 251.—Vasey, Cat. Forest Trees, 26.—Rusby in Bull. Torrey Bot. Club, ix, 78.

Q. confertifolia, Torrey, Bot. Mex. Boundary Survey, 207 [not HBK.].—Cooper in Smithsonian Rep. 1858, 261.

Limpia mountains, Texas (*Havard*), valleys of the high mountain ranges of southwestern New Mexico, Santa Rita mountains, Arizona, above 6,000 feet elevation; southward into Sonora.

A small evergreen tree of great beauty, 9 to 15 meters in height, with a trunk sometimes 0.75 meter in diameter; dry, gravelly slopes and summits, the large specimens hollow and defective.

Wood heavy, very strong and hard, close-grained, compact; layers of annual growth marked by few small open ducts; medullary rays broad, conspicuous; color, dark brown, the sap-wood much lighter; specific gravity, 0.8009; ash, 1.34.

285.—Quercus imbricaria, Michaux,

Hist. Chênes Am. No. 9, t. 15, 16; Fl. Bor.-Am. ii, 197.—Willdenow, Spec. iv, 428; Enum. Suppl. 64; Berl. Baumz. 338.—Persoon, Syn. ii, 567.—Poiret, Suppl. ii, 214.—Michaux f. Hist. Arb. Am. ii, 78, t. 13; N. American Sylva, 3 ed. i, 60, t. 15.—Aiton, Hort. Kew. 2 ed. v, 288.—Smith in Rees' Cycl. xxx, No. 15.—Pursh, Fl. Am. Sept. ii. 627.—Nuttall, Genera, ii, 214.—Barton, Compend. Fl. Philadelph. ii, 167.—Nouveau Duhamel, vii, 153.—Hayne, Dend. Fl. 155.—Elliott, Sk. ii, 598.—Sprengel, Syst. iii, 857.—Torrey, Compend. Fl. N. States, 357.—Beck, Bot. 328.—Eaton, Manual, 6 ed. 292.—Loudon, Arboretum, iii, 1898, f. 1777.—Eaton & Wright, Bot. 383.—Darby, Bot. S. States, 510.—Torrey & Gray in Pacific R. R. Rep. ii, 130.—Cooper in Smithsonian Rep. 1858, 255.—Brendel in Trans. Illinois Ag. Soc. iii, 623, t. 6.—Chapman, Fl. S. States, 420.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 36.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 643; Bot. & Fl. 305.—A. De Candolle, Prodr. xvi², 63.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1860, 73.—Gray, Manual N. States, 5 ed. 452.—Young, Bot. Texas, 502.—Liebmann, Chênes Am. Trop. t. D, t. xxii, f. 5.—Koch, Dendrologie, ii², 60.—Vasey, Cat. Forest Trees, 26.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Ridgway in Proc. U. S. Nat. Mus. 1882, 80.

Q. Phellos, var. *imbricaria*, Spach, Hist. Veg. xi, 160.

SHINGLE OAK. LAUREL OAK.

Allentown, Lehigh county, Pennsylvania (*Porter*), west through southern Michigan, southern Wisconsin, and southeastern Iowa to southeastern Nebraska and northeastern Kansas, south to northern Georgia and Alabama, middle Tennessee, and northern Arkansas.

A tree 24 to 30 meters in height, with a trunk 0.60 to 0.90 meter in diameter; rich woodlands.

Wood heavy, hard, rather coarse-grained, checking badly in drying; layers of annual growth marked by many rows of large open ducts; medullary rays broad, conspicuous; color, light brown tinged with red, the sap-wood much lighter; specific gravity, 0.7529; ash, 0.43; occasionally used for clapboards, shingles, etc.

286.—Quercus Phellos, Linnæus,

Spec. 1 ed. 994.—Lamarck, Dict. i, 722.—Wangenheim, Amer. 76, t. 5, f. 11.—Walter, Fl. Caroliniana, 234.—Aiton, Hort. Kew. iii, 354; 2 ed. v, 287.—Abbot, Insects Georgia, ii, t. 52, 91.—Michaux, Fl. Bor.-Am. ii, 197.—Willdenow, Spec. iv, 423; Enum. 974; Berl. Baumz. 337.—Smith in Rees' Cycl. xxx, No. 7.—Persoon, Syn. ii, 567.—Desfontaines, Hist. Arb. ii, 507.—Michaux f. Hist. Arb. Am. ii, 75, t. 12; N. American Sylva, 3 ed. i, 58, t. 14.—Pursh, Fl. Am. Sept. ii, 625.—Barton, Prodr. Fl. Philadelph. 91; Compend. Fl. Philadelph. ii, 167.—Nuttall, Genera, ii, 214; Sylva, i, 15; 2 ed. i, 17.—Nouveau Duhamel, vii, 150.—Hayne, Dend. Fl. 155.—Elliott, Sk. ii, 593.—Sprengel, Syst. iii, 857.—Torrey, Compend. Fl. N. States, 357; Fl. N. York, ii, 187.—Beck, Bot. 328.—Eaton, Manual, 6 ed. 383.—Loudon, Arboretum, iii, 1894, f. 1774 & t.—Eaton & Wright, Bot. 383.—Spach, Hist. Veg. xi, 160.—Penn. Cycl. xix, 216.—Darby, Bot. S. States, 509.—Cooper in Smithsonian Rep. 1858, 255.—Chapman, Fl. S. States, 420.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 36.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 643; Bot. & Fl. 305.—A. De Candolle, Prodr. xvi², 63.—Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1-6, 1866, 73.—Gray, Manual N. States, 5 ed. 452; Hall's Pl. Texas, 21.—Young, Bot. Texas, 502.—Koch, Dendrologie, ii², 59.—Vasey, Cat. Forest Trees, 26.—Gartenflora, xxix, 221 & f.—Ridgway in Proc. U. S. Nat. Mus. 83.

Q. Phellos angustifolia, Marshall, Arbustum, 124.

Q. Phellos latifolia, Marshall, Arbustum, 124.—Loddiges, Cat. ed. 1836.—London, Arboretum, iii, 1895 & t.

Q. Phellos, var. *viridis*, Aiton, Hort. Kew. iii, 354.

Q. Phellos, var. *humilis*, Pursh, Fl. Am. Sept. ii, 625.

WILLOW OAK. PEACH OAK.

Tottenville, Staten island, New York, south near the coast to northeastern Florida, through the Gulf states to the valley of the Sabine river, Texas, and through Arkansas to southeastern Missouri, Tennessee, and southern Kentucky.

A tree 18 to 24 meters in height, with a trunk sometimes 0.90 meter in diameter; bottom lands or rich sandy uplands.

Wood heavy, strong, not hard, rather close-grained, compact; layers of annual growth marked by several rows of small open ducts; medullary rays few, distant; color, light brown tinged with red, the sap-wood lighter red; specific gravity 0.7472; ash, 0.50; somewhat used for fellies of wheels, clapboards, in construction, etc.

287.—Quercus densiflora, Hooker & Arnott,

Bot. Beechey, 391.—Hooker, Icon. iv, t. 380.—Bentham, Pl. Hartweg. 337.—Nuttall, Sylva, i, 11, t. 5; 2 ed. i, 21, t. 5.—Torrey in Pacific R. R. Rep. iv, 138.—Bot. Wilkes Exped. 458.—Newberry in Pacific R. R. Rep. vi, 31, 89, f. 8.—A. De Candolle, Prodr. xvi², 82.—Bolander in Proc. California Acad. iii, 231.—Vasey, Cat. Forest Trees, 25.—Engelmann in Trans. St. Louis Acad. iii, 389; Bot. California, ii, 99.

Q. echinacea, Torrey in Pacific R. R. Rep. iv, 137, t. 14.

Pasania densiflora, Örsted in Saerskitt. Aftryk. af. Nat. For. Viden. Meddelt. Nos. 1–6, 1866, 73.

Q. echinoides, R. Brown Campst. in Ann. & Mag. Nat. Hist. April, 1871, 2.

TANBARK OAK. CHESTNUT OAK. PEACH OAK.

Valley of the Umpqua river, Oregon, south through the Coast ranges to the Santa Lucia mountains, California.

A tree 18 to 24 meters in height, with a trunk 0.60 to 0.90 meter in diameter; rich valleys and banks of streams; most common and reaching its greatest development in the redwood forests of the California coast.

Wood heavy, hard, strong, very close-grained, compact, containing broad bands of small open ducts parallel to the thin, dark, conspicuous medullary rays; color, bright reddish-brown, the thick sap-wood darker brown; specific gravity, 0.6827; ash, 1.49; largely used as fuel.

The bark, rich in tannin, very largely used and preferred to that of any other tree of the Pacific forests for tanning.

NOTE.—The following shrubby species of *Quercus* do not properly find a place in this catalogue:

Quercus undulata, Torrey in Ann. Lyc. N. York, ii, 248, t. 4.
Interior Pacific region from Colorado southward.

Quercus Breweri, Engelmann in Bot. California, ii, 96.
Q. lobata, var. *fruticosa*, Engelmann in Trans. St. Louis Acad. iii, 388.
Western slopes of the high Sierra Nevadas, California.

Quercus Georgiana, M. A. Curtis in Chapman's Fl. S. States.
Stone Mountain, Georgia.

Quercus myrtifolia, Willdenow, Sp. iv, 424.
Q. Phellos, var. *arenaria*, Chapman, Fl. S. States, 420.
Q. aquatica, var. *myrtifolia*, A. De Candolle, Prodr. xvi, 68.
South Atlantic and Gulf coast.

Quercus ilicifolia, Wangenheim, Amer. 79, t. 6, f. 17.
Q. Banisteri, Michaux, Hist. Chênes Am. t. 27.
North Atlantic region.

Quercus pumila, Walter, Fl. Caroliana, 234.
Q. Phellos pumila, Michaux, Hist. Chênes Am. t. 15, f. 1.
Q. cinerea, var. *pumila*, Chapman, Fl. S. States, 421.—A. De Candolle, Prodr. 16, 74.
Q. cinerea, var. *sericea*, Engelmann in Trans. St. Louis Acad. iii, 384.
Q. sericea, Willdenow, Spec. 424.
Q. Phellos, var. *sericea*, Aiton, Hort. Kew. iii, 354.
Pine barrens, South Carolina.

Quercus dumosa, Nuttall, Sylva, i, 7.
Q. berberidifolia, Liebmann in Dansk. Vidensk. Selsk. Forhandl. 1854, 172, in part.
Q. dumosa, var. *bullata*, Engelmann in Bot. California, 296.
Q. acutidens, Torrey, Bot. Mex. Boundary Survey, 207, t. 51.
Coast ranges of southern California.

Numerous hybrid or supposed hybrid oaks, variously described by American botanists, are not properly considered here.

288.—Castanopsis chrysophylla, A. De Candolle;

Seemann's Jour. Bot. i, 182; Prodr. xvi², 109.—Watson in King's Rep. v, 322; Bot. California, ii, 100.—Gray in Proc. Am. Acad. vii, 401.—Torrey, Bot. Wilkes Exped. 463.—Vasey, Cat. Forest Trees, 27.—Hall in Coulter's Bot. Gazette, ii, 91.

Castanea chrysophylla, Douglas in Hooker's London Jour. Bot. ii, 496, t. 16.—Bentham, Pl. Hartweg. 337.—Hooker, Fl. Bor.-Am. ii, 159.—Nuttall, Sylva, i, 21; 2 ed. i, 37.—Bot. Mag. t. 4953.—Torrey in Pacific R. R. Rep. iv, 137; Bot. Mex. Boundary Survey, 205.—Morren in Belg. Hort. vii, 248, t. 240.—Newberry in Pacific R. R. Rep. vi, 26, 89, f. 4.—Fl. des Serres, xii, 3, t. 1184.—Cooper in Smithsonian Rep. 1858, 261.—Kellogg in Proc. California Acad. ii, 280.—Bolander in Proc. California Acad. iii, 231.—Engelmann in Wheeler's Rep. vi, 375.—Shingles in London Gard. Chronicle, 1882, 716.

Castanea chrysophylla, var. *minor*, Bentham, Pl. Hartweg. 337.

Castanea sempervirens, Kellogg in Proc. California Acad. i, 71.

C. chrysophylla, var. *minor*, A. De Candolle, Prodr. xvi², 110.

C. chrysophylla, var. *pumila*, Vasey, Cat. Forest Trees, 27.

CHINQUAPIN.

Cascade mountains, Oregon, below 4,000 feet elevation, south along the western slopes of the Sierra Nevadas, and through the California Coast ranges to the San Bernardino and San Jacinto mountains.

A tree 15 to 24 meters in height, with a trunk 0.30 to 0.90 meter in diameter, or at high elevations and toward its southern limits reduced to a low shrub; most common and reaching its greatest development in the Coast Range valleys of northern California; at its southern limits rarely below 10,000 feet elevation.

Wood light, soft, not strong, close-grained, compact; layers of annual growth marked by a single row of rather large open ducts; medullary rays numerous, obscure; color, light brown tinged with red, the sap-wood lighter; specific gravity, 0.5574; ash, 0.35; in southern Oregon occasionally used in the manufacture of plows and other agricultural implements.

289.—Castanea pumila, Miller,

Dict. No. 2.—Lamarck, Dict. i, 708.—Michaux, Fl. Bor.-Am. ii, 193.—Willdenow, Spec. iv, 461; Enum. 980; Berl. Baumz. 78.—Smith in Rees' Cycl. xiv, No. 2.—Nouveau Duhamel, iii, 79.—Persoon, Syn. ii, 572.—Desfontaines, Hist. Arb. ii, 500.—Michaux f. Hist. Arb. Am. ii, 166, t. 7; N. American Sylva, 3 ed. iii, 16, t. 105.—Aiton, Hort. Kew. 2 ed. v, 298.—Pursh, Fl. Am. Sept. ii, 624.—Rafinesque, Fl. Ludoviciana, 159; New Fl. & Bot. i, 83.—Nuttall, Genera, ii, 217; Am. Phil. Soc. 2 ser. v, 168.—Hayne, Dend. Fl. 165.—James in Long's Exped. ii, 287.—Elliott, Sk. ii, 615.—Torrey, Compend. Fl. N. States, 355; Fl. N. York, ii, 196.—Audubon, Birds, t. 85.—Beck, Bot. 332.—Eaton, Manual, 6 ed. 84.—Penn. Cycl. vi, 350.—Loudon, Arboretum, iii, 2002, f. 1927, 1928.—Eaton & Wright, Bot. 184.—Spach, Hist. Veg. xi, 192.—Darlington, Fl. Cestrica, 3 ed. 270.—Darby, Bot. S. States, 512.—Cooper in Smithsonian Rep. 1858, 256.—Chapman, Fl. S. States, 424.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 47.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 646; Bot. & Fl. 307.—Porcher, Resources S. Forests, 237.—A. De Candolle, Prodr. xvi², 115.—Gray, Manual N. States, 5 ed. 455.—Young, Bot. Texas, 508.—Koch, Dendrologie, ii², 24.—Vasey, Cat. Forest Trees, 27.—Butler in Coulter's Bot. Gazette, iii, 17.

Fagus pumila, Linnæus, Spec. 1 ed. 998.—Du Roi, Harbk. i, 175.—Wangenheim, Amer. 57, t. 19, f. 44.—Walter, Fl. Caroliniana, 233.—Aiton, Hort. Kew. iii, 361.—Abbot, Insects Georgia, ii, t. 57.

Fagus Castanea pumila, Marshall, Arbustum, 47.

Fagus pumila, var. *præcox*, Walter, Fl. Caroliniana, 233.

C. nana, Muhlenberg, Cat. 86.—Elliott, Sk. ii, 615.—Rafinesque, New Fl. & Bot. i, 83.—Darby, Bot. S. States, 512.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 47.—Lesquereux in Owen's 2d Rep. Arkansas, 388.

C. alnifolia, Nuttall, Genera, ii, 217; Sylva, i, 19, t. 6; 2 ed. i, 36, t. 6.

C. vesca, Lesquereux in Owen's 2d Rep. Arkansas, 388 [not Gærtner].

CHINQUAPIN.

Lancaster county, Pennsylvania, and the valley of the lower Wabash river, Indiana, south and southwest to northern Florida and the valley of the Neches river, Texas.

A tree sometimes 15 meters in height, with a trunk 0.30 to 1.05 meter in diameter, or often, especially in the Atlantic states, reduced to a low shrub; rich hillsides and borders of swamps; most common and reaching its greatest development in southern Arkansas.

Wood light, hard, strong, coarse-grained, durable in contact with the ground, liable to check in drying; layers of annual growth marked by many rows of large open ducts; medullary rays numerous, obscure; color, dark brown, the sap-wood hardly distinguishable; specific gravity, 0.5887; ash, 0.12; used for posts, rails, railway ties, etc.

The small nuts sweet and edible.

290.—Castanea vulgaris, var. Americana, A. De Candolle,

Prodr. xvi², 114.—Schneck in Coulter's Bot. Gazette, vi, 159.—Bell in Geological Rep. Canada, 1879-'80, 53c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 84.

Fagus Castanea dentata, Marshall, Arbustum, 46.

Fagus Castanea, Wangenheim, Amer. 47 [not Linnæus].—Walter, Fl. Caroliniana, 233.—Aiton, Hort. Kew. iii, 361, in part.—Lamarck, Ill. iii, 366, t. 782, in part.

C. vesca, var. *Americana*, Michaux, Fl. Bor.-Am. ii, 193.—Persoon, Syn. ii, 572.—Barton, Prodr. Fl. Philadelph. 90.—Pursh, Fl. Am. Sept. ii, 624.—Eaton, Manual, 109; 6 ed. 84.—Nuttall, Genera, ii, 217.—Elliott, Sk. ii, 614.—Torrey, Compend. Fl. N. States, 355; Fl. N. York, ii, 195, t. 111.—Loudon, Arboretum, iii, 1984.—Eaton & Wright, Bot. 184.—Emerson, Trees Massachusetts, 164, 2 ed. i, 187 & t.—Porcher, Resources S. Forests, 238. Vasey, Cat. Forest Trees, 27.—Rudkin in Bull. Torrey Bot. Club, vii, 81.

C. Americana, Rafinesque, New Fl. & Bot. i, 82.—Willdenow, Enum. Suppl. 64.—Nuttall, Sylva, i, 24; 2 ed. i, 38.—Spach, Hist. Veg. xi, 191.—Cooper in Smithsonian Rep. 1858, 256.—Koch, Dendrologie, ii², 23.—Martindale in Proc. Philadelphia Acad. 1880, 2.

C. vesca, Willdenow, Spec. iv, 460, in part.—Desfontaines, Hist. Arb. ii, 500, in part.—Michaux f. Hist. Arb. Am. ii, 151, t. 6; N. American Sylva, 3 ed. iii, 11, t. 104 [not Gærtner].—Hayne, Dend. Fl. 165, in part.—Sprengel, Syst. iii, 856, in part.—Beck, Bot. 332.—Penn. Cycl. vi, 350.—Bigelow, Fl. Boston. 3 ed. 224.—Darlington, Fl. Cestrica, 3 ed. 270.—Darby, Bot. S. States, 511.—Chapman, Fl. S. States, 424.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 46.—Wood, Cl. Book, 646; Bot. & Fl. 306.—Gray, Manual N. States, 5 ed. 455.

CHESTNUT.

Southern Maine to the valley of the Winooski river, Vermont, southern Ontario and southern Michigan, south through the northern states to Delaware and southern Indiana, and along the Alleghany mountains to northern Alabama, extending west to middle Kentucky and Tennessee.

A large tree, 24 to 30 meters in height, with a trunk 1.80 to 4 meters in diameter; rich woods and hillsides; very common and reaching its greatest development on the western slopes of the southern Alleghany mountains.

Wood light, soft, not strong, coarse-grained, liable to check and warp in drying, easily split, very durable in contact with the soil; layers of annual growth marked by many rows of large open ducts; medullary rays numerous, obscure; color, brown, the sap-wood lighter; specific gravity, 0.4504; ash, 0.18; largely used in cabinet-making, for railway ties, posts, fencing, etc.

The fruit, although smaller, superior in sweetness and flavor to that of the European chestnut.

An infusion or fluid extract of the dried leaves is successfully employed in the treatment of whooping-cough and other pectoral affections (*U. S. Dispensatory*, 14 ed. 245.—*Nat. Dispensatory*, 2 ed. 364).

291.—Fagus ferruginea, Aiton,

Hort. Kew. iii, 362; 2 ed. v, 298.—Abbot, Insects Georgia, ii, t. 75.—Willdenow, Spec. iv, 460; Enum. 980; Berl. Baumz. 140.—Persoon, Syn. ii, 571.—Desfontaines, Hist. Arb. ii, 496.—Michaux f. Hist. Arb. Am. ii, 174, t. 9; N. American Sylva, 3 ed. iii, 21, t. 106.—Smith in Rees' Cycl. xiv, No. 4.—Pursh, Fl. Am. Sept. ii, 624.—Barton, Prodr. Fl. Philadelph. 90; Compend. Fl. Philadelph. ii, 174.—Eaton, Manual, 108; 6 ed. 145.—Sprengel, Syst. iii, 856.—Torrey, Compend. Fl. N. States, 354; Fl. N. York, ii, 194, t. 110.—Beck. Bot. 333.—Eaton, Manual, 6 ed. 145.—Loudon, Arboretum, iii, 1980, f. 1917.—Hooker, Fl. Bor.-Am. ii, 159.—Eaton & Wright, Bot. 244.—Bigelow, Fl. Boston. 3 ed. 374.—Darlington, Fl. Cestrica, 3 ed. 271.—Cooper in Smithsonian Rep. 1858, 256.—Chapman, Fl. S. States, 425.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 47.—Wood, Bot. & Fl. 307.—A. De Candolle, Prodr. xvi², 118.—Gray, Manual N. States, 5 ed. 455.—Koch, Dendrologie, ii², 19.—Vasey, Cat. Forest Trees, 27.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Sears in Bull. Essex Inst. xiii, 179.—Bell in Geological Rep. Canada, 1879-'80, 52c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 85.

F. sylvatica atropunicea, Marshall, Arbustum, 46.

F. Americana latifolia, Wangenheim, Amer. 80, t. 29, f. 55.—Loudon, Arboretum, iii, 1980, f. 1916.

F. sylvatica, Walter, Fl. Caroliniana, 233 [not Linnæus].—Pursh, Fl. Am. Sept. ii, 624.—Beck, Bot. 333.—Darlington, Fl. Cestrica, 2 ed. 538.—Darby, Bot. S. States, 512.

F. sylvestris, Michaux, Fl. Bor. Am. ii, 194.—Michaux f. Hist. Arb. Am. ii, 170, t. 8; N. American Sylva, 3 ed. iii, 18, t. 107.—Hooker, Fl. Bor.-Am. ii, 159.—Lesquereux in Owen's 2d Rep. Arkansas, 388.

F. alba, Rafinesque, Fl. Ludoviciana, 131.

F. sylvatica, var. *Americana*, Nuttall, Genera, ii, 216.—Barton, Compend. Fl. Philadelph. ii, 174.—Elliott, Sk. ii, 613.—Eaton, Manual, 6 ed. 145.—Loudon, Arboretum, iii, 1953.—Eaton & Wright, Bot. 244.—Emerson, Trees Massachusetts, 153; 2 ed. i, 180 & t.—Wood, Cl. Book, 647.—Porcher, Resources S. Forests, 235.

F. Americana, Sweet, Hort. Brit.—Spach, Hist. Veg. xi, 201.

F. ferruginea, var. *Caroliniana*, Loudon, Arboretum, iii, 1980, f. 1915.

BEECH.

Nova Scotia and the valley of the Restegouche river to the northern shores of lake Huron and northern Wisconsin, south to the Chattahoochee region of western Florida and the valley of the Trinity river, Texas, west to eastern Illinois, southeastern Missouri, and Madison county, Arkansas (*Letterman*).

A large tree, 24 to 30 or, exceptionally, 34 meters (*Ridgway*) in height, with a trunk 0.90 to 1.20 meter in diameter; rich woods, or at the south sometimes in bottom lands or the dryer portions of swamps, reaching its greatest development upon the "bluff" formations of the lower Mississippi basin; very common.

Wood very hard, strong, tough, very close grained, not durable in contact with the soil, inclined to check in drying, difficult to season, susceptible of a beautiful polish; medullary rays broad, very conspicuous; color, varying greatly with soil and situation, dark red, or often lighter, the sap-wood nearly white; specific gravity, 0.6883; ash, 0.51; largely used in the manufacture of chairs, shoe-lasts, plane-stocks, handles, etc., and for fuel.

292.—Ostrya Virginica, Willdenow,

Spec. iv, 469; Enum. 982; Berl. Baumz. 260.—Persoon, Syn. ii, 573.—Aiton, Hort. Kew. 2 ed. v, 302.—Pursh, Fl. Am. Sept. ii, 623.—Eaton, Manual, 109; 6 ed. 244.—Nuttall, Genera, ii, 219.—Hayne, Dend. Fl. 169.—Elliott, Sk. ii, 618.—Sprengel, Syst. iii, 856.—Torrey, Compend. Fl. N. States, 356; Nicollet's Rep. 160; Fl. N. York, ii, 185, t. 102.—Audubon, Birds, t. 40.—Loudon, Arboretum, iii, 2015, f. 1940.—Hooker, Fl. Bor.-Am. ii, 160.—Eaton & Wright, Bot. 336.—Bigelow, Fl. Boston. 3 ed. 383.—Spach in Ann. Sci. Nat. 2 ser. xvi, 246; Hist. Veg. xi, 218.—Emerson, Trees Massachusetts, 177; 2 ed. i, 201 & t.—Parry in Owen's Rep. 618.—Darlington, Fl. Cestrica, 3 ed. 274.—Darby, Bot. S. States, 509.—Cooper in Smithsonian Rep. 256.—Chapman, Fl. S. States, 426.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 75.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 647; Bot. & Fl. 307.—Porcher, Resources S. Forests, 233.—A. De Candolle, Prodr. xvi², 125.—Gray, Manual N. States, 5 ed. 456.—Young, Bot. Texas, 510.—Vasey, Cat. Forest Trees, 27.—Sargent in Am. Nat. xi, 683.—Sears in Bull. Essex Inst. xiii, 179.—Ridgway in Proc. U. S. Nat. Mus. 85.

Carpinus Ostrya, Linnæus, Spec. 1 ed. 998, in part.—Du Roi, Harbk. i, 130.—Wangenheim, Amer. 48.—Marshall, Arbustum, 25.—Mœnch, Meth. 694.—Abbot, Insects Georgia, ii, t. 76.—Nouveau Duhamel, ii, 200.—Michaux f. Hist. Arb. Am. iii, 53, t. 7; N. American Sylva, 3 ed. iii, 27, t. 109.

Carpinus Virginiana, Miller, Dict. 7 ed. No. 4.—Lamarck, Dict. i, 708; Wangenheim, Amer. 49.—Nouveau Duhamel, ii, 201.—Desfontaines, Hist. Arb. ii, 493.—Smith in Rees' Cycl. vii, No. 5.

Carpinus triflora, Mœnch, Meth. 394.

Carpinus Ostrya, var. *Americana*, Michaux, Fl. Bor.-Am. ii, 202.

O. Virginica, var. *glandulosa*, Spach in Ann, Sci. Nat. 2 ser. xvi, 246; Hist. Veg. xi, 218.

O. Virginica, var. *eglandulosa*, Spach. in Ann. Sci. Nat. 2 ser. xvi, 246; Hist. Veg. xi, 218.

O. Virginiana, Koch, Dendrologie, ii², 6.

HOP HORNBEAM. IRON WOOD. LEVER WOOD.

Bay of Chaleur, through the valleys of the Saint Lawrence and the lower Ottawa rivers, along the northern shore of lake Huron to northern Minnesota, south through the northern states and along the Alleghany mountains to the Chattahoochee region of western Florida, and through eastern Iowa, southeastern Missouri, and Arkansas to eastern Kansas, the Indian territory, and eastern Texas.

A small tree, 9 to 15 meters in height, with a trunk 0.30 to 0.60 meter in diameter; generally on dry, gravelly hillsides and knolls, reaching its greatest development in southern Arkansas; common.

Wood heavy, very strong and hard, tough, very close-grained, compact, susceptible of a beautiful polish, very durable in contact with the soil; medullary rays numerous, obscure; color, light brown tinged with red, or, like the sap-wood, often nearly white; specific gravity, 0.8284; ash, 0.50; used for posts, levers, handles of tools, etc.

293.—Carpinus Caroliniana, Walter,

Fl. Caroliniana, 238.—A. De Candolle, Prodr. xvi², 126.—Koch, Dendrologie, ii², 4.—Sears in Bull. Essex Inst. xviii, 180.—Ridgway in Proc. U. S. Nat. Mus. 1882, 85.

C. Americana, Lamarck, Dict. iv, 708; Suppl. ii, 202.—Michaux, Fl. Bor.-Am. ii, 201.—Willdenow, Spec. iv, 468; Enum. Suppl. 64; Berl. Baumz. 75.—Persoon, Syn. ii, 573.—Michaux f. Hist. Arb. Am. iii, 57, t. 8; N. American Sylva, 3 ed. iii, 26, t. 108.—Pursh, Fl. Am. Sept. ii, 623.—Aiton, Hort. Kew. 2 ed. v, 301.—Eaton, Manual, 109; 6 ed. 82.—Barton, Prodr. Fl. Philadelph. 91; Compend. Fl. Philadelph. ii, 176.—Nuttall, Genera, ii, 218.—Hayne, Dend. Fl. 168.—Elliott, Sk. ii, 618.—Watson, Dend. Brit. ii, t. 157.—Sprengel, Syst. iii, 854.—Guimpel, Otto & Hayne, Abb. Holz. 107, t. 84.—Torrey, Compend. Fl. N. States, 356; Fl. N. York, ii, 185, t. 103.—Penn. Cycl. iv, 315.—Loudon, Arboretum, iii, 2013, f. 1936.—Hooker, Fl. Bor.-Am. ii, 160.—Eaton & Wright, Bot. 182.—Bigelow, Fl. Boston. 3 ed. 383.—Spach in Ann. Sci. Nat. 2 ser. xvi, 252; Hist. Veg. xi, 224.—Emerson, Trees Massachusetts, 174; 2 ed. i, 198 & t.—Parry in Owen's Rep. 618.—Darlington, Fl. Cestrica, 3 ed. 273.—Darby, Bot. S. States, 508.—Cooper in Smithsonian Rep. 1858, 256.—Chapman, Fl. S. States, 425.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 75.—Lesquereux in Owen's 2d Rep. Arkansas, 388.—Wood, Cl. Book, 648; Bot. & Fl. 307.—Gray, Manual N. States, 5 ed. 457; Hall's Pl. Texas, 21.—Young, Bot. Texas, 509.—Vasey, Cat. Forest Trees, 27.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Bell in Geological Rep. Canada, 1879-'80, 52ᶜ.

C. Betulus Virginiana, Marshall, Arbustum, 25.

HORNBEAM. BLUE BEECH. WATER BEECH. IRON WOOD.

Nova Scotia, southern New Brunswick, northern shores of Georgian bay, southern peninsula of Michigan to northern Minnesota (lake Pokegama, *Garrison*), south to cape Malabar and Tampa bay, Florida, and the valley of the Trinity river, Texas, west to central Iowa, eastern Kansas, and the valley of the Poteau river, Indian territory.

A small tree, 9 to 15 meters in height, with a trunk sometimes 0.60 to 0.90 meter in diameter, or at the north much smaller and often reduced to a low shrub; borders of streams and swamps, in moist soil; most common and reaching its greatest development along the western slopes of the southern Alleghany mountains and in southern Arkansas and eastern Texas.

Wood heavy, very strong and hard, close-grained, inclined to check in drying; medullary rays numerous, broad; color, light brown, the thick sap-wood nearly white; specific gravity, 0.7286; ash, 0.83; sometimes used for levers, handles of tools, etc.

BETULACEÆ.

294.—Betula alba, var. populifolia, Spach,

Ann. Sci. Nat. 2 ser. xv, 187; Hist. Veg. xi, 233.—Endlicher, Genera, Suppl. iv², 19.—Regel in Mem. Soc. Nat. Moscow, xix, 76, t. 4, f. 19-28; Gray, Manual N. States, 5 ed. 459.—Vasey, Cat. Forest Trees, 28.—Macoun in Geological Rep. Canada, 1879-'80, 55c.

B. lenta, Du Roi, Harbk. i, 92 [not Linnæus].—Wangenheim, Amer. 45, t. 29, f. 38.

B. populifolia, Marshall, Arbustum, 19.—Aiton, Hort. Kew. iii, 336; 2 ed. v, 299.—Willdenow, Berl. Baumz. 1 ed. 37, t. 2, f. 5; Spec. iv, 463.—Persoon, Syn. ii, 572.—Desfontaines, Hist. Arb. ii, 476.—Nouveau Duhamel, iii, 204.—Poiret, Suppl. i, 687.—Michaux f. Hist. Arb. Am. ii, 139, t. 2; N. American Sylva, 3 ed. ii, 78, t. 71.—Pursh, Fl. Am. Sept. ii, 620.—Smith in Rees' Cycl. iv, No. 8.—Barton, Prodr. Fl. Philadelph. 92; Compend. Fl. Philadelph. ii, 175.—Eaton, Manual, 109; 6 ed. 53.—Nuttall, Genera, ii, 218; Sylva, i, 25; 2 ed. i, 42.—Hayne, Dend. Fl. 166.—Sprengel, Syst. iii, 854.—Watson, Dend. Brit. ii, 151.—Torrey, Compend. Fl. N. States, 355; Fl. N. York, ii, 199, t. 112.—Loudon, Arboretum, iii, 1707, f. 1560.—Hooker, Fl. Bor.-Am. ii, 155.—Eaton & Wright, Bot. 156.—Bigelow, Fl. Boston. 3 ed. 381.—Emerson, Trees Massachusetts, 213; 2 ed. i, 243 & t.—Gray, Manual N. States, 1 ed. 421.—Cooper in Smithsonian Rep. 1858, 256.—Wood, Cl. Book, 649; Bot. & Fl. 308.—Koch, Dendrologie, ii, 646.

B. acuminata, Ehrhart, Beitr. vi, 98.—Mœnch, Meth. 693.

B. alba, subspecies *populifolia*, Regel in Bull. Soc. Nat. Moscow, xxxviii⁴, 399; De Candolle, Prodr. xvi², 164.

WHITE BIRCH. OLD-FIELD BIRCH. GRAY BIRCH.

New Brunswick and the valley of the lower Saint Lawrence river to the southern shores of lake Ontario, south, generally near the coast, to New Castle county, Delaware.

A small, short-lived tree of rapid growth, 6 to 9 meters in height, with a trunk 0.30 to 0.45 meter in diameter; dry, gravelly, barren soil or borders of swamps, now generally springing up upon abandoned or burned land in eastern New England.

Wood light, soft, not strong, close-grained, liable to check in drying, not durable; medullary rays numerous, obscure; color, light brown, the sap wood nearly white; specific gravity, 0.5760; ash, 0.29; largely used in the manufacture of spools, shoe-pegs, wood pulp, etc., for hoop-poles and fuel.

The bark and leaves, as well as those of *B. papyrifera* and *B. lenta*, are popularly esteemed as a remedy for various chronic diseases of the skin, bladder, etc., and for rheumatic and gouty complaints; the empyreumatic oil of birch obtained from the inner bark by distillation is used externally and internally for the same purposes (*U. S. Dispensatory*, 14 ed. 1592.—*Nat. Dispensatory*, 2 ed. 287); the bark occasionally used domestically in the manufacture of ink.

295.—Betula papyrifera, Marshall,

Arbustum, 19.—Michaux, Fl. Bor.-Am. ii, 180.

B. papyracea, Aiton, Hort. Kew. iii, 337; 2 ed. v, 300.—Willdenow, Spec. iv, 464; Enum. 981; Berl. Baumz. 58, t. 2, f. 1.—Nouveau Duhamel, iii, 205.—Persoon, Syn. ii, 572.—Desfontaines, Hist. Arb. ii, 477.—Poiret, Suppl. i, 688.—Michaux f. Hist. Arb. Am. ii, 133, t. 1; N. American Sylva, 3 ed. ii, 70, t. 69.—Smith in Rees' Cycl. iv, No. 9.—Pursh, Fl. Am. Sept. ii, 621.—B. S. Barton, Bot. Appx. 34, t. 27, f. 1.—Eaton, Manual, 109; 6 ed. 53.—Barton, Compend. Fl. Philadelph. ii, 175.—Nuttall, Genera, ii, 218; Sylva, i, 25; 2 ed. i, 42.—Hayne, Dend. Fl. 167.—Watson, Dend. Brit. ii, t. 152.—Sprengel, Syst. iii, 854.—Torrey, Compend. Fl. N. States, 355; Fl. N. York, ii, 199.—Audubon, Birds, t. 88.—Loudon, Arboretum, iii, 1708, f. 1561 & t.—Hooker, Fl. Bor.-Am. ii, 155.—Eaton & Wright, Bot. 156.—Bigelow, Fl. Boston. 3 ed. 381.—Penn. Cycl. ii, 349.—Emerson, Trees Massachusetts, 210; 2 ed. i, 239 & t.—Parry in Owen's Rep. 618.—Richardson, Arctic Exped. 437.—Cooper in Smithsonian Rep. 1858, 256.—Hooker f. in Trans. Linnæan Soc. xxiii², 300, 339.—Wood, Cl. Book, 649; Bot. & Fl. 308.—Gray, Manual N. States, 5 ed. 459.—Koch, Dendrologie, ii, 645.—Vasey, Cat. Forest Trees, 28.—Macoun in Geological Rep. Canada, 1875-'76, 210.—Sears in Bull. Essex Inst. xiii, 180.—Bell in Geological Rep. Canada, 1879-'80, 45c.

B. nigra, Loiseleur in Nouveau Duhamel, ii, t. 51 [not Linnæus].

B. grandis, Schrader in Ind. Hort. Goett. 1833, 2.

B. rubra, Loddiges, Cat. ed. 1836.

B. Canadensis, Loddiges, Cat. ed. 1836.

B. alba, var. *papyrifera*, Spach. in Ann. Sci. Nat. 2 ser. xv, 188; Hist. Veg. xi, 234.—Endlicher, Genera, Suppl. iv², 19.—Regel in Mem. Soc. Nat. Moscow, xix, 81, t. 5, f. 5–16.

B. cordifolia, Regel in Mem. Soc. Nat. Moscow, xix, 86, t. 12, f. 29–36.

B. alba, subspecies *papyrifera*, Regel in Bull. Soc. Nat. Moscow, xxxviii⁴, 401; De Candolle, Prodr. xvi², 166.

B. alba, subspecies *papyrifera*, var. *cordifolia*, Regel in Bull. Soc. Nat. Moscow, xxxviii⁴, 401; De Candolle, Prodr. xvi², 166.

B. alba, subspecies *papyrifera*, var. *communis*, Regel in Bull. Soc. Nat. Moscow, xxxviii⁴, 401; De Candolle, Prodr. xvi², 166.

B. alba, subspecies *commutata*, Regel in Bull. Soc. Nat. Moscow, xxxviii⁴, 401; De Candolle, Prodr. xvi², 166.

B. occidentalis, Lyall in Jour. Linnæan Soc. vii, 134 [not Hooker].

B. alba, var. *populifolia*, Winchell in Ludlow's Rep. Black Hills, 67 [not Spach].

CANOE BIRCH. WHITE BIRCH. PAPER BIRCH.

Northern Newfoundland and Labrador to the southern shores of Hudson bay and northwest to the Great Bear lake and the valley of the Yukon river, Alaska, south, in the Atlantic region to Wading river, Long island, the mountains of northern Pennsylvania, Clear lake, Montcalm county, Michigan, northeastern Illinois and Saint Cloud, Minnesota; in the Pacific region south to the Black hills of Dakota (*R. Douglas*), the Mullen trail of the Bitter Root mountains and Flathead lake, Montana, the neighborhood of Fort Colville, Washington territory (*Watson*), and the valley of the lower Fraser river, British Columbia (*Engelmann & Sargent*).

A tree 18 to 24 meters in height, with a trunk 0.60 to 0.90 meter in diameter; rich woodlands and banks of streams; very common in the northern Atlantic region and reaching a higher latitude than any deciduous tree of the American forest.

Wood light, strong, hard, tough, very close-grained, compact; medullary rays numerous, obscure; color, brown tinged with red, the sap-wood nearly white; specific gravity, 0.5955; ash, 0.25; largely used in the manufacture of spools, shoe-lasts and pegs, in turnery, for fuel, wood-pulp, etc.

The very tough, durable bark easily separated into thin layers, impervious to water, is largely used in the manufacture of canoes, tents, etc.

296.—Betula occidentalis, Hooker,

Fl. Bor.-Am. ii, 155.—Spach in Ann. Sci. Nat. 2 ser. xv, 197.—Nuttall, Sylva, i, 22, t. 7; 2 ed. i, 40, t. 7.—Endlicher, Genera, Suppl. iv², 20.—Torrey in Fremont's Rep. 97; Bot. Wilkes Exped. 466.—Newberry in Pacific R. R. Rep. vi, 89.—Cooper in Smithsonian Rep. 1858, 261; Am. Nat. iii, 408.—Regel in Mem. Soc. Nat. Moscow, xix, 131, t. 15, f. 35.—Porter in Hayden's Rep. 1871, 493.—Watson in King's Rep. v, 323, t. 35; Pl. Wheeler, 17; Bot. California, ii, 79.—Porter & Hayden, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 127.—Rothrock in Pl. Wheeler. 50; Wheeler's Rep. vi, 239.—Vasey, Cat. Forest Trees, 28.—Macoun in Geological Rep. Canada, 1875–'76, 210.—G. M. Dawson in Canadian Nat. new ser. ix, 331.

B. alba, subspecies *occidentalis typica*, Regel in Bull. Soc. Nat. Moscow, xxxviii⁴, 400; De Candolle, Prodr. xvi², 165.

BLACK BIRCH.

British Columbia, south to the Mount Shasta region (Strawberry vale) and the eastern cañons of the Sierra Nevadas above Owen's valley (*Lemmon*), California, and through the interior ranges and the Rocky mountains to Utah and northern New Mexico.

A small tree, 8 to 12 meters in height, with a trunk sometimes 0.30 to 0.45 meter in diameter; mountain cañons and along streams, in moist soil, often throwing up several stems from the ground and forming dense thickets.

Wood soft, strong, brittle, close-grained, compact; medullary rays numerous, obscure; color, light brown, the sap-wood lighter; specific gravity, 0.6030; ash, 0.30; somewhat used for fencing, fuel, etc.

297.—Betula lutea, Michaux f.

Hist. Arb. Am. ii, 152, t. 5; N. American Sylva, 3 ed. ii, 82, t. 73.—Spach in Ann. Sci. Nat. 2 ser. xv, 191; Hist. Veg. xi, 243.—Endlicher, Genera, Suppl. iv², 20.—Wood, Bot. & Fl. 308.—Gray, Manual N. States, 5 ed. 459.—Koch, Dendrologie, ii, 640.—Vasey, Cat. Forest Trees, 28.—Sears in Bull. Essex Inst. xiii, 180.

B. excelsa, Pursh, Fl. Am. Sept. ii, 621 [not Aiton].—Nuttall, Genera, ii, 218.—Sprengel, Syst. iii, 854.—Torrey, Compend. Fl. N. States, 355; Fl. N. York, ii, 200.—Eaton, Manual, 6 ed. 53.—Loudon, Arboretum, iii, 1711, f. 1564, 1565 & t.—Hooker, Fl. Bor.-Am. ii, 156.—Eaton & Wright, Bot. 156.—Bigelow, Fl. Boston. 3 ed. 382.—Lindley in Penn. Cycl. ii, 349.—Gray, Manual N. States, 1 ed. 422.—Emerson, Trees Massachusetts, 206; 2 ed. i, 235 & t.—Richardson, Arctic Exped. 438.—Cooper in Smithsonian Rep. 1858, 256.—Chapman, Fl. S. States, 428.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 74.—Wood, Cl. Book, 648.—Bell in Geological Rep. Canada, 1879-'80, 50c.

B. lenta, Regel in Mem. Soc. Nat. Moscow, xix, 125, in part; Bull. Soc. Nat. Moscow, xxxviii⁴, 417, in part; De Candolle, Prodr. xvi², 179, in part.

YELLOW BIRCH. GRAY BIRCH.

Newfoundland, northern shores of the gulf of Saint Lawrence to Abittibi lake and the western shores of lake Superior and Rainy lake, south through the northern states to Delaware and southern Minnesota, and along the Alleghany mountains to the high peaks of North Carolina and Tennessee.

One of the largest and most valuable deciduous trees of the northern New England and Canadian forests, often 21 to 29 meters in height, with a trunk 0.90 to 1.20 meter in diameter; rich woodlands; common.

Wood heavy, very strong and hard, very close-grained, compact, satiny, susceptible of a beautiful polish; medullary rays numerous, obscure; color, light brown tinged with red, the heavier sap-wood nearly white; specific gravity, 0.6553; ash, 0.31; largely used for fuel, in the manufacture of furniture, button and tassel molds, pill and match boxes, and for the hubs of wheels.

298.—Betula nigra, Linnæus,

Spec. 1 ed. 982.—Marshall, Arbustum, 18.—Walter, Fl. Caroliniana, 231.—Aiton, Hort. Kew. iii, 336; 2 ed. v, 299.—Gærtner, Fruct. ii, 54, t. 90, f. 1.—Willdenow, Spec. iv, 464; Enum. 981; Berl. Baumz. 56.—Nouveau Duhamel, iii, 203, t. 51.—Persoon, Syn. ii, 572.—Desfontaines, Hist. Arb. ii, 477.—Smith in Rees' Cycl. iv, No. 2.—Pursh, Fl. Am. Sept. ii, 621.—Nuttall, Genera, ii, 218.—Hayne, Dend. Fl. 166.—Lamarck, Ill. iii, 350, t. 760, f. 2.—Elliott, Sk. ii, 616.—Watson, Dend. Brit. ii, t. 153.—Sprengel, Syst. ii, 854.—Torrey, Compend. Fl. N. States, 355; Fl. N. York, ii, 201.—Beck, Bot. 325.—Loudon, Arboretum, iii, 1710, f. 1562, 1563 & t.—Penn. Cycl. ii, 149.—Emerson, Trees Massachusetts 208; 2 ed. i, 237.—Darlington, Fl. Cestrica, 3 ed. 275.—Darby, Bot. S. States, 508.—Cooper in Smithsonian Rep. 1858, 256.—Chapman, Fl. S. States, 428.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 73.—Regel in Mem. Soc. Nat. Moscow, xix, 118, t. 12, f. 1-12; Bull. Soc. Nat. Moscow, xxxviii⁴, 412; De Candolle, Prodr. xvi², 175.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 649; Bot. & Fl. 308.—Porcher, Resources S. Forests, 266.—Gray, Manual N. States, 5 ed. 459; Hall's Pl. Texas, 21.—Koch, Dendrologie, ii, 644.—Young, Bot. Texas, 512.—Vasey, Cat. Forest Trees, 28.—Burbank in Proc. Boston Soc. Nat. Hist. xviii, 214.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Ridgway in Proc. U. S. Nat. Mus. 1882, 85.

B. lanulosa, Michaux, Fl. Bor.-Am. ii, 181.—Nouveau Duhamel, iii, 206.

B. rubra, Michaux f. Hist. Arb. Am. ii, 142, t. 3; N. American Sylva, 3 ed. ii, 80, t. 72.—Loddiges, Bot. Cab. t. 1248.—Eaton, Manual, 6 ed. 53.—Eaton & Wright, Bot. 156.—Spach in Ann. Sci. Nat. 2 ser. xv, 185; Hist. Veg. xi, 230.—Endlicher, Genera, Suppl. iv², 19.

B. angulata, Loddiges, Cat. ed. 1836.

RED BIRCH. RIVER BIRCH.

Banks of the Merrimac and Spicket rivers, Middlesex and Essex counties, Massachusetts, Wading river, Long island, south through the coast and middle districts to the Chattahoochee region of western Florida, west to western Iowa, northwestern Missouri, eastern Kansas, the Indian territory, and the valley of the Trinity river, Texas.

A tree 18 to 24 meters in height, with a trunk rarely exceeding 0.75 meter in diameter; banks of streams and ponds; very common and reaching its greatest development in the south Atlantic states and in the basin of the lower Mississippi river.

Wood light, rather hard, strong, close-grained, compact; medullary rays numerous, obscure; color, brown, the sap-wood much lighter; specific gravity, 0.5762; ash, 0.35; used in the manufacture of furniture, woodenware, wooden shoes, ox-yokes, etc.

299.—Betula lenta, Linnæus,

Spec. 1 ed. 983.—Lamarck, Dict. i, 453.—Marshall, Arbustum, 19.—Aiton, Hort. Kew. iii, 337; 2 ed. v, 300.—Willdenow, Spec. iv, 464; Enum. 981; Berl. Baumz. 59.—Persoon, Syn. ii, 572.—Desfontaines, Hist. Arb. ii, 477.—Nouveau Duhamel, iii, 205.—Michaux f. Hist. Arb. Am. ii, 147, t. 4; N. American Sylva, 3 ed. ii, 85, t. 74.—Smith in Rees' Cycl. iv, No. 3.—Pursh, Fl. Am. Sept. ii, 621.—Eaton, Manual, 109; 6 ed. 53.—Barton, Compend. Fl. Philadelph. ii, 175.—Nuttall, Genera, ii, 218.—Hayne, Dend. Fl. 167.—Elliott, Sk. ii, 617.—Watson, Dend. Brit. ii, 144.—Sprengel, Syst. ii, 854.—Torrey, Compend. Fl. N. States, 356; Fl. N. York, ii, 200.—Guimpel, Otto & Hayne, Abb. Holz. 105, t. 83.—Loudon, Arboretum, iii, 1713, f. 1566.—Hooker, Fl. Bor.-Am. ii, 156.—Eaton & Wright, Bot. 156.—Bigelow, Fl. Boston. 3 ed. 381.—Lindley in Penn. Cycl. ii, 349.—Spach in Ann. Sci. Nat. 2 ser. xv, 190; Hist. Veg. xi, 241.—Emerson, Trees Massachusotts, 203; 2 ed. i, 232 & t.—Richardson, Arctic Exped. 438.—Endlicher, Genera, Suppl. iv², 20.—Darlington, Fl. Cestrica, 3 ed. 275.—Darby, Bot. S. States, 508.—Cooper in Smithsonian Rep. 1858, 256.—Chapman, Fl. S. States, 428.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 74.—Regel in Mem. Soc. Nat. Moscow, xxxviii⁴, 125, in part; Bull. Soc. Nat. Moscow, xxxviii, 417, in part; De Candolle, Prodr. xvi², 179, in part.—Wood, Cl. Book, 648; Bot. & Fl. 308.—Porcher, Resources S. Forests, 265.—Gray, Manual N. States, 5 ed. 458.—Koch, Dendrologie, ii, 639.—Vasey, Cat. Forest Trees, 28.—Sears in Bull. Essex Inst. xiii, 180.—Bell in Geological Rep. Canada, 1879-'80, 55ᶜ.—Ridgway in Proc. U. S. Nat. Mus. 1882, 85.

B. nigra, Du Roi, Harbk. i, 93.—Wangenheim, Amer. 35, t. 15, f. 34.

B. excelsa, Aiton, Hort. Kew. iii, 337; 2 ed. v, 299 [not Pursh].—Willdenow, Spec. iv, 464.—Berl. Baumz. 41, t. 2, f. 2.—Nouveau Duhamel, iii, 203, t. 52.—Persoon, Syn. ii, 572.—Desfontaines, Hist. Arb. ii, 477.—Poiret, Suppl. i, 687.—Smith in Rees' Cycl. iv, No. 10.—Hayne, Dend. Fl. i, 7.—Spach in Ann. Sci. Nat. 2 ser. xv, 188; Hist. Veg. xi, 243.—Endlicher, Genera, iv², 20.

B. carpinifolia, Ehrhart, Beitr. vi, 99.—Willdenow, Enum. 981; Berl. Baumz. 49.

CHERRY BIRCH. BLACK BIRCH. SWEET BIRCH. MAHOGANY BIRCH.

Newfoundland and the valley of the Saguenay river, west through Ontario to the Manitou islands of lake Huron, south to northern Delaware and southern Indiana, and along the Alleghany mountains to the Chattahoochee region of northern Florida, extending west to middle Kentucky and Tennessee.

A tree 18 to 24 meters in height, with a trunk 0.90 to 1.50 meter in diameter; rich woodlands; very common in all northern forests.

Wood heavy, very strong and hard, close-grained, compact, satiny, susceptible of a beautiful polish; medullary rays numerous, obscure; color, dark brown tinged with red, the sap-wood light brown or yellow; specific gravity, 0.7617; ash, 0.26; now largely used in the manufacture of furniture and for fuel; in Nova Scotia and New Brunswick largely in ship-building.

"Birch beer" is obtained by fermenting the saccharine sap of this and perhaps some other species of the genus

300.—Alnus maritima, Muhlenberg,

Mss.—Nuttall, Sylva, i, 34, t. 10²; 2 ed. i, 50, t. 10².—Gray, Manual N. States, 5 ed. 461; Hall's Pl. Texas, 21.—Canby in Coulter's Bot. Gazette, vi, 1881.

Betula-Alnus maritima, Marshall, Arbustum, 20.

A. oblongata, Regel in Mem. Soc. Nat. Moscow, xix, 172, t. vi, f. 3-9 [not Willdenow].

A. maritima typica, Regel in Bull. Soc. Nat. Moscow, xxxviii⁴, 427; De Candolle, Prodr. xvi², 186.

SEASIDE ALDER.

Southern Delaware and eastern Maryland, near the coast; valley of the Red river, Indian territory, in about longitude 96° 30′ W. (*E. Hall*); Manchuria and Japan (*A. maritima, Japonica* and *arguta, Regel in De Candolle, Prodr.* xvi², 186).

A small tree, 6 to 7 meters in height, with a trunk 0.10 to 0.15 meter in diameter; borders of streams and swamps.

Wood light, soft, close-grained, checking badly in drying; medullary rays broad, conspicuous; color, light bright brown, the sap-wood hardly distinguishable, somewhat lighter; specific gravity, 0.4996; ash, 0.39.

301.—Alnus rubra, Bongard,

Mem. Acad. St. Petersburg, 6 ser. ii, 162.—Hooker, Fl. Bor.-Am. ii, 158.—Spach in Ann. Sci. Nat. 2 ser. xv, 205.—Endlicher, Genera, Suppl. iv^2, 21.—Lyall in Jour. Linnæan Soc. vii, 134.—Regel in Bull. Soc. Nat. Moscow, xxxviii^4, 429; De Candolle, Prodr. xvi^2, 186.—Torrey, Bot. Wilkes Exped. 467.—Watson, Bot. California, ii, 80.—G. M. Dawson in Canadian Nat. new ser. ix, 331.

?*A. glutinosa*, Pursh, Fl. Am. Sept. ii, 622 [not Willdenow].

A. Oregana, Nuttall, Sylva, i, 28, t. 9; 2 ed. i, 44, t. 9.—Newberry in Pacific R. R. Rep. vi, 25, 89.—Cooper in Smithsonian Rep. 1858, 261; Pacific R. R. Rep. xii^2, 28, 68.—Vasey, Cat. Forest Trees, 28.—Hall in Coulter's Bot. Gazette, ii, 91.

A. incana, var. *rubra*, Regel in Mem. Soc. Nat. Moscow, xix, 157, t. 17, f. 3–4.

ALDER.

Sitka, south through the islands and Coast ranges of British Columbia, Washington territory, Oregon, and California to Santa Barbara, extending east through the Blue mountains to northern Montana.

A large tree, 24 to 30 meters in height, with a trunk 0.90 to 1.20 meter in diameter, or in British Columbia and the Blue mountains often reduced to a low shrub; river bottom lands and borders of streams; most common and reaching its greatest development along the large streams of western Washington territory and Oregon.

Wood light, soft, not strong, brittle, very close-grained, compact, easily worked, satiny, susceptible of a beautiful polish; medullary rays distant, broad; color, light brown tinged with red, the sap-wood nearly white; specific gravity, 0.4813; ash, 0.42; largely used in Oregon in the manufacture of furniture.

302.—Alnus rhombifolia, Nuttall,

Sylva, i, 33; 2 ed. i, 49.—Torrey, Bot. Wilkes Exped. 467.—Vasey, Cat. Forest Trees, 28.—Watson, Bot. California, ii, 80.

A. glutinosa, var. *serrulata*, Regel in Mem. Soc. Nat. Moscow, xix, 164, in part.

A. serrulata, var. *rugosa*, Regel in Bull. Soc. Nat. Moscow, xxxviii^4, 432, in part; De Candolle, Prodr. xvi^2, 188, in part.

ALDER.

Valley of the lower Fraser river, British Columbia, south through the Coast ranges to southern California, extending east along the ranges of Washington territory to Clear creek, Idaho (*Watson*), and the valley of the Flathead river, Montana (*Canby & Sargent*).

A small tree, 9 to 15 meters in height, with a trunk sometimes 0.60 to 0.90 meter in diameter, or toward its northern and eastern limits reduced to a shrub; borders of streams; the common alder of the California valleys.

Wood light, soft, not strong, brittle, close-grained, compact; medullary rays numerous, obscure; color, light brown, the sap-wood lighter, often nearly white; specific gravity, 0.4127; ash, 0.31.

303.—Alnus oblongifolia, Torrey,

Bot. Mex. Boundary Survey, 204.—Cooper in Smithsonian Rep. 1858, 266.—Watson in Pl. Wheeler, 17; Bot. California, ii, 80.—Rothrock in Wheeler's Rep. vi, 239.—Rusby in Bull. Torrey Bot. Club, ix, 79.

A. serrulata, var. *oblongifolia*, Regel in Bull. Soc. Nat. Moscow, xxxviii^4, 443; De Candolle, Prodr. xvi^2, 188.

ALDER.

San Bernardino and Cayumaca mountains, California, through the ranges of southern Arizona and southern New Mexico to the valley of the Rio Grande; southward into Mexico.

A tree 15 to 21 meters in height, with a trunk 0.90 to 1.20 meter in diameter; borders of streams in deep mountain cañons.

Wood light, soft, not strong, brittle, close-grained, compact; medullary rays numerous, very obscure; color, light brown tinged with yellow, the sap-wood nearly white; specific gravity, 0.3981; ash, 0.42.

304.—Alnus serrulata, Willdenow.

Spec. iv, 336; Enum. 965; Berl. Baumz. 2 ed. 21.—Nouveau Duhamel, ii, 216.—Persoon, Syn. ii, 550.—Desfontaines, Hist. Arb. ii, 488.—Aiton, Hort. Kew. 2 ed. v, 259.—Michaux f. Hist. Arb. Am. iii, 320, t. 4, f. 1; N. American Sylva, 3 ed. ii, 87, t. 75, f. 1.—Pursh, Fl. Am. Sept. ii, 623.—Barton, Prodr. Fl. Philadelph. 89; Compend. Fl. Philadelph. ii, 158.—Eaton, Manual, 105; 6 ed. 12.—Nuttall, Genera, ii, 206.—Hayne, Dend. Fl. 122.—Elliott. Sk. ii, 567.—Torrey, Compend. Fl. N. States, 350; Fl. N. York, ii, 202, t. 115.—Beck, Bot. 326.—Darlington, Fl. Cestrica, 3 ed. 276.—Loudon, Arboretum, iii, 1688, f. 1544.—Eaton & Wright, Bot. 120.—Bigelow, Fl. Boston. 3 ed. 220.—Spach in Ann. Sci. Nat. 2 ser. xv, 206; Hist. Veg. xi, 251.—Emerson, Trees Massachusetts, 218; 2 ed. i, 248 & t.—Endlicher, Genera, Suppl. iv², 21.—Darby, Bot. S. States, 508.—Chapman, Fl. S. States, 429.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 102.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 650; Bot. & Fl. 308.—Porcher, Resources S. Forests, 266.—Gray, Manual N. States, 5 ed. 461.—Young, Bot. Texas, 513.—Broadhead in Coulter's Bot. Gazette, iii, 60.

Betula rugosa, Du Roi, Harbk. i, 176.—Wangenheim, Amer. 86, t. 29, f. 60.—Ehrhart, Beitr. iii, 21.

?*Betula-Alnus glauca*, Marshall, Arbustum, 20.

Betula serrulata, Aiton, Hort. Kew. iii, 338.—Willdenow, Berl. Baumz. 1 ed. 45.—Abbot, Insects Georgia, ii, 183, t. 92.—Michaux, Fl. Bor.-Am. ii, 181.

A. serrulata, var. *vulgaris*, Spach in Ann. Sci. Nat. 2 ser. xv, 206.

A. serrulata, var. *macrophylla*, Spach in Ann. Sci. Nat. 2 ser. xv, 206.

A. serrulata, var. *oblongata*, Spach, Hist. Veg. xi, 251.

A. serrulata, var. *latifolia*, Spach, Hist. Veg. xi, 251.

A. rubra, Tuckerman in Am. Jour. Sci. 1 ser. xlv, 32.

A. hybrida, Reichenbach, Icon. Fl. Germ. xii, t. 630, f. 1292.

A. glutinosa, var. *serrulata*, Regel in Mem. Soc. Nat. Moscow, xix, 164, t. 11, f. 6, 8, in part.

A. glutinosa, var. *rugosa*, Regel in Mem. Soc. Nat. Moscow, xix, 165, t. 11, f. 9, 10.

A. serrulata genuina and *obtusifolia*, Regel in Bull. Soc. Nat. Moscow, xxxviii⁴, 432; De Candolle, Prodr. xvi², 188.

A. serrulata, var. *rugosa*, Regel in Bull. Soc. Nat. Moscow. xxxviii⁴, 432, in part; De Candolle, Prodr. xvi², 188, in part.

A. rugosa, Koch, Dendrologie, ii, 635.

A. oblongata, *undulata*, *rugosa*, *Canadensis*, and *Americana*, Hort.

BLACK ALDER. SMOOTH ALDER.

Essex county, Massachusetts, west to southern Missouri, south to northern Florida and the valley of the Trinity river, Texas.

A small tree, 6 to 12 meters in height, with a trunk 0.10 to 0.15 meter in diameter, or more often a tall, branching shrub forming dense thickets; borders of streams and swamps, probably reaching its greatest development in southern Arkansas.

Wood light, soft, close-grained, compact; medullary rays numerous, conspicuous; color, light brown, the sapwood lighter; specific gravity, 0.4666; ash, 0.38.

A decoction of the bark and leaves, as well as those of *A. incana*, is a popular remedy against impurity of the blood and in the treatment of diarrhœa and hæmaturia, etc. (*Nat. Dispensatory*, 2 ed. 135).

305.—Alnus incana, Willdenow,

Spec. iv, 335; Enum. 965; Berl. Baumz. 2 ed. 20.—Persoon, Syn. ii, 550.—Aiton, Hort. Kew. 2 ed. v, 259.—Hayne, Dend. Fl. 152.—Eaton, Manual, 6 ed. 12.—Loudon, Arboretum, iii, 1687, f. 1543.—Hooker, Fl. Bor.-Am. ii, 157.—Eaton & Wright, Bot. 120.—Spach in Ann. Sci. Nat. 2 ser. xv, 206; Hist. Veg. xi, 252.—Nuttall, Sylva, i, 30; 2 ed. i, 46.—Tuckerman in Am. Jour. Sci. 1 ser. xlv, 32.—Torrey, Fl. N. York, ii, 202.—Emerson, Trees Massachusetts, 220; 2 ed. i, 251 & t.—Endlicher, Genera, Suppl. iv², 21.—Parry in Owen's Rep. 618.—Cooper in Smithsonian Rep. 1858, 256.—Hooker f. in Trans. Linnæan Soc. xxiii², 301.—Wood, Cl. Book, 649; Bot. & Fl. 308.—Regel in Bull. Soc. Nat. Moscow, xxxviii⁴, 433; De Candolle, Prodr. xvi², 188.—Gray, Manual N. States, 5 ed. 461.—Koch, Dendrologie, ii. 636.—Vasey, Cat. Forest Trees, 28.—Macoun in Geological Rep. Canada, 1875–'76, 210.—Bell in Geological Rep. Canada, 1879–'80, 55c.

Betula-Alnus, var. *β. incana*, Linnæus, Spec. 1 ed. 983.—Du Roi, Harbk. i, 109.

Betula incana, Linnæus, Suppl. 417.—Aiton, Hort. Kew. iii, 339.—Willdenow, Berl. Baumz. 1 ed. 45.—Smith in Rees' Cycl. iv, No. 7.

? *Betula-Alnus rubra*, Marshall. Arbustum, 20.

A. glauca, Michaux f. Hist. Arb. Am. iii, 322, t. 4, f. 2; N. American Sylva, 3 ed. 89, t. 75, f. 2.—Bigelow, Fl. Boston. 3 ed. 367.

A. incana, var. *glauca*, Gray, Manual N. States, 1 ed. 423; 3 ed. 461.

A. incana, *Americana*, and *genuina*, Regel in Mem. Soc. Nat. Moscow, xix, 155.

SPECKLED ALDER. HOARY ALDER. BLACK ALDER.

Newfoundland to the eastern base of the Rocky mountains, south to northern New England, Wisconsin, Minnesota, and eastern Nebraska; in Europe.

A small tree, 6 to 7 meters in height, with a trunk 0.10 to 0.15 meter in diameter, or more often a tall, branching shrub; borders of streams and swamps.

A form with leaves green and glabrous on both sides or slightly pubescent, extending through the mountain ranges of the Pacific region from the Saskatchewan and British Columbia to New Mexico and the southern Sierra Nevadas of California, is—

var. virescens, Watson, Bot. California, ii, 81.

A. incana, var. *glauca*, Regel in Mem. Soc. Nat. Moscow, xix, 154, in part; Bull. Soc. Nat. Moscow, xxxviii[4] 433, in part; De Candolle, Prodr. xvi[2], 189, in part.—Watson in King's Rep. v, 326 [not Aiton]; Pl. Wheeler, 17.—Rothrock, Pl. Wheeler, 50; Wheeler's Rep. vi, 239.—Macoun in Geological Rep. Canada, 1875–'76, 210.

A. serrulata, var. *rugosa*, Regel in Bull. Soc. Nat. Moscow, xxxviii[4], 432, in part; De Candolle, Prodr. xvi[2], 188, in part.

Wood light, soft, close-grained, checking in drying; medullary rays numerous, broad; color, light brown, the sap-wood nearly white; specific gravity, 0.4607; ash, 0.42; preferred and largely used in northern New England in the final baking of bricks, and occasionally, as well as that of *A. serrulata*, in the manufacture of gunpowder.

SALICACEÆ.

306.—Salix nigra, Marshall,

Arbustum, 139.—Muhlenberg in Neue Schriften Gesell. Nat. Fr. Berlin, iv, 237, t. 4, f. 5 (Ann. Bot. ii, 65, t. 5, f. 5).—Willdenow, Spec. iv, 657; Enum. 1003; Berl. Baumz. 2 ed. 426.—Persoon, Syn. ii, 599.—Michaux f. Hist. Arb. Am. iii, 324, t. 5, f. 1; N. American Sylva, 3 ed. iii, 64, t. 125, f. 1.—Pursh, Fl. Am. Sept. ii, 614.—Poiret, Suppl. iv, 61.—Eaton, Manual, 118; 6 ed. 320.—Nuttall, Genera, ii, 231; Sylva, i, 79; 2 ed. i, 94.—Hayne, Dend. Fl. 180.—Elliott, Sk, ii, 670.—Sprengel, Syst. i, 100.—Torrey, Compend. Fl. N. States, 370; Fl. N. York, ii, 209.—Forbes, Sal. Woburn. 280.—W. Koch, Comment. 17.—Beck, Bot. 320.—Trautvetter in Mem. Acad. St. Petersburg, iii, 614.—Loudon, Arboretum, iii, 1529, 1604, f. 8.—Hooker, Fl. Bor.-Am. ii, 148.—Barratt, Sal. Am. No. 19.—Eaton & Wright, Bot. 408.—Dietrich, Syn. v, 419.—Seringe, Fl. Jard. ii, 35.—Emerson Trees Massachusetts, 271; 2 ed. i, 307 & t.—Darlington, Fl. Cestrica, 3 ed. 279.—Andersson in Ofr. af. Vet. Akad. Forh. 1858, 114 (Proc. Am. Acad. iv, 53); Kongl. Sven. Akad. Handl. vi, 19, f. 15; De Candolle, Prodr. xvi[2], 200.—Darby, Bot. S. States, 506.—Cooper in Smithsonian Rep. 1858, 256.—Walpers, Ann. v, 744.—Chapman, Fl. S. States, 430.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 75.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 654; Bot. & Fl. 310.—Porcher, Resources S. Forests, 334.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 209.—Gray, Manual N. States, 5 ed. 460; Hall's Pl. Texas, 21.—Koch, Dendrologie, ii, 513.—Young, Bot. Texas, 514.—Macoun in Geological Rep. Canada, 1875–'76, 210.—Vasey, Cat. Forest Trees, 28.—Bebb in Bot. California, ii, 83.—Sears in Bull. Essex Inst. xiii, 181.—Ridgway in Proc. U. S. Nat. Mus. 1882, 86.—Hemsley, Bot. Am.-Cent. iii, 180

S. pentandra, Walter, Fl. Caroliniana, 243.

S. Caroliniana, Michaux, Fl. Bor.-Am. ii, 226.—Lamarck, Dict. vi, 662.—Poiret, Suppl. v, 62.

S. Houstoniana, Pursh, Fl. Am. Sept. ii, 614.—Poiret, Suppl. v, 68.—Sprengel, Syst. i, 107.—Elliott, Sk. ii, 670.—Trautvetter in Mem. Acad. St. Petersburg, iii, 615.—Forbes, Sal. Woburn. 21, t. 21.—Eaton & Wright, Bot. 409.

S. falcata, Pursh, Fl. Am. Sept. ii, 614 [not HBK.].—Poiret, Suppl. v, 70.—Sprengel, Syst. i, 107.—Forbes, Sal. Woburn. 279.—Eaton, Manual, 6 ed. 320.—Hooker, Fl. Bor.-Am. ii, 149.—Barratt, Sal. Am. No. 21.—Dietrich, Syn. v, 420.

? *S. ambigua*, Pursh, Fl. Am. Sept. ii, 617.—Forbes, Sal. Woburn. 282.—Eaton, Manual, 6 ed. 321.—Eaton & Wright, Bot. 409.

S. ligustrina, Michaux f. Hist. Arb. Am. iii, 326, t. 5, f. 2; N. American Sylva, 3 ed. iii, 65, t. 125, f. 2.—Poiret, Suppl. v, 61.

S. Purshiana, Sprengel, Syst. iii, 608.—Beck, Bot. 320.—Darlington, Fl. Cestrica, 2 ed. 560.

S. flavo-virens, Hornemann in Cat. Hort. Hafn. Suppl. ii, 11.

? *S. cordata*, var. *falcata*, Torrey; Compend. Fl. N. States, 370.

S. nigra, var. *falcata*, Torrey, Fl. N. York, ii, 209.—Carey in Gray, Manual N. States, 1 ed. 429.—Darlington, Fl. Cestrica, 3 ed. 280.

BLACK WILLOW.

Southern New Brunswick and the northern shores of lakes Huron and Superior southward through the Atlantic region to bay Biscayne and the Caloosa river, Florida, and the valley of the Guadalupe river, Texas; Pacific region, valleys of the Sacramento river, California, and the Colorado river, Arizona.

A small tree, sometimes 15 to 18 meters in height, with a trunk rarely 0.60 meter in diameter, or in southern Florida reduced to a low shrub; usually along the banks of streams; most common in the basin of the Mississippi river and reaching its greatest development in the rich bottom lands of the Colorado and other rivers of eastern Texas; varying greatly in the size and shape of the leaves (vars. *angustifolia*, *longifolia*, *latifolia*, etc., *Andersson in Kongl. Sven. Akad. Handl.* vi, 20), length and habit of the aments, etc.

The best marked forms are—

var. **marginata**, Andersson in Kongl. Sven. Akad. Handl. vi, 22; De Candolle, Prodr. xvi², 201.

S. marginata, Wimmer in Schedul. Herb. Vindab.

var. **longipes**, Andersson in Kongl. Sven. Akad. Handl. vi, 22; De Candolle, Prodr. xvi², 201.

S. longipes, Shuttleworth in herb. Hooker.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 114 (Proc. Am. Acad. iv, 53).—Walpers, Ann. v, 744.

Forms of var. *longipes* more or less pubescent have been characterized by *Andersson in Kongl. Sven. Akad. Handl.* vi, 22; *De Candolle, Prodr.* xvi², 201, as subvars. *venulosa* and *gongylocarpa* [*Shuttleworth*], (*S. longipes*, var. *pubescens*, *Andersson in Proc. Am. Acad.* iv, 53; *S. subvillosa, Elliott in herb. Schweinitz ex. Nuttall, Sylva*, i, 79; 2 ed. i, 94, *vide Gray in Proc. Am. Acad.* iv, 53, note).

var. **Wrightii**, Andersson in Kongl. Sven. Akad. Handl. vi, 22; De Candolle, Prodr. xvi², 201.—Hemsley, Bot. Am.-Cent. iii, 180.

S. Wrightii, Andersson in Ofv. af. Vet. Akad. Forh. 1858, 115 (Proc. Am. Acad. iv, 55 —Walpers, Ann. v, 745.—Torrey in Bot. Mex. Boundary Survey, 204.

var. **Wardii**, Bebb in Bull. U. S. Nat. Mus. No. 22, 114.

Wood light, soft, weak, close-grained, checking badly in drying; medullary rays obscure; color, brown, the sap-wood nearly white; specific gravity, 0.4456; ash, 0.70.

The tonic and astringent bark used domestically as a popular febrifuge, and containing, in common with that of all the species of the genus, salicylic acid, a powerful anti-pyritic now successfully used in the treatment of acute cases of gout, rheumatism, typhoid fever, etc. (*Am. Jour. Pharm.* 1875, 303.—*U. S. Dispensatory*, 14 ed. 796, 1748.—*Nat. Dispensatory*, 2 ed. 1248).

NOTE.—The closely allied *Salix occidentalis*, Bosc, of the West Indies is not perhaps specifically distinct from *S. nigra*, with which some of the forms of var. *longipes* from southern Florida seem to connect it.

307.—Salix amygdaloides, Andersson,

Ofv. af Vet. Akad. Forh. 1858, 114 (Proc. Am. Acad. iv, 53).—Walpers, Ann. v, 744.—Bebb in Wheeler's Rep. vi, 240.

? *S. melanopsis*, Nuttall, Sylva, i, 78, t. 21; 2 ed. I, 93, t. 21.

S. nigra, var. *amygdaloides*, Andersson in Kongl. Sven. Akad. Handl. vi, 21; De Candolle, Prodr. xvi², 201.—Rothrock, Pl. Wheeler, 50.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 128.

WILLOW.

Shores of the great lakes (Wayne county, New York, *Hankenson*; Painesville, Ohio, *Beardslee*), westward to the valley of the Saskatchewan, and southward through the Rocky Mountain region to southern New Mexico; banks of the lower Columbia river, Oregon (*Howells*).

A small tree, rarely 9 to 12 meters in height, with a trunk 0.15 to 0.30 meter in diameter; along streams.

Wood light, soft, not strong, close-grained, checking in drying; the heart-wood light brown, sap-wood nearly white; specific gravity, 0.4509; ash, 0.92.

308.—Salix lævigata, Bebb,

Am. Nat. viii, 202; Bot. California, ii, 83.

WILLOW.

California, Sierra county (*Lemmon*) and the valley of the Sacramento river to the southern boundary of the state.

A tree sometimes 15 meters in height, with a trunk 0.30 to 0.60 meter in diameter; borders of streams and bottom lands.

A form with narrower falcate leaves (Yreka, *E. L. Greene*) is—

var. **angustifolia**, Bebb in Bot. California, ii, 84.—Rothrock in Wheeler's Rep. vi, 374.

A form with short, densely-flowered aments is—

var. **congesta**, Bebb in Bot. California, ii, 84.

Wood light, soft, not strong, brittle, close-grained, compact; medullary rays numerous, very thin; color, light brown tinged with red; specific gravity, 0.4872; ash, 0.58.

309.—Salix lasiandra, Bentham,

Pl. Hartweg. 336.—Torrey in Pacific R. R. Rep. iv, 138.—Newberry in Pacific R. R. Rep. vi, 89.—Bebb in Bot. California, ii, 84.

S. Hoffmanniana, Hooker & Arnott, Bot. Beechey, 159.

S. speciosa, Nuttall, Sylva, i, 58, t. 17; 2 ed. i, 74, t. 17 [not Hooker & Arnott].—Newberry in Pacific R. R. Rep. vi, 89.—Cooper in Pacific R. R. Rep. xii², 29.

S. lucida, var. *angustifolia*, forma *lasiandra*, Andersson in Ofv. af. Vet. Akad. Forh. 1858, 115 (Proc. Am. Acad. iv, 54).

S. arguta, var. *lasiandra*, Andersson in Kongl. Sven. Akad. Handl. vi, 33; De Candolle, Prodr. xvi², 206.

WILLOW.

British Columbia, shores of lake Kamloop (*Macoun*), southward to the valley of the Sacramento river, California; Rocky mountains, Utah, and through Colorado to New Mexico (var. *Fendleriana*).

A tree 12 to 18 meters in height, with a trunk sometimes 0.60 meter in diameter; banks of streams; very common; varying in the shape of the leaves and character of the aments.

The best marked forms are—

var. **lancifolia**, Bebb in Bot. California, ii, 84.

S. lancifolia, Andersson in Kongl. Sven. Akad. Handl. vi, 34, f. 23.—Gray in Proc. Am. Acad. vii, 402.—Hall in Coulter's Bot. Gazette, ii, 91.

S. lucida, var. *macrophylla*, Andersson in De Candolle, Prodr. xvi², 205.

The common form of British Columbia and western Washington territory and Oregon.

var. **Fendleriana**, Bebb in Bot. California, ii, 84.

S. pentandra, var. *caudata*, Nuttall, Sylva, i, 61, t. 18; 2 ed. i, 77, t. 18.

S. Fendleriana, Andersson in Ofv. af. Vet. Akad. Forh. 1858, 115 (Proc. Am. Acad. iv, 54).—Walpers, Ann. v, 745.

S. arguta, Andersson in Kongl. Sven. Akad. Handl. vi, 32; De Candolle, Prodr. xvi², 205, in part.

Wood light, soft, not strong, brittle, close-grained, compact; medullary rays numerous, very obscure; color, light brown, the sap-wood lighter or often nearly white; specific gravity, 0.4756; ash, 0.60. Var. *lancifolia*, specific gravity, 0.4547; ash, 0.79. Var. *Fendleriana*, the heart-wood brown, sap-wood light brown; specific gravity, 0.4598; ash, 0.56.

310.—Salix longifolia, Muhlenberg,

Neue Schriften Gesell. Nat. Fr. Berlin, iv, 238, t. 6, f. 6 (Ann. Bot. ii, 66, t. 5, f. 6).—Willdenow, Spec. iv, 670.—Persoon, Syn. ii, 600.—Pursh, Fl. Am. Sept. ii, 613.—Nuttall, Genera, ii, 231.—Torrey in Ann. Lyc. N. York, ii, 248; Fl. N. York, ii, 209; Nicollet's Rep. 160; Fremont's Rep. 97; Emory's Rep. 412; Sitgreaves' Rep. 172; Bot. Mex. Boundary Survey, 204.—Barratt, Sal. Am. No. 23.—Beck, Bot. 320.—Eaton, Manual, 6 ed. 319.—Eaton & Wright, Bot. 408.—Hooker, Fl. Bor.-Am. ii, 149.—Dietrich, Syn. v, 420.—Parry in Owen's Rep. 618.—Richardson, Arctic Exped. 439, 440.—Cooper in Smithsonian Rep. 1858, 261.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 116 (Proc. Am. Acad. iv, 56); Kongl. Sven. Akad. Handl. vi, 54, f. 25; De Candolle, Prodr. xvi², 214.—Walpers, Ann. v, 745.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 653; Bot. & Fl. 310.—Engelmann in Proc. Am. Phil. Soc. new ser. xii, 209.—Gray, Manual N. States, 5 ed. 465.—Watson in King's Rep. v, 324; Wheeler's Rep. 1872, 493.—Gray in Proc. Am. Acad. vii, 402.—Macoun in Geological Rep. Canada, 1875–'76, 210.—Vasey, Cat. Forest Trees, 29.—Hall in Coulter's Bot. Gazette, ii, 91.—Bebb in Wheeler's Rep. vi, 240; Bot. California, ii, 84.—Ward in Bull. U. S. Nat. Mus. No. 22, 116.

S. fluviatalis, Nuttall, Sylva, i, 73; 2 ed. i, 89.

? *S. rubra*, Richardson, Arctic Exped. Appx. 37?

S. longifolia, var. *pedicellata*, Andersson in Kongl. Sven. Akad. Handl. vi, 55, f. 35; De Candolle, Prodr. xvi², 214.—Macoun in Geological Rep. Canada, 1875–'76, 210.

SAND-BAR WILLOW.

Valley of the Connecticut river (Sunderland, Massachusetts, *N. G. Jesup*) and of the Potomac river at Washington (*Ward*); west and northwest through the region of the great lakes to the valley of the Mackenzie river, in latitude 66° N. (*Richardson*), through the Mississippi basin, Texas, the Rocky Mountain region, and the Pacific Coast states.

A small tree, 6 to 9 meters in height, with a trunk rarely exceeding 0.30 meter in diameter; borders of streams and river sand-bars, in low, wet sandy soil, often forming low, dense clumps; rare east of the Alleghany mountains; very common throughout the Mississippi River basin, and reaching its greatest development in the valleys of Oregon and northern California.

Well-marked forms, varying from the type in the form of the leaves, aments, and nature of pubescens, etc., are—

var. exigua, Bebb in Bot. California, ii, 85.

S. exigua, Nuttall, Sylva, i, 75; 2 ed. i, 90.

S. longifolia, var. *angustissima*, Andersson in Ofv. af. Vet. Akad. Forh. 1858, 116 (Proc. Am. Acad. iv, 56).

Western Texas to California and Oregon.

var. argyrophylla, Andersson in Kongl. Sven. Akad. Handl. vi, 55; De Candollo, Prodr. xvi², 214.—Watson in King's Rep. v, 324.—Porter in Hayden's Rep. 1872, 493.—Rothrock, Pl. Wheeler, 50.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 128.—Macoun in Geological Rep. Canada, 1875–'76, 210.—Bebb in Bot. California, ii, 85.

S. argophylla, Nuttall, Sylva, i, 71, t. 20; 2 ed. i, 87, t. 20.

? *S. brachycarpa*, Nuttall, Sylva, i, 69; 2 ed. i, 85.

S. longifolia, var. *opaca*, Andersson in Kongl. Sven. Akad. Handl. vi, 55.

S. longifolia, var. *argyrophylla angustissima*, Andersson in Kongl. Sven. Akad. Handl. vi, 55; De Candolle, Prodr. xvi², 214.

S. longifolia, var. *argyrophylla opaca*, Andersson in De Candolle, Prodr. xvi², 214.

Western Texas to Oregon.

Wood light, soft, very close-grained, compact; medullary rays numerous, very obscure; color, brown tinged with red, the sap-wood brown; specific gravity, 0.4930; ash, 0.48. Var. *exigua*, heavier, the heart- and sap-wood darker colored; specific gravity, 0.5342; ash, 1.06.

311.—Salix sessilifolia, Nuttall,

Sylva, i, 68; 2 ed. i, 84.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 116 (Proc. Am. Acad. iv, 56); Kongl. Sven. Akad. Handl. vi, 55, f. 36; De Candolle, Prodr. xvi², 214.—Walpers, Ann. v, 746.—Bebb in Bot. California, ii, 85.

S. sessilifolia, var. *villosa*, Andersson in De Candolle, Prodr. xvi², 215.

Puget sound southward to northern California, near the coast.

A small tree, 9 to 12 meters in height, with a trunk rarely exceeding 0.30 to 0.45 meter in diameter; borders of streams, in low, wet ground.

A form with narrower entire leaves, of the Sacramento valley and the California Coast ranges, is—

var. **Hindsiana**, Andersson in Ofv. af. Vet. Akad. Forh. 1858, 117 (Proc. Am. Acad. iv, 56).—Bebb in Bot. California, ii, 85.

S. Hindsiana, Bentham, Pl. Hartweg. 335.—Newberry in Pacific R. R. Rep. vi, 89.—Torrey in Pacific R. R. Rep. iv, 138.—Andersson in Kongl. Sven. Akad. Handl. vi, 56, f. 37; De Candolle, Prodr. xvi², 215.—Walpers, Ann. v, 746.

S. Hindsiana, var. *tenuifolia*, Andersson in Kongl. Sven. Akad. Handl. vi, 56; De Candolle, Prodr. xvi², 215.

Wood light, soft, close-grained, compact; medullary rays thin; color, light red, the sap-wood nearly white; specific gravity, 0.4397; ash, 0.50.

312.—Salix discolor, Muhlenberg,

Neue Schriften Gesell. Nat. Fr. Berlin, iv, 234, t. 5, f. 1 (Ann. Bot. ii, 62, t. 5, f. 1).—Willdenow, Spec. iv, 665.—Persoon, Syn. ii, 599.—Pursh, Fl. Am. Sept. ii, 613.—Poiret, Suppl. v, 56.—Nuttall, Genera, ii, 231.—Elliott, Sk. ii, 669.—Torrey, Compend. Fl. N. States, 369; Fl. N. York, ii, 206.—Sprengel, Syst. i, 104.—Forbes, Sal. Woburn. 279.—Eaton, Manual, 6 ed. 319.—Smith in Rees' Cycl. No. 25.—Darlington, Fl. Cestrica, 3 ed. 257.—Eaton & Wright, Bot. 408.—Loudon, Arboretum, iii, 1530, f. 1317, 1630, f. 147.—Bigelow, Fl. Boston. 3 ed. 392.—Hooker, Fl. Bor.-Am. ii, 147.—Barratt, Sal. Am. No. 3.—Emerson, Trees Massachusetts, 258; 2 ed. i, 296 & t.—Dietrich, Syn. v, 419.—Richardson, Arctic Exped. 312.—Darby, Bot. S. States, 506.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 114 (Proc. Am. Acad. iv, 63); Kongl. Sven. Akad. Handl. vi, 83, f. 49; De Candolle, Prodr. xvi², 225.—Walpers, Ann. v, 750.—Chapman, Fl. S. States, 430.—Gray, Manual N. States, 5 ed. 462.—Koch, Dendrologie, ii, 570.—Macoun in Geological Rep. Canada, 1874–'75, 210.—Ridgway in Proc. U. S. Nat. Mus. 1882, 86.

S. sensitiva, Barratt, Sal. Am. No. 8.

GLAUCOUS WILLOW.

Labrador, west to the valleys of the Peace and Athabasca rivers, southward through the Atlantic region to Delaware and southern Missouri.

A small tree, rarely exceeding 6 meters in height, with a trunk sometimes 0.30 meter in diameter, or more often a tall, straggling shrub 3 to 6 meters in height; along streams and borders of swamps in low, wet soil; varying greatly in the form of leaves, aments, and nature of pubescence.

The best marked forms are—

var. **eriocephala**, Andersson in Kongl. Sven. Akad. Handl. vi, 85; De Candolle, Prodr, xvi², 225.—Gray, Manual N. States, 5 ed. 463.

S. eriocephala, Michaux, Fl. Bor.-Am. ii, 225.—Lamarck, Dict. vi, 661.—Bigelow, Fl. Boston. 3 ed. 391.—Eaton, Manual, 6 ed. 321.—Eaton & Wright, Bot. 409.—Emerson, Trees Massachusetts, 1 ed. 259; 2 ed. i, 196 & t.—Carey in Gray's Manual N. States, 1 ed. 426.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 117 (Proc. Am. Acad. iv, 57).—Walpers, Ann. v, 746.

S. crassa, Barratt, Sal. Am. No. 7.

var. **prinoides**, Andersson in Kongl. Sven. Akad. Handl. vi, 86; De Candolle, Prodr. xvi², 225.—Emerson, Trees Massachusetts, 2 ed. i, 297.

S. prinoides, Pursh, Fl. Am. Sept. ii, 613.—Nuttall, Genera, ii, 231.—Sprengel, Syst. i, 102.—Poiret, Suppl. iv, 67.—Torrey, Compend. Fl. N. States, 366.—Smith in Rees' Cycl. No. 26.—Forbes, Sal. Woburn. 79, t. 40.—Eaton, Manual, 6 ed. 319.—Beck, Bot. 319.—Eaton & Wright, Bot. 407.—W. Koch, Comment. 46.—Loudon, Arboretum, iii, 1530, f. 1317, 1612, f. 40.—Hooker, Fl. Bor.-Am. ii, 150.—Emerson, Trees Massachusetts, 1, ed. 259.—Dietrich, Syn. v, 419.

Wood light, soft, close-grained, compact, containing many evenly-distributed, small, open ducts; medullary rays and layers of annual growth not obscure; color, brown streaked with orange, the sap-wood light brown; specific gravity, 0.4261; ash, 0.43.

313.—Salix flavescens, Nuttall,

Sylva, i, 65; 2 ed. i, 81.—Bebb in Bot. California, ii, 86, in part.

Rocky mountains of Idaho and Montana southward to the Mogollon range, New Mexico (*E. L. Greene*); on the Cascade mountains, Oregon, and the Sierra Nevada, California.

A small tree, sometimes 6 to 9 meters in height, with a trunk rarely 0.30 meter in diameter; borders of streams, reaching its greatest development in the southern Rocky Mountain region.

Wood light, soft, not strong, close-grained, compact; medullary rays numerous, obscure; color, brown tinged with red, the sap-wood nearly white; specific gravity, 0.4969; ash, 0.61.

Var. **Scouleriana**, Bebb;

Coulter's Bot. Gazette, vii, 129.

S. brachystachys, Bentham, Pl. Hartweg. 336.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 121 (Proc. Am. Acad. iv, 61); Kongl. Sven. Akad. Handl. vi, 82, f. 48; De Candolle, Prodr. xvi², 224.

S. Scouleriana, Barratt in Hooker, Fl. Bor.-Am. ii, 145, in part.—Cooper in Pacific R. R. Rep. xii², 29.

S. brachystachys, var. *Scouleriana*, Andersson in De Candolle, Prodr. xvi², 224.

S. flavescens, Bebb in Bot. California, ii, 86, in part.

BLACK WILLOW.

Kadiak island, Alaska (*Kellogg*), southward through British Columbia, western Washington territory, and Oregon to Santa Barbara, California.

A small tree, 8 to 9 meters in height, with a trunk rarely 0.60 meter in diameter; uplands, near springs or streams, or often in quite dry soil; common and reaching its greatest development near the shores of Puget sound.

Wood light, hard, strong, tough, close-grained, compact; medullary rays numerous, very obscure; color, light red, the sap-wood brown; specific gravity, 0.5412; ash, 0.39.

314.—Salix Hookeriana, Barratt;

Hooker, Fl. Bor.-Am. ii, 145, t. 180.—Nuttall, Sylva, i, 64; 2 ed. i, 80.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 119 (Proc. Am. Acad. iv, 59); De Candolle, Prodr. xvi², 274.—Walpers, Ann. v, 747.—Macoun in Geological Rep. Canada, 1875–'76, 210.

Grand rapids of the Saskatchewan (*Douglas*); coast of Washington territory and Oregon.

A small tree, 8 to 9 meters in height, with a trunk rarely 0.30 meter in diameter, or more often a low, straggling shrub with many prostrate stems; on the coast generally along the edge of sea-beaches, or in low, rather moist, sandy soil.

Wood light, soft, close-grained, compact, containing many minute open ducts; medullary rays thin, very obscure; color, light brown tinged with red, the sap-wood nearly white; specific gravity, 0.5350; ash, 0.32.

315.—Salix cordata, var. vestita, Andersson,

Kongl. Sven. Akad. Handl. vi, 159; De Candolle, Prodr. xvi², 252.

DIAMOND WILLOW.

Valley of the Missouri river and its tributaries, Fort Osage, Missouri (*Prince Neuwied*), Iowa, Nebraska, and westward to about the one hundred and tenth degree of longitude.

A small tree, rarely 8 meters in height, with a trunk 0.15 to 0.20 meter in diameter, or more often a straggling shrub not exceeding 1.80 to 3 meters in height; low bottom lands, in wet, sandy soil.

Wood light, soft, close-grained, compact, the annual layers of growth clearly defined; medullary rays very obscure; color, brown or often tinged red, the sap-wood nearly white; specific gravity, 0.6069; ash, 0.59; heavier than that of other species examined, and largely used for fence posts, being said to equal, when thoroughly seasoned, red cedar in durability in contact with the soil.

NOTE.—The typical *Salix cordata*, Muhlenberg, of wide distribution through the Atlantic region, rarely, if ever, attains arborescent size or habit.

316.—Salix lasiolepis, Bentham,

Pl. Hartweg. 335.—Cooper in Smithsonian Rep. 1858, 261.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 118 (Proc. Am. Acad. iv, 58); De Candolle, Prodr. xvi², 264.—Walpers, Ann. v, 747.—Vasey, Cat. Forest Trees, 29.—Bebb in Bot. California, ii, 86.

S. lasiolepis, var. *Bigelovii*, Bebb in Bot. California, ii, 86 (a vernal state, *teste* Bebb *in lit.*).

S. Bigelovii, Torrey in Pacific R. R. Rep. iv, 139.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 118 (Proc. Am. Acad. iv, 58); Kongl. Sven. Akad. Handl. vi, 163, f. 94; De Candolle, Prodr. xvi², 255.—Walpers, Ann. v, 747.

S. Bigelovii, var. *fuscior*, Andersson in Kongl. Sven. Akad. Handl. vi, 163; De Candolle, Prodr. xvi², 255.

S. ———, ? Watson in King's Rep. v, 325.

S. lasiolepis, var. *fallax*, Bebb in Bot. California, ii. 86.

WILLOW.

California, valley of the Klamath river, southward through the western portions of the state, reaching in the Sierra Nevadas an elevation of 3,500 to 4,000 feet above the sea.

A small tree, sometimes 12 to 18 meters in height, with a trunk 0.45 to 0.50 meter in diameter, or northward and at high elevations reduced to a low shrub; leaves varying greatly in shape and breadth (vars. *angustifolia* and *latifolia, Andersson in De Candolle Prodr.* xvi², 255), or toward its southern limit often persistent until spring (*S. Hartwegi, Bentham in Pl. Hartweg,* 52; *S. humilis,* var. *Hartwegi, Andersson, l. c.* 236).

Wood light, soft, not strong, close-grained, compact; medullary rays numerous, thin; color, light brown, the sap-wood nearly white; specific gravity, 0.5587; ash, 0.98; somewhat used as fuel, especially in the southern part of the state.

317.—Salix Sitchensis, Sanson;

Bongard in Mem. Acad. St. Petersburg, 6 ser. ii, 162.—Ledebour, Fl. Rossica, iii, 609.—Richardson, Arctic Exped. 439.—Andersson in Ofv. af. Vet. Akad. Forh. 1858, 126 (Proc. Am. Acad. iv, 66); Kongl. Sven. Akad. Handl. vi, 106, f. 59; De Candolle, Prodr. xvi², 233.—Walpers, Ann. v, 752.—Gray in Proc. Am. Acad. vii, 402.—Hall in Coulter's Bot. Gazette, ii, 93.—Bebb in Bot. California, ii, 87; Coulter's Bot. Gazette, vii, 25.

S. cuneata, Nuttall, Sylva, i, 66; 2 ed. i, 82.

SILKY WILLOW.

Alaska, southward near the coast to Santa Barbara, California.

A low, much-branched tree, rarely exceeding 8 meters in height, with a trunk 0.30 to 0.45 meter in diameter, or more often a straggling shrub; low, wet soil, borders of streams and ponds.

A form with narrow oblanceolate leaves is—

var. angustifolia, Bebb in Bot. California, ii, 87.

S. chlorophylla, var. *pellita*, Andersson in Kongl. Sven. Akad. Handl. 139, f. 72; De Candolle, Prodr. xvi², 244.

Wood light, soft, close-grained, compact; medullary rays numerous, thin; color, light red, the sap-wood nearly white; specific gravity, 0.5072; ash, 0.59.

318.—Populus tremuloides, Michaux,

Fl. Bor.-Am. ii, 243.—Nouveau Duhamel, ii, 184, t. 53.—Persoon, Syn. ii, 623.—Desfontaines, Hist. Arb. ii, 465.—Michaux f. Hist. Arb.-Am. iii, 285, t. 8, f. 1; N. American Sylva, 3 ed. ii, 175, t. 99, f. 1.—Poiret, Suppl. iv, 377.—Willdenow, Enum. Suppl. 67.—Torrey, Ann. Lyc. N. York, ii, 249; Compend. Fl. N. States, 375; Fremont's Rep. 97; Fl. N. York, ii, 214; Sitgreaves' Rep. 172; Ives' Rep. 27; Bot. Wilkes Exped, 468.—Beck, Bot. 323.—Darlington, Fl. Cestrica, 3 ed. 281.—Eaton, Manual, 117; 6 ed. 277.—Lindley, Fl. Med. 320.—Hooker, Fl. Bor.-Am. ii, 154.—Eaton & Wright, Bot. 370.—Bigelow, Fl. Boston. 3 ed. 397.—Spach in Ann. Sci. Nat. 2 ser. xv, 30; Hist. Veg. x, 384.—Nuttall, Sylva, i, 55; 2 ed. i, 70.—Seringe, Fl. des Jard. ii, 56.—Parry in Owen's Rep. 618.—Newberry in Pacific R. R. Rep. vi, 25, 89.—Cooper in Smithsonian Rep. 1858, 257; Pacific R. R. Rep. xii², 29, 68; Am. Nat. iii, 409.—Hooker f. in Trans. Linnæan Soc. xxiii², 301.—Wood, Cl. Book, 655; Bot. & Fl. 311.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 209.—Gray, Manual N. States, 5 ed. 466.—Wesmæl in De Candolle, Prodr. xvi², 325.—London Gard. Chronicle, 1871, 683.—Watson in King's Rep. v, 327; Pl. Wheeler, 17; Am. Jour. Sci. 3 ser. xv, 135; Bot. California, ii, 91.—Porter in Hayden's Rep. 1871, 494.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 128.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 29.—Hall in Coulter's Bot. Gazette, ii, 91.—Macoun in Geological Rep. Canada, 1875–'76, 210.—Rothrock in Wheeler's Rep. vi, 51.—Beal in Am. Nat. xv, 32, f. 1.—Trelease in Coulter's Bot. Gazette, vi, 284, f. 6.—Sears in Bull. Essex Inst. xiii, 183.—G. M. Dawson in Canadian Nat. new ser. ix, 231.—Ridgway in Proc. U. S. Nat. Mus. 1882, 87.

P. trepida, Willdenow, Spec. iv, 803.—Aiton, Hort. Kew. 2 ed. 395.—Pursh. Fl. Am. Sept. ii, 618.—Eaton, Manual, 117.—Nuttall, Genera, ii, 239.—Sprengel, Syst. ii, 244.—Loudon, Arboretum, iii, 1649, f. 1510.

P. tremuliformis, Emerson, Trees Massachusetts, 243; 2 ed. i, 279 & t.

P. Atheniensis, Hort.—Koch, Dendrologie, ii, 486 (excl. syn.).

ASPEN. QUAKING ASP.

Northern Newfoundland and Labrador to the southern shores of Hudson bay, northwest to the Great Bear lake, the mouth of the Mackenzie river, and the valley of the Yukon river, Alaska; south in the Atlantic region to the mountains of Pennsylvania, the valley of the lower Wabash river, and northern Kentucky; in the Pacific region south to the valley of the Sacramento river, California, and along the Rocky mountains and interior ranges to southern New Mexico, Arizona, and central Nevada.

A small tree, 15 to 18 meters in height, with a trunk rarely exceeding 0.60 meter in diameter; very common through British America and spreading over enormous areas bared by fire of the coniferous forest; in the Pacific region very common upon moist mountain slopes and bottoms at an elevation of 6,000 to 10,000 feet; the most widely-distributed North American tree.

Wood light, soft, not strong, close-grained, compact, not durable, containing, as does that of the whole genus, numerous minute, scattered, open ducts; medullary rays very thin, hardly distinguishable; color, light brown, the thick sap-wood nearly white; specific gravity, 0.4032; ash, 0.55; largely manufactured into wood-pulp, a substitute for rags in the manufacture of paper; in the Pacific region sometimes used for fuel, flooring, in turnery, etc.

A bitter principle in the bark causes its occasional use as a tonic in the treatment of intermittent fevers and cases of debility (*U. S. Dispensatory*, 14 ed. 1763).

319.—Populus grandidentata, Michaux,

Fl. Bor.-Am. ii, 243.—Persoon, Syn. ii, 624.—Desfontaines, Hist. Arb. ii, 466.—Michaux f. Hist. Arb. Am. iii, 287, t. 8, f. 2; N. American Sylva, 3 ed. ii, 176, t. 99, f. 2.—Pursh, Fl. Am. Sept. ii, 619.—Poiret, Suppl. iv, 377.—Barton, Compend. Fl. Philadelph. ii, 197.—Nuttall, Genera, ii, 239.—Hayne, Dend. Fl. 200.—Willdenow, Enum. Suppl. 67.—Elliott, Sk. ii, 710.—Sprengel, Syst. ii, 244.—Torrey, Compend. Fl. N. States, 375; Fl. N. York, ii, 214.—Beck, Bot. 323.—Eaton, Manual, 6 ed. 277.—Hooker, Fl. Bor.-Am. ii, 154.—Eaton & Wright, Bot. 370.—Loudon, Arboretum, iii, 1650, f. 1511.—Bigelow, Fl. Boston. 3 ed. 397.—Spach in Ann. Sci. Nat. xv, 2 ser. 33; Hist. Veg. x, 384.—Emerson, Trees Massachusetts, 242; 2 ed. i, 278 & t.—Seringe in Fl. des Jard. ii, 56.—Parry in Owen's Rep. 618.—Darlington, Fl. Cestrica, 3 ed. 281.—Darby, Bot. S. States, 507.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 431.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 73.—Wood, Cl. Book, 656; Bot. & Fl. 311.—Gray, Manual N. States, 5 ed. 466.—Koch, Dendrologie, ii, 487.—Wesmæl in De Candolle, Prodr. xvi², 327.—Vasey, Cat. Forest Trees, 29.—Watson in Am. Jour. Sci. 3 ser. xv, 135.—Beal in Am. Nat. xv, 34, f. 2.—Sears in Bull. Essex Inst. xiii, 182.—Trelease in Coulter's Bot. Gazette, vi, 285.—Bell in Geological Rep. Canada, 1879–'80, 56ᶜ.

P. grandidentata, var. *pendula*, Torrey, Compend. Fl. N. States, 375.—Nuttall, Genera, ii, 239.

POPLAR.

Nova Scotia, New Brunswick, and west through Ontario to northern Minnesota, south through the northern states and along the Alleghany mountains to North Carolina, extending west to middle Kentucky and Tennessee.

A tree 21 to 24 meters in height, with a trunk 0.50 to 0.75 meter in diameter; rich woods and borders of streams and swamps.

Wood light, soft, not strong, close-grained, compact; medullary rays thin, obscure; color, light brown, the sap-wood nearly white; specific gravity, 0.4632; ash, 0.45; largely manufactured into wood-pulp and occasionally used in turnery, for woodenware, etc.

320.—Populus heterophylla, Linnæus,

Spec. 1 ed. 1034.—Marshall, Arbustum, 107.—Wangenheim, Amer. 85.—Walter, Fl. Caroliniana, 248.—Aiton, Hort. Kew. iii, 407; 2 ed. v, 397.—Nouveau Duhamel, ii, 181, t. 51.—Michaux, Fl. Bor.-Am. ii, 244.—Willdenow, Spec. iv, 806; Enum. 1017; Berl. Baumz. 293.—Desfontaines, Hist. Arb. ii, 466—Pursh, Fl. Am. Sept. ii, 619.—Nuttall, Genera, ii, 239.—Hayne, Dend. Fl. 203.—Elliott, Sk. ii, 712.—Sprengel, Syst. ii, 244.—Torrey, Compend. Fl. N. States, 375; Fl. N. York, ii, 215.—Beck, Bot. 323.—Eaton, Manual, 6 ed. 278.—Darlington, Fl. Cestrica, 3 ed. 281.—Loudon, Arboretum, iii, 1672, f. 1534.—Eaton & Wright, Bot. 371.—Spach in Ann. Sci. Nat. 2 ser. xv, 30; Hist. Veg. x, 386.—Seringe in Fl. des Jard. ii, 61.—Darby, Bot. S. States, 507.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 431.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 73.—Wood, Cl. Book, 656; Bot. & Fl. 311.—Gray, Manual N. States, 5 ed. 467.—Koch, Dendrologie, ii, 488.—Wesmæl in De Candolle, Prodr. xvi², 326.—Vasey, Cat. Forest Trees, 29.—Watson in Am. Jour. Sci. 3 ser. xv, 135.—Trelease in Coulter's Bot. Gazette, vi, 285.—Ridgway in Proc. U. S. Nat. Mus. 1881, 86.

P. cordifolia, Burgsdorf, Anleit. Erz. Holzart. 3 ed. 152.

P. argentea, Michaux f. Hist. Arb. Am. iii, 390, t. 9; N. American Sylva, 3 ed. ii, 170, t. 97.

P. heterophylla, var. *argentea*, Wesmæl in De Candolle, Prodr. xvi², 376.

RIVER COTTONWOOD. SWAMP COTTONWOOD.

Guilford, Connecticut (*W. R. Dudley*), Northport, Long island, south, generally near the coast, to southern Georgia, through the Gulf states to western Louisiana, and through Arkansas to central Tennessee and Kentucky, southern Illinois and Indiana.

A tree 24 to 27 meters in height, with a trunk 0.60 to 0.75 meter in diameter; borders of river swamps; most common and reaching its greatest development in the basin of the lower Ohio river; rare and local.

Wood light, soft, not strong, close-grained, compact; medullary rays thin, very obscure; color, dull brown, the thick sap-wood lighter brown; specific gravity, 0.4089; ash, 0.81.

321.—Populus balsamifera, Linnæus,

Spec. 1 ed. 1034.—Du Roi, Harbk. 82 —Marshall, Arbustum, 107.—Wangenheim, Amer. 85, t. 28, f. 59.—Aiton, Hort. Kew. iii, 406; 2 ed. v, 397.—Mœnch, Meth. 338.—B. S. Barton, Coll. i, 16.—Nouveau Duhamel, ii, 179, t. 50.—Michaux, Fl. Bor.-Am. ii, 244.—Willdenow, Spec. iv, 805; Enum. 1017; Berl. Baumz. 290.—Persoon, Syn. ii, 624.—Desfontaines, Hist. Arb. ii, 466.—Michaux f. Hist. Arb. Am. iii, 306, t. 13, f. 1; N. American Sylva, 3 ed. ii, 172, t. 98, f. 1.—Pursh, Fl. Am. Sept. ii, 618.—Eaton, Manual, 117; 6 ed. 278.—Nuttall, Genera, ii, 239; Sylva, i, 55; 2 ed. i, 70.—Hayne, Dend. Fl. 202.—Sprengel, Syst. ii, 244.—Beck, Bot. 322.—Lindley, Fl. Med. 320.—Loudon, Arboretum, iii, 1637, f. 1535, 1536 & t.—Hooker, Fl. Bor.-Am. ii, 153.—Eaton & Wright, Bot. 370.—Hooker & Arnott, Bot. Beechey, 159.—Spach in Ann. Sci. Nat. 2 ser. xv, 33; Hist. Veg. x, 393.—Lindley, Bot. Reg. xxix, Misc. 20.—Seringe in Fl. des Jard. ii, 65.—Torrey, Fl. N. York, ii, 216; Bot. Wilkes Exped. 469.—Cooper in Smithsonian Rep. 1858, 257; Am. Nat. iii, 408.—Hooker f. in Trans. Linnæan Soc. xxiii², 301.—Wood, Cl. Book, 656; Bot. & Fl. 311.—Gray, Manual N. States, 5 ed. 467.—Koch, Dendrologie, ii, 495.—Vasey, Cat. Forest Trees, 29.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Watson in Am. Jour. Sci. xv, 135.—Beal in Am. Nat. xv, 34, f. 4.—Trelease in Coulter's Bot. Gazette, vi, 285.—Sears in Bull. Essex Inst. xiii, 181.—Bell in Geological Rep. Canada, 1879–'80, 45c.

P. Tacamahaca, Miller, Dict.

P. viminea, Bon Jard. 1845, 565.

P. balsamifera, var. *genuina*, Wesmæl in De Candolle, Prodr. xvi², 329.

BALSAM. TACAMAHAC. BALM OF GILEAD.

Straits of Belle Isle to Richmond gulf and cape Churchill, Hudson bay, northwest to the shores of the Great Bear lake and the valley of the Yukon river, Alaska, south to northern New England, central Michigan and Minnesota, the Rocky mountains and interior ranges of Montana and Idaho, Washington territory, and British Columbia.

A large tree, 18 to 24 meters in height, with a trunk 1.50 to 2.10 meters in diameter; very common on all islands and shores of the northern rivers; in British Columbia generally confounded with the allied *P. trichocarpa*, the range of the two species here still uncertain.

Wood very light, soft, not strong, close-grained, compact; medullary rays numerous, very obscure; color, brown, the thick sap-wood nearly white; specific gravity, 0.3635; ash, 0.66.

The buds, as well as those of several other species, covered with a resinous exudation, and occasionally used medicinally as a substitute for turpentine and other balms.

Var. candicans, Gray,

Manual N. States, 2 ed. 419; 5 ed. 467.—Cooper in Smithsonian Rep. 1858, 257.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 129.—Watson in Am. Jour. Sci. 3 ser. xv, 135.—Bull. Torrey Bot. Club, vii, 57.—Trelease in Coulter's Bot. Gazette, vi, 285.

P. balsamifera lanceolata, Marshall, Arbustum, 108.

P. candicans, Aiton, Hort. Kew. iii, 406; 2 ed. v. 397.—Nouveau Duhamel, ii, 179.—Willdenow, Spec. iv, 806; Enum. 1017; Berl. Baumz. 291.—Persoon, Syn. ii, 624.—Michaux f. Hist. Arb. Am. iii, 308, t. 13, f. 2; N. American Sylva, 3 ed. ii, 173, t. 98, f. 2.—Pursh, Fl. Am. Sept. ii, 618.—Barton, Prodr. Fl. Philadelph. 96.—Poiret, Suppl. iv, 378.—Nuttall, Genera, ii, 239.—Hayne, Dend. Fl. 202.—Sprengel, Syst. ii, 244.—Torrey, Compend. Fl. N. States, 375; Fl. N. York, ii, 217.—Audubon, Birds, t. 59.—Beck, Bot, 332.—Eaton, Manual, 6 ed. 278.—Loudon, Arboretum, ii, 1676, f. 1537.—Hooker, Fl. Bor.-Am. ii, 154.—Eaton & Wright, Bot. 370.—Bigelow, Fl. Boston. 3 ed. 398.—Spach in Ann. Sci. Nat. 2 ser. xv, 33; Hist. Veg. x, 392.—Lindley, Bot. Reg. xxix, Misc. 22.—Emerson, Trees Massachusetts, 245; 2 ed. i, 281.—Seringe in Fl. des Jard. ii, 63.—Gray, Manual N. States, 1 ed. 431.—Wood, Cl. Book, 656; Bot. & Fl. 311.—Wesmæl in De Candolle, Prodr. xvi², 330.

P. Canadensis, Mœnch, Weiss. 81 [not Michaux f.].

P. latifolia, Mœnch, Meth. 338.

P. Ontariensis, Hort.—Loddiges, Cat. 1836.

P. macrophylla, Lindley in Loudon, Encyc. Pl. 840.

P. acladesca and *P. heterophylla*, Hort. (ex. Koch, Wachen. 1865, 238).

A large tree, rare or unknown in a wild state; very common in cultivation.

The wood heavier than that of the species; specific gravity, 0.4161; ash, 0.46.

322.—Populus angustifolia, James,

Long's Exped. i, 497.—Torrey in Ann. Lyc. N. York, ii, 249; Fremont's Rep. 97; Sitgreaves' Rep. 172; Ives' Rep. 27; Bot. Wilkes Exped. 469.—Nuttall, Sylva, i, 52, t. 16; 2 ed. i, 68, t. 16.—Cooper in Smithsonian Rep. 1858, 261; Am. Nat. iii, 408.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 29.—Watson in Am. Jour. Sci. 3 ser. xv, 136; Bot. California, ii, 91.

P. Canadensis, var. *angustifolia*, Wesmæl in De Candolle, Prodr. xvi², 329.

P. balsamifera, var. *angustifolia*, Watson in King's Rep. v, 327; Pl. Wheeler, 17.—Porter in Hayden's Rep. 1871, 494.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 128.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Rusby in Bull. Torrey Bot. Club, ix, 106.

BLACK COTTONWOOD.

Black hills of Dakota (*R. Douglas*), Swimming Horse creek, and the Snowy Mountain region, Montana, Red Rock creek, southwestern Montana (*Watson*), east Humboldt and Shoshone mountains, Nevada, Rocky mountains of Colorado, and the ranges of southwestern New Mexico and eastern Arizona.

A small tree, 15 to 18 meters in height, with a trunk rarely exceeding 0.60 meter in diameter; borders of streams, between 6,000 and 10,000 feet elevation.

Wood light, soft, weak, close-grained, compact; medullary rays numerous, obscure; color, brown, the sap-wood nearly white; specific gravity, 0.3912; ash, 0.79.

323.—Populus trichocarpa, Torrey & Gray;

Hooker, Icon. v, 878.—Walpers, Ann. v, 767.—Cooper in Smithsonian Rep. 1858, 266.—Wesmæl in De Candolle, Prodr. xvi², 330.—Watson in King's Rep. v, 328; Am. Jour. Sci. 3 ser. xv, 136; Bot. California, ii, 91.—Torrey, Bot. Wilkes Exped. 469.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Trelease in Coulter's Bot. Gazette, vi, 285, f. 5.—G. M. Dawson in Canadian Nat. new ser. ix, 331.

P. balsamifera, var. Hooker, Fl. Bor.-Am. ii, 154.

P. angustifolia, Newberry in Pacific R. R. Rep. vi, 89 [not James].—Cooper in Pacific R. R. Rep. xii², 29, 68.

P. balsamifera, Lyall in Jour. Linnæan Soc. vii, 134 [not Linnæus].—Hall in Coulter's Bot. Gazette, ii, 91.

P. trichocarpa, var. *cupulata*, Watson in Am. Jour. Sci. 3 ser. xv, 136; Bot. California, ii, 91.

P. balsamifera, var. ? *Californica*, Watson in Am. Jour. Sci. 3 ser. xv, 136.

BLACK COTTONWOOD. BALSAM COTTONWOOD.

Valley of the Fraser river, British Columbia, and probably much farther north, east to the eastern base of the Bitter Root mountains, Montana (*Watson*), south through Washington territory, western Oregon and California to the southern borders of the state.

A large tree, 24 to 60 meters in height, with a trunk 1.20 to 2.10 meters in diameter; banks of streams and bottom lands below 6,000 feet elevation; very common and reaching its greatest development in the valleys of the lower Columbia river and the streams flowing into Puget sound, here the largest deciduous tree of the forest.

Wood very light, soft, not strong, rather close-grained, compact; medullary rays thin, hardly distinguishable; color, light dull brown, the sap-wood lighter, nearly white; specific gravity, 0.3814; ash, 1.27; in Oregon and Washington territory largely manufactured into staves of sugar barrels, woodenware, etc.

324.—Populus monilifera, Aiton,

Hort. Kew. iii, 406; 2 ed. v, 396.—Abbot, Insects Georgia, ii, 71.—Nouveau Duhamel, ii, 186.—Willdenow, Spec. iv, 805; Enum. 1017; Berl. Baumz. 292.—Persoon, Syn. ii, 623.—Desfontaines, Hist. Arb. ii, 465.—Michaux f. Hist. Arb. Am. iii, 295, t. 10, f. 2; N. American Sylva, 3 ed. ii, 168, t. 96, f. 2.—Pursh, Fl. Am. Sept. ii, 618.—Nuttall, Genera, ii, 239; Trans. Am. Phil. Soc. 2 ser. v, 167.—Hayne, Dend. Fl. 202.—Sprengel, Syst. ii, 244.—Watson, Dend. Brit. ii, t. 102.—Beck, Bot. 323.—Eaton, Manual, 6 ed. 278.—Loudon, Arboretum, iii, 1657, f. 1517 & t.—Eaton & Wright, Bot. 371.—Spach in Ann. Sci. Nat. 2 ser. xv, 32; Hist. Veg. x, 389.—Torrey in Fremont's Rep. 97; Fl. N. York, ii, 215; Pacific R. R. Rep. v, 365.—Emerson, Trees Massachusetts, 249; 2 ed. i, 287.—Seringe in Fl. des Jard. ii, 63.—Cooper in Smithsonian Rep. 1858, 257.—Gray in Pacific R. R. Rep. xii², 47; Manual N. States, 5 ed. 467.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 72.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 655.—Engelmann in Trans. Am. Phil. Soc. xii, 209.—Watson in King's Rep. v, 327; Am. Jour. Sci. 3 ser. xv, 136.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Trelease in Coulter's Bot. Gazette, vi, 285, f. 3, 4.—Ward in Bull. U. S. Nat. Mus. No. 22, 116.—Beal in Am. Nat. xv, 34, f. 3.—Bell in Geological Rep. Canada, 1879–'80, 56ᶜ.—Ridgway in Proc. U. S. Nat. Mus. 1882, 87.—Chapman, Fl. S. States, Suppl. 649.

? *P. deltoide*, Marshall, Arbustum, 106.

P. angulata, Aiton, Hort. Kew. iii, 406; 2 ed. v, 396.--Nouveau Duhamel, ii, 186.—Desfontaines, Hist. Arb. ii, 466.—Willdenow, Spec. iv, 805; Enum. 1017; Berl. Baumz. 294.—Michaux f. Hist. Arb. Am. iii, 302, t. 12; N. American Sylva, 3 ed. ii, 161, t. 94.—Pursh. Fl. Ann. Sept. ii, 619.—Eaton, Manual, 117; 6 ed. 277.—Nuttall, Genera, ii, 239.—James in Long's Exped. ii, 164.—Torrey in Ann. Lyc. N. York, ii, 249.—Elliott, Sk. ii, 711.—Sprengel, Syst. ii, 244.—London, Arboretum, iii, 1670, 1533 & t.—Eaton & Wright, Bot. 370.—Spach in Ann. Sci. Nat. 2 ser. xv, 321; Hist. Veg. x, 391.—Seringe in Fl. des Jard. ii, 64.—Scheele in Rœmer, Texas, 446.—Darby, Bot. S. States, 507.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 431.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 655; Bot. & Fl. 311.—Gray, Manual N. States, 5 ed. 467.—Wesmæl in De Candolle, Prodr. xvi², 328.—Koch, Dendrologie, ii, 494.—Young, Bot. Texas, 514.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 129.—Vasey, Cat. Forest Trees, 29.—Sears in Bull. Essex Inst. xiii, 182.

P. lævigata, Aiton, Hort. Kew. iii, 406; 2 ed. v, 395.—Willdenow, Spec. iv, 803.—Pursh, Fl. Am. Sept. ii, 619.—Poiret, Suppl. iv, 378.—Nuttall, Genera, ii, 239; Sylva, i, 54; 2 ed. i, 70.—Sprengel, Syst. ii, 244.—Beck, Bot. 323.—Eaton, Manual, 6 ed. 278.—Loddiges, Cat. ed. 1836.—Eaton & Wright, Bot. 370.—Emerson, Trees Massachusetts, 246; 2 ed. i, 283.

P. glandulosa, Mœnch, Meth. 339.

P. angulosa, Michaux, Fl. Bor.-Am. ii, 243.

P. Canadensis, Michaux f. Hist. Arb. Am. iii, 302, t. 12; N. American Sylva, 3 ed. ii, 164, t. 95.—Spach in Ann. Sci. Nat. 2 ser. xv, 32; Hist. Veg. x, 390.—Seringe in Fl. des Jard. ii, 65.—Fescali, Forst. Pfl. 122, t. 8, f. 10–14.—Wood, Bot. & Fl. 311.—Wesmæl in De Candolle, Prodr. xvi², 329.—Koch, Dendrologie, ii, 491.

P. Virginiana, Du Mont, Cours. Bot. Cult. vi, 400.

P. Marylandica, Bosc in Nouv. Dict. xi, 409.—Poiret, Suppl. iv, 378.—Sprengel, Syst. ii, 244.

P. macrophylla, Loddiges, Cat. ed. 1836.

P. Lindleyana, *P. neglecta*, and *P. lævigata*, Hort.

COTTONWOOD. NECKLACE POPLAR. CAROLINA POPLAR. BIG COTTONWOOD.

Shores of lake Champlain, Vermont, south through western New England to the Chattahoochee region of western Florida, west along the northern shores of lake Ontario to the eastern base of the ranges of the Rocky mountains of Montana, Colorado, and New Mexico.

A large tree, 24 to 51 meters in height, with a trunk 1.20 to 2.40 meters in diameter; low, moist soil; the common cottonwood of Texas and the western plains, bordering all streams flowing east from the Rocky mountains.

Wood very light, soft, not strong, close-grained, compact, liable to warp in drying, difficult to season; medullary rays numerous, obscure; color, dark brown, the thick sap-wood nearly white; specific gravity, 0.3889; ash, 0.96; largely used in the manufacture of paper-pulp, for light packing-cases, fence boards, and fuel.

325.—Populus Fremontii, Watson,

Proc. Am. Acad. x, 350; Am. Jour. Sci. 3 ser. xv, 136; Bot. California, ii, 92.

P. monilifera, Newberry in Pacific R. R. Rep. vi, 327 [not Aiton].—Watson in King's Rep. v, 327; Pl. Wheeler, 17.—Torrey, Bot. Wilkes Exped. 469.

COTTONWOOD.

California, valley of the upper Sacramento river, south to San Bernardino county (Colton, *Parry*), and eastward in Nevada and Utah.

A large tree, 24 to 30 meters in height, with a trunk 1.20 to 1.80 meter in diameter; borders of streams; the common cottonwood of the valleys of central California.

Wood light, soft, not strong, close-grained, compact, liable to warp in drying, difficult to season; medullary rays thin, very obscure; color, light brown, the sap-wood nearly white; specific gravity, 0.4914; ash, 0.77.

Var. Wislizeni, Watson,

Am. Jour. Sci. 3 ser. xv, 137; Bot. California, ii, 92; Proc. Am. Acad. xviii, 157.—Rusby in Bull. Torrey Bot. Club, ix, 79.

P. monilifera, Torrey in Sitgreaves' Rep. 172; Bot. Mex. Boundary Survey, 204; Ives' Rep. 27 [not Aiton].—Bigelow in Pacific R. R. Rep. iv, 21.

COTTONWOOD. WHITE COTTONWOOD.

San Diego county, California, through Arizona and New Mexico to western Texas and southern Colorado.

A large tree, 24 to 30 meters in height, with a trunk 1.20 to 1.80 meter in diameter; borders of streams; the prevalent cottonwood of the arid southwestern region, there largely planted as a shade tree and for fuel.

Wood light, soft, not strong, compact; specific gravity, 0.4621; ash, 1.13; furnishing the ordinary domestic fuel of the region.

CONIFERÆ.

326.—Libocedrus decurrens, Torrey,

Smithsonian Contrib., vi, 7, t. 3; Pacific R. R. Rep. iv, 140; Bot. Mex. Boundary Survey, 211; Bot. Wilkes Exped. t. 16.—Bentham, Pl. Hartweg. 338.—Lindley in London Gard. Chronicle, 1853, 695.—Newberry in Pacific R. R. Rep. vi, 63.—Cooper in Smithsonian Rep. 1858, 262.—Walpers, Ann. v, 795.—Bolander in Proc. California Acad. iii, 228.—Parlatore in De Candolle, Prodr. xvi², 456.—R. Brown Campst. in Trans. Edinburgh Bot. Soc. ix, 373.—Hoopes, Evergreens, 309, f. 40.—Watson in King's Rep. v, 335; Bot. California, ii, 116.—A. Murray in London Garden. ii. 542.—Gordon, Pinetum, 2 ed. 402.—Veitch, Manual Conif. 267.

Thuya Craigana, Murray in Rep. Oregon Exped. 2, t. 5.

Thuya gigantea, Carrière in Rev. Hort. 1854, 224, f. 12–14, in part; Fl. des Serres, ix, 199, f. 3–5, in part; Trait. Conif. 106, in part: 2 ed. 112, in part.—Gordon, Pinetum, 321, in part; Suppl. 102, in part.—Henkel & Hochstetter, Nadelhölz. 280, in part.

Heyderia decurrens, Koch, Dendrologie, ii², 179.

WHITE CEDAR. BASTARD CEDAR. POST CEDAR. INCENSE CEDAR.

North fork of the Santian river, Oregon, south along the western slopes of the Cascade and Sierra Nevada mountains between 3,000 and 8,500 feet elevation, and through the California Coast ranges to the San Bernardino and Cayumaca mountains.

A large tree, 30 to 45 meters in height, with a trunk 1.20 to 2.10 meters in diameter; slopes and valleys; common.

Wood light, soft, not strong, brittle, close-grained, compact, very durable in contact with the soil; bands of small summer cells thin, dark colored, conspicuous; medullary rays numerous, obscure; the thin sap-wood nearly white; specific gravity, 0.4017; ash, 0.08; largely used for fencing and in the construction of water-flumes, and for interior finish, furniture, laths, shingles, etc.; often injured by a species of dry rot (*Dædalia vorax, Harkness in Pacific Rural Press*, Jan. 25, 1879, f. 1, 2), rendering it unfit for lumber.

327.—Thuya occidentalis, Linnæus,

Spec. 1 ed. 1002.—Kalm, Travels, English ed. iii, 170.—Marshall, Arbustum, 152.—Wangenheim, Amer. 7, t. 2, f. 3.—Walter, Fl. Caroliniana, 238.—Aiton, Hort. Kew. iii, 371; 2 ed. v, 321.—Gærtner, Fruct. ii, 62, t. 91, f. 2.—Michaux, Fl. Bor.-Am. ii, 209.—Willdenow, Spec. iv, 508; Enum. 990; Berl. Baumz. 504.—Nouveau Duhamel, iii, 12, t. 4.—Poiret in Lamarck, Dict. vii, 369; Ill. iii, 369.—Schkuhr, Handb. iii, 287, t. 309.—Persoon, Syn. ii, 580.—Desfontaines, Hist. Arb. ii, 575.—Titford, Hort. Bot. Am. 98.—Michaux f. Hist. Arb. Am. iii, 29, t. 3; N. American Sylva, 3 ed. iii, 177, t. 156.—Pursh, Fl. Am. Sept. ii, 647.—Barton, Prodr. Fl. Philadelph. 93.—Eaton, Manual, 111; 6 ed. 364.—Nuttall, Genera, ii, 224.—Hayne, Dend. Fl. 177.—Elliott, Sk. ii, 641.—Watson, Dend. Brit. ii, 150.—Sprengel, Syst. iii, 888.—Richard, Conif. 43, t. 71, f. 1.—Torrey, Compend. Fl. N. States, 361; Fl. N. York, ii, 234.—Rafinesque, Med. Bot. ii, 268.—Beck, Bot. 338.—Loudon, Arboretum, iv, 2454, f. 2312–2314 & t.—Forbes, Pinetum Woburn. 193.—Hooker, Fl. Bor.-Am. ii, 165.—Eaton & Wright, Bot. 451.—Bigelow, Fl. Boston. 3 ed. 388.—Spach, Hist. Veg. xi, 339.—Penn. Cycl. xxiv, 409.—Reid in London Gard. Chronicle, 1844, 276.—Emerson, Trees Massachusetts, 96; 2 ed. i, 112.—Endlicher, Syn. Conif. 51.—Lindley & Gordon in Jour. Hort. Soc. London, v, 206.—Parry in Owen's Rep. 618.—Darlington, Fl. Cestrica, 3 ed. 294.—Knight, Syn. Conif. 16.—Carrière in Rev. Hort. 1854, 224, f. 15; Trait. Conif. 103; 2 ed. 109.—Darby, Bot. S. States, 516.—Cooper in Smithsonian Rep. 1858, 257.—Gordon, Pinetum, 323; 2 ed. 403.—Chapman, Fl. S. States, 436.—Wood, Cl. Book, 662; Bot. & Fl. 315.—Porcher, Resources S. Forests, 507.—Henkel & Hochstetter, Nadelhölz. 278.—Nelson, Pinaceæ, 68.—R. Brown Campst. in Trans. Edinburgh Bot. Soc. ix, 363.—Gray, Manual N. States, 5 ed. 472.—Hoopes, Evergreens, 317.—Parlatore in De Candolle, Prodr. xvi², 458.—Schnizlein, Icon. t. 76, f. 2.—Koch, Dendrologie, ii², 173.—Vasey, Cat. Forest Trees, 36.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Sears in Bull. Essex Inst. xiii, 183.—Veitch, Manual Conif. 261.—Bell in Geological Rep. Canada, 1879–'80, 47ᶜ.

T. odorata, Marshall, Arbustum, 152.

T. obtusa, Mœnch, Meth. 691.

Cupressus Arbor-vitæ, Targione-Tozzetti, Obs. Bot. ii, 51.

T. Wareana and *T. Sibirica*, Hort.

WHITE CEDAR. ARBOR-VITÆ.

New Brunswick to Anticosti island, through the valley of the Saint Lawrence river to the southern shores of James' bay and southeast to the eastern extremity of lake Winnipeg, south through the northern states to central New York, northern Pennsylvania, central Michigan, northern Illinois, central Minnesota, and along the Alleghany mountains to the high peaks of North Carolina.

A tree 12 to 18 meters in height, with a trunk sometimes 1.20 to 1.50 meter in diameter; cold, wet swamps and along the rocky banks of streams; very common at the north, spreading over great areas of swamp; extensively cultivated as a hedge and ornamental plant, and producing innumerable seminal varieties of more or less horticultural value.

Wood very light, soft, not strong, brittle, rather coarse-grained, compact, very durable in contact with the soil; the bands of small summer cells very thin, dark colored; medullary rays numerous, indistinct; color, light brown, turning darker with exposure, the thin sap-wood nearly white; specific gravity, 0.3164; ash, 0.37; largely used for posts, fencing, railway ties, and shingles.

The distilled oil and a tincture of the leaves of *Thuya* have been found useful in the treatment of pulmonary and uterine complaints (*U. S. Dispensatory*, 14 ed. 1775.—*Nat. Dispensatory*, 2 ed. 1428).

328.—Thuya gigantea, Nuttall,

Jour. Philadelphia Acad. vii, 52; Sylva, iii, 102, t. iii; 2 ed. ii, 162, t. 111.—Loddiges, Cat. ed. 1836.—Loudon, Arboretum, iv, 2458.—Hooker, Fl. Bor.-Am. ii, 165.—Spach, Hist. Veg. xi, 342.—Endlicher, Syn. Conif. 52.—Lindley & Gordon in Jour. Hort. Soc. London, v, 206.—Newberry in Pacific R. R. Rep. vi, 56, f. 22.—Carrière, Trait. Conif. 102; 2 ed. 112, in part.—Cooper in Smithsonian Rep. 1858, 262; Am. Nat. iii, 413.—Gordon, Pinetum, 321, in part; Suppl. 102; 2 ed. 181.—Torrey, Bot. Mex. Boundary Survey, 211.—Lyall in Jour. Linnæan Soc. vii, 133, 144.—Henkel & Hochstetter, Nadelhölz. 280, in part.—Nelson, Pinaceæ, 67.—Rothrock in Smithsonian Rep. 1867, 434.—Parlatore in De Candolle, Prodr. xvi², 457.—R. Brown Campst. in Trans. Edinburgh Bot. Soc. ix, 367.—Hoopes, Evergreens, 315.—London Gard. Chronicle, 1871, 683.—Gray in Proc. Am. Acad. vii, 402.—Fowler in London Gard. Chronicle, 1872, 1527.—Koch, Dendrologie, ii², 176.—Vasey, Cat. Forest Trees, 36.—E. Hall in Coulter's Bot. Gazette, ii, 91.—Watson, Bot. California, ii, 115.—G. M. Dawson in Canadian Nat. new ser. ix, 324.—T. Howell in Coulter's Bot. Gazette, vi, 267.—Veitch, Manual Conif. 256.

T. plicata, Don, Hort. Cantab. 6 ed. 249.—Lambert, Pinus, 1 ed. ii, 19; 2 ed. 114, in part.—Nuttall, Sylva, iii, 103; 2 ed. ii, 164.—Spach, Hist. Veg. xi, 342.—Endlicher, Syn. Conif. 51 (excl. syn. *Wareana* & *odorata*).—Lindley & Gordon in Jour. Hort. Soc. London, v, 205.—Knight, Syn. Conif. 16.—Carrière, Trait. Conif. 102 (excl. syn. *Wareana* & *odorata*); 2 ed. 106 (excl. syn. *Wareana*).—Cooper in Smithsonian Rep. 1858, 262; Pacific R. R. Rep. xii², 27.—Henkel & Hochstetter, Nadelhölz. 277 (excl. syn. *odorata*).—Nelson, Pinaceæ, 68.—Gordon, Pinetum, 2 ed. 406.—A. De Candolle, Prodr. xvi², 457, in part.—Vasey, Cat. Forest Trees, 36.—Veitch, Manual Conif. 263.

T. Menziesii, Douglas, Mss.—Carrière, Trait. Conif. 106; 2 ed. 107.—Gordon, Pinetum, 323.—Nelson, Pinaceæ, 67.—Henkel & Hochstetter, Nadelhölz. 281.

T. Lobbii, Hort.

T. occidentalis, var. *plicata*, Hort.—Hoopes, Evergreens, 321.

RED CEDAR. CANOE CEDAR.

Alaska, south along the Coast ranges and islands of British Columbia, through western Washington territory and Oregon and the Coast ranges of northern California to Mendocino county, extending east along the mountains of Washington territory to the Cœur d'Alêne, Bitter Root, and Salmon River mountains of Idaho and the western slopes of the Rocky mountains of northern Montana (*Canby & Sargent*).

A large tree, 30 to 45 meters in height, with a trunk 0.90 to 3.60 meters in diameter; low, rich woods and swamps, less commonly on dry ridges and slopes below 5,200 feet elevation; common and reaching its greatest development in western Washington territory and Oregon; the large specimens generally hollow.

Wood very light, soft, not strong, brittle, rather coarse-grained, compact, easily worked, very durable in contact with the soil; bands of small summer cells thin, dark colored, distinct; medullary rays numerous, obscure; color, dull brown tinged with red, the thin sap-wood nearly white; specific gravity, 0.3796; ash, 0.17; largely used for interior finish, fencing, shingles, in cabinet-making and cooperage, and exclusively by the Indians of the northwest coast in the manufacture of their canoes.

329.—Chamæcyparis sphæroidea, Spach,

Hist. Veg. xi, 331.—Endlicher, Syn. Conif. 61.—Lindley & Gordon in Jour. Hort. Soc. London, v, 209.—Knight, Syn. Conif. 20.—Carrière, Trait. Conif. 133; 2 ed. 122.—Gordon, Pinetum, 49; 2 ed. 71.—Henkel & Hochstetter, Nadelhölz. 248.—Nelson, Pinaceæ, 69.—Parlatore in De Candolle, Prodr. xvi², 464.—Ridgway in Proc. U. S. Nat. Mus. 1882, 87.

Cupressus thyoides, Linnæus, Spec. 1 ed. 1003.—Kalm, Travels, English ed. ii, 174.—Du Roi, Harbk. ii, 198.—Marshall, Arbustum, 39.—Wangenheim, Amer. 8, t. 2, f. 4.—Aiton, Hort. Kew. iii, 372; 2 ed. v, 323.—Bartram, Travels, 2 ed. 409.—Michaux, Fl. Bor.-Am. ii, 208.—Willdenow, Spec. iv, 512; Enum. 991; Berl. Baumz. 111.—Nouveau Duhamel, iii, 6.—Persoon, Syn. ii, 580.—Desfontaines, Hist. Arb. ii, 567.—Schkuhr, Handb. iii, 286, t. 310.—Michaux f. Hist. Arb. Am. iii, 20, t. 2; N. American Sylva, 3 ed. iii, 162, t. 152.—Pursh, Fl. Am. Sept. ii, 646.—Eaton, Manual, 111; 6 ed. 115.—Nuttall, Genera, ii, 224.—Hayne, Dend. Fl. 178.—Elliott, Sk. ii, 644.—Watson, Dend. Brit. ii, 156.—Torrey, Compend. Fl. N. States, 361; Fl. N. York, ii, 233.—Beck, Bot. 338.—London, Arboretum, iv, 2475, f. 2327.—Forbes, Pinetum Woburn. 183, t. 61.—Hooker, Fl. Bor.-Am. ii, 165.—Eaton & Wright, Bot. 215.—Bigelow, Fl. Boston. 3 ed. 387.—Emerson, Trees Massachusetts, 98; 2 ed. i, 114.—Richardson, Arctic Exped. 442.—Darby, Bot. S. States, 516.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 435.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 28.—Wood, Cl. Book, 663; Bot. & Fl. 315.—Porcher, Resources S. Forests, 509.—Gray, Manual N. States, 5 ed. 473.—Hoopes, Evergreens, 346.—Koch, Dendrologie, ii², 162.—Vasey, Cat. Forest Trees, 36.—Veitch, Manual Conif. 238.

Thuya sphæroidea, Sprengel, Syst. iii, 889.

Thuya sphæroidalis, Richard, Conif. 45, t. 8, f. 2.

WHITE CEDAR.

Southern Maine, south near the coast to northern Florida, and along the Gulf coast to the valley of the Pearl river, Mississippi.

A tree 24 to 27 meters in height, with a trunk 0.60 to 1.20 meter in diameter; in deep, cold swamps; rare in the Gulf states, west of the bay of Mobile.

Wood very light and soft, not strong, close-grained, compact, easily worked, very durable in contact with the soil; bands of small summer cells thin, dark colored, conspicuous; medullary rays numerous, obscure; color, light brown tinged with red, growing darker with exposure, the sap-wood lighter; specific gravity, 0.3322; ash, 0.33; largely used in boat-building, for woodenware, cooperage, shingles, interior finish, telegraph and fence posts, railway ties, etc.

Along the Atlantic coast from New Jersey southward lumber is manufactured from buried trunks of this species dug from peat swamps.

330.—Chamæcyparis Nutkaensis, Spach,

Hist. Veg. xi, 333.—Nuttall, Sylva, iii, 105; 2 ed. ii, 165.—Endlicher, Syn. Conif. 62.—Ledebour, Fl. Rossica, iii, 680.—Lindley & Gordon in Jour. Hort. Soc. London, v, 209.—Carrière, Trait. Conif. 131; 2 ed. 127.—Walpers, Ann. v, 796.—Henkel & Hochstetter, Nadelhölz, 250.—Parlatore in De Candolle, Prodr. xvi², 465.—Hall in Coulter's Bot. Gazette, ii, 91.—G. M. Dawson in Canadian Nat. 2 ser. ix, 329.

Cupressus Nootkatensis, Lambert, Pinus, 1 ed. ii, 18; 2 ed. ii, No. 60.—London, Arboretum, iv, 2480.

Cupressus Nutkaensis, Hooker, Fl. Bor.-Am. ii, 165.—Newberry in Pacific R. R. Rep. vi, 63, f. 28.—Gordon, Pinetum, 66; 2 ed. 94.—Cooper in Smithsonian Rep. 1858, 263.—Nelson, Pinaceæ, 74.—Hoopes, Evergreens, 345.—Lawson, Pinetum Brit. ii, 199, t. 34, f. 1-12.—Koch, Dendrologie, ii², 165.—Vasey, Cat. Forest Trees, 36.—Macoun in Geological Rep. Canada, 1876-'77, 211.—Veitch, Manual Conif. 235.

Thuya excelsa, Bongard in Mem. Acad. St. Petersburg, 6 ser. ii, 164.

Cupressus Americana, Trautvetter, Imag. Pl. Fl. Rossica, 12, t. 7.

C. Nutkaensis, var. *glauca*, Walpers, Ann. v, 769.

Thuyopsis borealis, Hort.—Carrière, Trait. Conif. 1 ed. 113.

Thuyopsis cupressoides, Carrière, Man. des Pl. iv, 324.

C. excelsa, Fischer in herb. Sitka.

Thuyopsis Tchugatskoy and *T. Tchugatskoyæ*, Hort.

YELLOW CYPRESS. SITKA CYPRESS.

Sitka, south along the islands and Coast ranges of British Columbia and the Cascade mountains of Washington territory and Oregon to the valley of the Santiam river, Oregon ("Lucky Camp mountain", *Cusick*).

A large tree of great economic value, 30 to 38 meters in height, with a trunk 1.20 to 1.80 meter in diameter, or toward its southern limits and at high elevations much smaller; common along the coast at the sea-level to about latitude 49° 30′ N., then less common and only at higher elevations; south of British Columbia hardly below 5,000 feet elevation and very rare and local; the most valuable timber tree of Alaska.

Wood light, hard, not strong, brittle, very close-grained, compact, very durable in contact with the soil, easily worked, satiny, susceptible of a beautiful polish, possessing an agreeable, resinous odor; bands of small summer cells thin, not conspicuous; medullary rays thin, numerous, hardly distinguishable; color, bright, light clear yellow, the thin sap-wood nearly white; specific gravity, 0.4782; ash, 0.34; somewhat used in boat- and ship-building, for furniture, interior finish, etc., probably unsurpassed in beauty as a cabinet wood by that of any North American tree.

331.—Chamæcyparis Lawsoniana, Parlatore,

Stud. Organ. Conif. 23, 29, t. 5, f. 22-25; De Candolle, Prodr. xvi², 464.—Gordon, Pinetum, 2 ed. 85.—Watson, Bot. California, ii, 155.—Sargent in London Gard. Chronicle, 1881, 8.

Cupressus Lawsoniana, Murray in Edinburgh New Phil. Jour. new ser. i, 292, t. 9.—Bot. Mag. t. 5581.—Nelson, Pinaceæ, 72.—Cooper in Smithsonian Rep. 1858, 263.—Lawson, Pinetum Brit. ii, 191, t. 31, f. 1-13.—Hoopes, Evergreens 342, f. 53.—Henkel & Hochstetter, Nadelhölz. 246.—Fowler in London Gard. Chronicle, 1872, 285.—London Garden, vii 508 & t.—Vasey, Cat. Forest Trees, 36.—Veitch, Manual Conif. 231.—Eichler in Monatsb. Acad. Berl. 1881, f. 29, 30.

Cupressus fragrans, Kellogg in Proc. California Acad. i, 103.

? *Cupressus attenuata*, Gordon, Pinetum, 1 ed. 57; 2 ed. 79.

C. Boursierii, Carrière, Trait. Conif. 2 ed. 125 [not Decaisne].

C. Nutkanus, Torrey, Bot. Wilkes Exped. t. 16.

PORT ORFORD CEDAR. OREGON CEDAR. WHITE CEDAR. LAWSON'S CYPRESS. GINGER PINE.

Oregon, Coos bay, south to the valley of the Rogue river, not extending more than thirty miles from the coast; California, valley of the upper Sacramento river (shores of Castle and Soda lakes, Shasta county).

A large tree of the first economic value, 45 to 61 meters in height, with a trunk 1.80 to 4 meters in diameter; rich woods, in low, moist soil, interspersed with the yellow fir and hemlock; most common and reaching its greatest development along the Oregon coast; local; in California very rare and local.

Wood light, hard, strong, very close-grained, compact, easily worked, very durable in contact with the ground, abounding in odoriferous resin, satiny, susceptible of a beautiful polish; layers of small summer cells thin, not conspicuous; medullary rays numerous, very obscure; color, light yellow or almost white, the thin sap-wood hardly distinguishable; specific gravity, 0.4621; ash, 0.10; largely manufactured into lumber and used for interior finish, flooring, railway ties, fence posts, matches, and in ship- and boat-building; the resin strongly diuretic and a powerful insecticide.

332.—Cupressus macrocarpa, Hartweg,

Jour. Hort. Soc. London, ii, 187.—Bentham, Pl. Hartweg. 337.—Gordon in Jour. Hort. Soc. London, iv, 296 & t.; Pinetum, 65; 2 ed. 91.—Lindley & Gordon in Jour. Hort. Soc. London, v, 206.—Knight, Syn. Conif. 20.—Torrey, Bot. Mex. Boundary Survey, 211.—Cooper in Smithsonian Rep. 1858, 263; Proc. California Acad. iii, 290.—Carrière, Trait. Conif. 1 ed. 124, in part.—Bolander in Proc. California Acad. iii, 228.—Henkel & Hochstetter, Nadelhölz. 239.—Nelson, Pinaceæ, 73.—Hoopes, Evergreens, 353.—Parlatore in De Candolle, Prodr. xvi², 473.—Fowler in London Gard. Chronicle, 1872, 285.—Koch, Dendrologie, ii², 148.—Vasey, Cat. Forest Trees, 36.—Watson, Bot. California, ii, 113.—Veitch, Manual Conif. 234.—Lawson Pinetum Brit. ii, 195, t. 32.

C. Lambertiana, Carrière in Rev. Hort. 1855, 232; Trait. Conif. 124; 2 ed. 166.

C. Hartwegii, Carrière in Rev. Hort. 1855, 232; Trait. Conif. 2 ed. 168.

? *C. macrocarpa*, var. *fastigiata*, Knight, Conif. 20.—Parlatore in De Candolle, Prodr. xvi², 473.—Veitch, Manual Conif. 234.

? *C. Hartwegii*, var. *fastigiata*, Carrière, Trait. Conif. 2 ed. 169.

MONTEREY CYPRESS.

California, Monterey (Cypress point, Pescadero ranch, and Carmelo point).

A tree 15 to 21 meters in height, with a trunk 1.20 to 1.80 meter in diameter; on granite rocks immediately upon the sea-coast; very local.

Wood heavy, hard, strong, rather brittle, very close-grained, compact, easily worked, very durable in contact with the soil, satiny, susceptible of a beautiful polish, odorous; bands of small summer cells thin, dark colored, conspicuous; medullary rays numerous, hardly distinguishable; color, clear bright brown streaked with red and yellow, the thin sap-wood light yellow; specific gravity, 0.6261; ash, 0.57; very beautiful and of undoubted value as a cabinet wood.

333.—Cupressus Goveniana, Gordon,

Jour. Hort. Soc. London, iv, 296 & f.; Pinetum, 60; 2 ed. 83.—Bentham, Pl. Hartweg. 337.—Lindley & Gordon in Jour. Hort. Soc. London, v, 206.—Carrière, Trait. Conif. 125; 2 ed. 170.—Torrey, Mex. Boundary Survey, 211.—Cooper in Smithsonian Rep. 1858, 266.—Henkel & Hochstetter, Nadelhölz. 240.—Hoopes, Evergreens, 252.—Parlatore in De Candolle, Prodr. xvi², 472.—Fowler in London Gard. Chronicle, 1872, 285.—Watson, Bot. California. ii, 114.—Veitch, Manual Conif. 230.

? *C. Californica*, Carrière, Trait. Conif. 127; 2 ed. 164.

C. Californica gracilis, Nelson, Pinaceæ, 70, in part

? *C. cornuta*, Carrière in Rev. Hort. 1866, 251 & f.

? *Juniperus aromatica*, Hort.

Humboldt county, California, south along the coast and through the Coast ranges into Lower California.

A small tree, sometimes 12 to 15 meters in height, with a trunk 0.60 to 0.90 meter in diameter; borders of streams and mountain slopes, in rather rich soil, or often a low shrub, fruiting when 0.30 to 1 meter in height, and occupying extensive tracts of sandy barrens 1 to 5 miles inland from the coast, or thin, rocky soil (*Pringle*); widely but not generally distributed.

Wood light, soft, not strong, brittle, close-grained, compact; bands of small summer cells broad, dark colored, conspicuous; medullary rays thin, obscure; color, light brown, the thick sap-wood nearly white; specific gravity, 0.4689; ash, 0.45.

334.—Cupressus Macnabiana, Murray,

Edinburgh, New Phil. Jour. new ser. i, 293, t. 10.—Gordon, Pinetum, 64; 2 ed. 90.—Carrière, Trait. Conif. 2 ed. 165.—Hoopes, Evergreens, 353.—Parlatore in De Candolle, Prodr. xvi², 473.—Koch, Dendrologie, ii², 150.—Vasey, Cat. Forest Trees, 36.—Watson, Bot. California, ii, 114.—Veitch, Manual Conif. 233.

C. glandulosa, Hooker, (ex. Henkel & Hochstetter, Nadelhölz. 241).

C. Californica gracilis, Nelson, Pinaceæ, 70, in part.

California, mountains south of Clear lake, Lake county (*Torrey*, *Bolander*, *Pringle*, *Miller*).

A small tree, sometimes 9 meters in height, with a trunk 0.30 to 0.45 meter in diameter, or more often a tall shrub branching from the ground; very rare and local; not rediscovered in the original station reported by Jeffrey, the Mount Shasta region.

Wood not collected.

335.—Cupressus Guadalupensis, Watson,

Proc. Am. Acad. xiv, 300; Bot. California, ii, 114.

C. macrocarpa, ? Watson in Proc. Am. Acad. xi, 119 [not Hartweg].

C. Arizonica, E. L. Greene in Bull. Torrey Bot. Club, ix, 64.—Rusby in Bull. Torrey Bot. Club, ix, 79.—Watson in Proc. Am. Acad. xviii, 157.

San Francisco mountains of New Mexico and eastern Arizona (*Greene*, *Rusby*), Santa Catalina and Santa Rita mountains, Arizona (*Pringle*, *Lemmon*); on the Sierra Madre, near Saltillo, and Gaudalupe island, Mexico (*Palmer*).

A tree 18 to 21 meters in height, with a trunk 0.60 to 0.90 meter in diameter; rocky cañons and ridges; on the New Mexico and Arizona mountains, forming extensive forests between 5,000 and 8,000 feet elevation, generally on northern slopes; local.

Wood light, soft, very close-grained, compact, easily worked, susceptible of a good polish; bands of small summer cells, broad, conspicuous; medullary rays numerous, very obscure; color, gray, often faintly streaked with yellow, the thick sap-wood light yellow; specific gravity, 0.4843; ash, 0.44.

336.—Juniperus Californica, Carrière,

Rev. Hort, iii, 353 & f.; Trait. Conif. 58; 2 ed. 41.—Gordon, Pinetum, 121.—Vasey, Cat. Forest Trees, 37.—Engelmann in Trans. St. Louis Acad. iii, 588; Wheeler's Rep. vi, 375.—Palmer in Am. Nat. xii, 593.—Watson, Bot. California, ii, 113.

J. tetragona, var. *osteosperma*, Torrey in Pacific R. R. Rep. iv, 141; Bot. Mex. Boundary Survey, 210; Ives' Rep. 28.

J. tetragona, Cooper in Smithsonian Rep. 1858, 263 [not Schlechtendal].

J. Cerrosianus, Kellogg in Proc. California Acad. ii, 37.

J. occidentalis, Gordon, Pinetum, Suppl. 38; Pinetum, 2 ed. 162, in part.—Henkel & Hochstetter, Nadelhölz. 245, in part.—Hoopes, Evergreens, 299, in part.—Parlatore in De Candolle, Prodr. xvi², 489, in part.

J. Californica, var. *osteosperma*, Engelmann; Watson in Proc. Am. Acad. xi, 119.

JUNIPER.

California, San Francisco bay, south through the Coast ranges to Lower California.

A small tree, rarely 6 to 9 meters in height, with a trunk 0.30 to 0.60 meter in diameter, or more often a tall shrub, sending up many stems from the ground; sandy barrens and dry, rocky soil.

Wood light, soft, very close-grained, compact, very durable in contact with the soil; bands of small summer cells thin, dark colored, not conspicuous; medullary rays numerous, very obscure; color, light brown slightly tinged with red, the sap-wood nearly white; specific gravity, 0.6282; ash, 0.75; in southern California largely used for fencing and fuel.

Var. Utahensis, Engelmann,

Trans. St. Louis Acad. iii, 588; Wheeler's Rep. vi, 264.—Vasey, Cat. Forest Trees, 37.—Sargent in Am. Jour. Sci. 3 ser. xvii, 418.—Palmer in Am. Nat. xii, 594.—Watson, Bot. California, ii, 113.

J. occidentalis, Watson in King's Rep. v, 336, in part; Pl. Wheeler, 18 [not Hooker].

J. occidentalis, var. *Utahensis*, Veitch, Manual Conif. 289.

JUNIPER.

Western base of the Wahsatch mountains, Utah, to eastern California, south through the Great Basin to southeastern California (*Pringle*) and the San Francisco mountains, eastern Arizona (*Greene*).

A small, contorted tree, 6 to 9 meters in height, with a trunk 0.60 to 0.90 meter in diameter, or more often a tall, much-branched shrub; very common through the elevated valleys and along the lower slopes of all the ranges of central and southern Utah and Nevada, and the most generally-distributed arborescent species of the region.

Wood light, soft, close-grained, compact, very durable in contact with the soil; color, light brown, the thick sap-wood nearly white; specific gravity, 0.5522; ash, 0.49; the common fuel and fencing material of the region.

337.—Juniperus pachyphlœa, Torrey,

Pacific R. R. Rep. iv, 142; Bot. Mex. Boundary Survey, 210; Ives' Rep. 28.—Cooper in Smithsonian Rep. 1858, 263.—Henkel & Hochstetter, Nadelhölz. 247.—Carrière, Trait. Conif. 2 ed. 56.—Parlatore in De Candolle, Prodr. xvi², 490.—Gordon, Pinetum, 2 ed. 164.—Engelmann in Trans. St. Louis Acad. iii, 589; Wheeler's Rep. vi, 264.—Palmer in Am. Nat. xii, 593.—Veitch, Manual Conif. 289.—Rusby in Bull. Torrey Bot. Club, ix, 79.—Hemsley, Bot. Am.-Cent. iii, 184.

J. ploehyderma, Torrey in Sitgreaves' Rep. 173, t. 16.

J. Sabina pachyphlœa, Antoine, Kupress. 39.

JUNIPER.

Eagle and Limpia mountains (*Havard*), west along the ranges of western Texas, southern New Mexico and Arizona south of latitude 34°; southward into Mexico.

A tree 9 to 15 meters in height, with a trunk 0.60 to 1.20 meter in diameter; dry, stony slopes and ridges, generally between 2,000 and 3,000 feet elevation; the prevailing and largest juniper of the mountains of western Texas.

Wood light, soft, not strong, brittle, very close-grained, compact, susceptible of a fine polish; bands of small summer cells very thin, dark colored, not conspicuous; medullary rays numerous, obscure; color, clear light red, often streaked with yellow, the thin sap-wood nearly white; specific gravity, 0.5829; ash, 0.11.

338.—Juniperus occidentalis, Hooker,

Fl. Bor.-Am. ii, 166.—Endlicher, Syn. Conif. 26.—Lindley & Gordon in Jour. Hort. Soc. London, v, 202.—Carrière, Conif. 42, in part; 2 ed. 40, in part.—Torrey in Pacific R. R. Rep. iv, 142.—Cooper in Smithsonian Rep. 1858, 263.—Gordon, Pinetum, 117 (excl. syn.); Suppl. 38 (excl. syn.); 2 ed. 162 (excl. syn.).—Henkel & Hochstetter, Nadelhölz. 345, in part.—Nelson, Pinaceæ, 142.—Hoopes, Evergreens, 299 (excl. syn. *Californica*).—Parlatore in De Candolle, Prodr. xvi², 489, in part.—Vasey, Cat. Forest Trees, 37.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Palmer in Am. Nat. xii, 594.—Watson, Bot. California, ii, 113.—Veitch, Manual Conif. 289.

J. excelsa, Pursh, Fl. Am. Sept. ii, 647.—Nuttall, Genera, ii, 245.

J. Andina, Nuttall, Sylva, iii, 95, t. 110; 2 ed. ii, 157, t. 110.—Carrière, Trait. Conif. 2 ed. 55.

Chamæcyparis Boursierii, Decaisne in Bull. Soc. Bot. France, i, 70.

J. Hermanni, Koch, Dendrologie, ii², 141 [not Sprengel].

J. occidentalis, var. *pleiosperma*, Engelmann in Trans. St. Louis Acad. ii, 590.

J. pyriformis, Hort.

JUNIPER.

Blue mountains and high prairies of eastern Washington territory and Oregon, Cascade mountains of Oregon, valley of the Klamath river, California, and south along the high ridges of the Sierra Nevada, between 7,000 and 10,000 feet elevation, to the San Bernardino mountains (*Parish Bros.*).

A tree 9 to 15 meters in height, with a trunk 1.20 to 2.10 meters in diameter, or often a low, much-branched shrub; dry, rocky ridges and prairies, reaching its greatest development in the California sierras.

Wood light, soft, very close-grained, compact, very durable in contact with the soil; bands of small summer cells thin, not conspicuous; medullary rays numerous, very obscure; color, light red or brown, the sap-wood nearly white; specific gravity, 0.5765; ash, 0.12; largely used for fencing and fuel.

Var. monosperma, Engelmann,

Trans. St. Louis Acad. iii, 590; Wheeler's Rep. vi, 263.—Veitch, Manual Conif. 289.—Rusby in Bull. Torrey Bot. Club, ix, 79.

JUNIPER.

Eastern base of Pike's peak, Colorado, to the mountains of western Texas, and through New Mexico and southern Arizona to southern California.

A small, stunted tree, 6 to 9 meters in height, with a trunk sometimes 0.60 meter in diameter, or often branching from the ground with many stout, contorted stems; dry, gravelly slopes between 3,500 and 7,000 feet elevation.

Wood heavier than that of the type, the layers of annual growth often eccentric; specific gravity, 0.7119; ash, 0.78; largely used for fuel and fencing.

Var. conjugens, Engelmann,

Trans. St. Louis Acad. iii, 590.—Veitch, Manual Conif. 289.—Watson in Proc. Am. Acad. xviii, 158.

JUNIPER.

Western Texas, valley of the Colorado river (Austin), west and north.

A tree 11 to 15 meters in height, with a trunk sometimes 0.30 meter in diameter, covering with extensive forests the limestone hills of western Texas; its range not yet satisfactorily determined.

Wood light, hard, not strong, very close-grained, compact, very durable in contact with the soil; bands of small summer cells thin, dark colored, conspicuous; medullary rays numerous, very obscure; color, brown, often streaked with red, the thin sap-wood nearly white; specific gravity, 0.6907; ash, 0.46; largely used for fencing, fuel, telegraph poles, railway ties, etc.

339.—Juniperus Virginiana, Linnæus,

Spec. 1 ed. 1039.—Kalm, Travels, English ed. ii, 180.—Marshall, Arbustum, 70.—Wangenheim, Amer. 9, t. 2, f. 5.—Walter, Fl. Caroliniana, 248.—Aiton, Hort. Kew. iii, 414; 2 ed. v, 414.—Lamarck, Dict. iv, 627.—Willdenow, Spec. iv, 853; Enum. 1025; Berl. Baumz. 198.—Persoon, Syn. ii, 632.—Desfontaines, Hist. Arb. ii, 539.—Michaux f. Hist. Arb. Am. iii, 42, t. 5; N. American Sylva, 3 ed. 173, t. 155.—Pursh, Fl. Am. Sept. 647.—Nouveau Duhamel, vi, 49, t. 16.—Barton, Prodr. Fl. Philadelph. 96; Compend. Fl. Philadelph. ii, 200.—Eaton, Manual, 118; 2 ed. 194.—Nuttall, Genera, ii, 245; Sylva, iii, 97; 2 ed. ii, 159.—Bigelow, Med. Bot. iii, 49, t. 45; Fl. Boston. 3 ed. 398.—Hayne, Dend. Fl. 205.—Elliott, Sk. ii, 717.—Torrey in Nicollet's Rep. 167; Compend. Fl. N. States, 377; Fl. N. York, ii, 235; Marcy's Rep. 284; Pacific R. R. Rep. iv, 142; Bot. Mex. Boundary Survey, 211; Ives' Rep. 28.—Sprengel, Syst. iii, 908.—Richard, Conif. 37, t. 6, f. 2.—Audubon, Birds, t. 43.—Rafinesque, Med. Bot. ii, 13.—Beck, Bot. 337.—Lindley, Fl. Med. 556.—Loudon, Arboretum, iv, 2495, f. 2357.—Forbes, Pinetum Woburn. 199.—Penn. Cycl. xiii, 147.—Eaton & Wright, Bot. 288.—Emerson, Trees Massachusetts, 102; 2 ed. i, 118.—Endlicher, Syn. Conif. 27, in part.—Scheele in Rœmer, Texas, Appx. 447.—Lindley & Gordon in Jour. Hort. Soc. London, v, 202.—Parry in Owen's Rep. 618.—Darlington, Fl. Cestrica, 3 ed. 295.—Knight, Syn. Conif. 12.—Darby, Bot. S. States, 515.—Durand in Jour. Philadelphia Acad. 1855, 101.—Torrey & Gray in Pacific R. R. Rep. ii, 130, 175.—Carrière, Trait. Conif. 43; 2 ed. 44.—Bigelow in Pacific R. R. Rep. 20.—Gordon, Pinetum, 112; 2 ed. 154.—Cooper in Smithsonian Rep. 1858, 257; Am. Nat. iii, 413.—Chapman, Fl. S. States, 435.—Gray in Pacific R. R. Rep. xii², 48; Manual N. States, 5 ed. 474; Hall's Pl. Texas, 21.—Hooker f. in Trans. Linnæan Soc. xxiii², 302.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 71.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 663; Bot. & Fl. 314.—Porcher, Resources S. Forests, 510.—Engelmann in Trans. Am. Phil. Soc. new ser. xii, 209; Trans. St. Louis Acad. iii, 591; Wheeler's Rep. vi, 263.—Lyall in Jour. Linnæan Soc. vii, 144.—Henkel & Hochstetter, Nadelhölz. 335.—Nelson, Pinaceæ, 153.—Hoopes, Evergreens, 291.—Parlatore in De Candolle, Prodr. xvi², 488.—Young, Bot. Texas, 517.—Koch, Dendrologie, ii², 138.—Watson in King's Rep. v, 335.—Rothrock in Pl. Wheeler, 28, 50; Wheeler's Rep. vi, 10.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 132.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 122.—Vasey, Cat. Forest Trees, 37.—Guibourt, Hist. Drogues, 7 ed. ii, 242.—Broadhead in Coulter's Bot. Gazette, iii, 60.—G. M. Dawson in Canadian Nat. new ser. ix, 329.—Sears in Bull. Essex Inst. xiii, 183.—Veitch, Manual Conif. 282.—Bell in Geological Rep. Canada, 1879–'80, 52c.—Ridgway in Proc. U. S. Nat. Mus. 1882, 87.—Hemsley, Bot. Am.-Cent. iii, 184.

J. Caroliniana, Marshall, Arbustum, 71.—Du Roi, Harbk. 2 ed. 497.

J. arborescens, Mœnch, Meth. 699.

J. Barbadensis, Michaux, Fl. Bor.-Am. ii, 246 [not Linnæus].—Pursh, Fl. Am. Sept. ii, 647.—Nuttall, Genera, ii, 245; Sylva, iii, 96; 2 ed. ii, 158.

J. Virginiana, var. *Caroliniana*, Willdenow, Berl. Baumz. 198.—Hayne, Dend. Fl. 205.—Loudon, Arboretum, iv, 2495.

J. Virginiana, var. *Hermanni*, Persoon, Syn. ii, 632.

J. Hermanni, Sprengel, Syst. iii, 908.

J. fœtida, var. *Virginiana*, Spach in Ann. Sci. Nat. 2 ser. xvi, 298; Hist. Veg. xi, 318.

J. Virginiana vulgaris, Endlicher, Syn. Conif. 28.

J. Sabina, var. *Virginiana*, Antoine, Kupress. t. 83, 84.

RED CEDAR. SAVIN.

Southern New Brunswick to the northern shores of Georgian bay, northern Michigan, Wisconsin and Minnesota, south to cape Malabâr and Tampa bay, Florida, and the valley of the Colorado river, Texas, west to eastern Nebraska, Kansas, and the Indian territory to about the one hundredth parallel of west longitude; in the Pacific region, Rocky mountains of Colorado to Vancouver's island, British Columbia; not extending to western Texas, California, or Oregon; in Utah, Nevada, and Arizona rare and local.

The most widely distributed of North American Coniferæ, a tree 24 to 30 meters in height, with a trunk 0.60 to 1.35 meter in diameter, or toward its northern and western limits much smaller, often reduced to a low shrub; dry, gravelly ridges, and limestone hills, or in the Gulf states, especially near the coast, in deep swamps; in northern Montana, borders of streams and lakes; common; and reaching its greatest development in the valley of the Red river, Texas.

Wood light, soft, not strong, brittle, very close- and straight-grained, compact, easily worked, very durable in contact with the soil; odorous; bands of small summer cells rather broad, conspicuous; medullary rays numerous, very obscure; color, dull red, the thin sap-wood nearly white; specific gravity, 0.4926; ash, 0.13; largely used for posts, sills, railway ties, interior finish, cabinet-making, and almost exclusively for lead-pencils.

A decoction of the leaves is occasionally used as a substitute for savine cerete, and an infusion of the berries as a diuretic (*U. S. Dispensatory*, 14 ed. 529.—*Nat. Dispensatory*, 2 ed. 795).

340.—Taxodium distichum, Richard,

Ann. Mus. xvi, 298; Conif. 52, t. 10.—Nouveau Duhamel, iii, 8.—Robin, Voyages, iii, 525.—Lambert, Pinus, 2 ed. 25 & t.—Torrey, Compend. Fl. N. States, 361; Bot. Mex. Boundary Survey, 210.—Brongniart in Ann. Sci. Nat. 1 ser. xxx, 182.—Loudon, Arboretum, iv, 2481, f. 2335–2339.—Forbes, Pinetum Woburn. 177, t. 60.—Endlicher, Syn. Conif. 68, in part.—Engelmann & Gray in Jour. Boston Soc. Nat. Hist. v, 234.—Scheele in Rœmer, Texas, Appx. 447.—Lindley & Gordon in Jour. Hort. Soc. London, v, 209.—Knight, Syn. Conif. 20.—Darlington, Fl. Cestrica, 3 ed. 295.—Carrière, Trait. Conif. 143; 2 ed. 180; Rev. Hort. viii, 62 & f.—Morren in Belg. Hort. vi, 74 & t.—Gordon, Pinetum, 305; 2 ed. 382.—London Gard. Chronicle, 1857, 549.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 435.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 29.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 663; Bot. & Fl. 315.—Henkel & Hochstetter, Nadelhölz. 258.—Gray, Manual N. States, 5 ed. 473.—Hoopes, Evergreens, 364, f. 58.—Parlatore in De Candolle, Prodr. xvi², 440.—Lawson, Pinetum Brit. ii, 305, f. 1–9.—Fowler in London Gard. Chronicle, 1872, 1526.—Young, Bot. Texas, 518.—Koch, Dendrologie, ii², 195.—Bertrand in Bull. Soc. Bot. France, xviii, 127.—Vasey, Cat. Forest Trees, 36.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Veitch, Manual Conif. 214.—Ridgway in Proc. U. S. Nat. Mus. 87.—Watson in Proc. Am. Acad. xviii, 158.

Cupressus disticha, Linnæus, Spec. 1 ed. 1003.—Du Roi, Harbk. i, 201.—Marshall, Arbustum, 39.—Lamarck, Dict. ii, 244.—Wangenheim, Amer. 43.—Walter, Fl. Caroliniana, 238.—Aiton, Hort. Kew. iii, 372; 2 ed. v, 323.—Bartram, Travels, 2 ed. 88.—Michaux, Fl. Bor.-Am. ii, 208.—Desfontaines, Hist. Arb. ii, 567.—Willdenow, Spec. iv, 512; Enum. 991; Berl. Baumz. 111.—Schkuhr, Handb. iii, 288.—Michaux f. Hist. Arb. Am. iii, 4, t. 1; N. American Sylva, 3 ed. iii, 154, t. 151.—Pursh, Fl. Am. Sept. ii, 645.—Barton, Prodr. Fl. Philadelph. 93.—Rafinesque, Fl. Ludoviciana, 151.—Nuttall, Genera, ii, 224.—Hayne, Dend. Fl. 178.—James in Long's Exped. ii, 317, 318.—Elliott, Sk. ii, 642.—Beck, Bot. 238.—Eaton, Manual, 6 ed. 116.—Eaton & Wright, Bot. 215.—De Chambray, Trait. Arb. Res. Conif. 349.—Dickson & Brown in Am. Jour. Sci. 2 ser. v, 15.—Porcher, Resources S. Forests, 508.

Cupressus disticha, var. *patens* and var. *nutans*, Aiton, Hort. Kew. 2 ed. v, 323.

Cupressus disticha, var. *imbricaria*, Nuttall, Genera, ii, 224; Trans. Am. Phil. Soc. 2 ser. v, 163.—Croom in Am. Jour. Sci. 1 ser. xxviii, 166.

Schubertia disticha, Mirbel in Mem. Mus. xiii, 75.—Sprengel, Syst. iii, 890.—Spach, Hist. Veg. xi, 349.

T. microphyllum, Brongniart in Ann. Sci. Nat. 1 ser. xxx, 182.—Endlicher, Syn. Conif. 68.—Lindley & Gordon in Jour. Hort. Soc. London, v, 207.—Carrière, Trait. Conif. 148.

T. adscendens, Brongniart in Ann. Sci. Nat. 1 ser. xxx, 182.—Endlicher, Syn. Conif. 69.—Lindley & Gordon in Jour. Hort. Soc. London, v, 207.—Carrière, Trait. Conif. 148.

T. distichum, var. *patens* and var. *nutans*, Endlicher, Syn. Conif. 68.—Loudon, Arboretum, iv, 2481.

T. distichum fastigiatum, Knight, Syn. Conif. 21.—Carrière, Trait. Conif. 145; 2 ed. 181.—Gordon, Pinetum, 307; 2 ed. 383.—Henkel & Hochstetter, Nadelhölz. 260.—Hoopes, Evergreens, 367.

T. distichum, var. *microphyllum*, Henkel & Hochstetter, Nadelhölz. 261.—Parlatore in De Candolle, Prodr. xvi², 441 (*T. Sinense pendulum*, Forbes, Pinetum Woburn. 180.—*Glyptostrobus pendulus*, Endlicher, Conif. 71.—Bot. Mag. t. 5603.—Carrière, trait. Conif. 152.—*T. Sinense*, Gordon, Pinetum, 309.—*Cupressus Sinense*, Hort.).

Cuprespinnata disticha, Nelson, Pinaceæ, 61.

BALD CYPRESS. BLACK CYPRESS. RED CYPRESS. WHITE CYPRESS. DECIDUOUS CYPRESS.

Sussex county, Delaware, south near the coast to Mosquito inlet and cape Romano, Florida, west through the Gulf states near the coast to the valley of the Nueces river, Texas, and through Arkansas to western Tennessee, western and northern Kentucky, southeastern Missouri, and southern Illinois and Indiana.

A large tree of great economic value, 24 to 46 meters in height, with a trunk 1.80 to 4 meters in diameter; deep, submerged swamps, river-bottom lands, and pine-barren ponds; common and forming extensive forests in the south Atlantic and Gulf states.

Wood light, soft, close, straight-grained, not strong, compact, easily worked, very durable in contact with the soil; bands of small summer cells broad, resinous, conspicuous; medullary rays numerous, very obscure; color, light or dark brown, the sap-wood nearly white; specific gravity, 0.4543; ash, 0.42; largely manufactured into lumber and used for construction, cooperage, railway ties, posts, fencing, etc., often injured, especially west of the Mississippi river, by a species of *Dædalia*, not yet determined, rendering it unfit for lumber.

Two varieties of cypress, black and white, are recognized by lumbermen, the wood of the former heavier than water when green, rather harder and considered more durable than the other; the unseasoned wood of the latter lighter than water and rather lighter colored than black cypress.

341.—Sequoia gigantea, Decaisne,

Bull. Bot. Soc. France, i, 70; Rev. Hort. 1855, 9, t. 10, f. 1.—Gray in Proc. Am. Acad. iii, 94; Am. Jour. Sci. 2 ser. xvii. 440; xviii, 150, 286.—Torrey in Pacific R. R. Rep. iv, 140.—Kellogg in Proc. California Acad. i, 42.—Blake in Pacific R. R. Rep. v, 257, t. 13.—Carrière, Trait. Conif. 166.—Newberry in Pacific R. R. Rep. vi, 90.—Cooper in Smithsonian Rep. 1858, 263.—Wood, Bot. & Fl. 315.—Bloomer in Proc. California Acad. iii, 397.—Hoopes, Evergreens, 239, f. 29.—Parlatore in De Candolle Prodr. xvi², 437.—Koch, Dendrologie, ii², 194.—Bertrand in Ann. Sci. Nat. 5 ser. xx, 114.—Vasey, Cat. Forest Trees, 36.—Muir in Proc. Am. Assoc. xxv, 242.—Watson, Bot. California, ii, 117.

Wellingtonia gigantea, Lindley in London Gard. Chronicle, 1853, 819, 823; Bot. Mag. t. 4777, 4778.—C. Lemaire in Ill. Hort. 1854, 14 & t.—Naudin in Rev. Hort. 1854, 116.—Fl. des Serres, ix, 93 & t. 903 & t.—Flor. Cabinet, 1854, 121 & t.—Bigelow in Pacific R. R. Rep. iv, 22.—Gordon, Pinetum, 330; Suppl. 106; 2 ed. 415.—Murray in Edinburgh New Phil. Jour. new ser, xi, 205, t. 3-9 (Trans. Bot. Soc. Edinburgh, vi, 330, t. 6, f. 8, 9).—Henkel & Hochstetter, Nadelhölz. 222.—Carrière, Trait. Conif. 2 ed. 217.—Veitch, Manual Conif. 415.

Wellingtonia Californica, Winslow in California Farmer, September, 1854.—Hooker, Jour. Bot. & Kew Misc. vii, 26.

Taxodium Washingtonianum, Winslow in California Farmer, September, 1854.

Taxodium giganteum, Kellogg & Behr in Proc. California Acad. i, 51.

S. Wellingtonia, Seemann in Bonplandia, ii, 238; iii, 27; vi, 343; Ann. & Mag. Nat. Hist. 3 ser. March, 1859, 161.—Lawson, Pinetum Brit. iii, 299, t. 37, 51, 53, f. 1-37.

Gigantabies Wellingtonia, Nelson, Pinaceæ, 79.

BIG TREE.

California, western slopes of the Sierra Nevadas from Placer county (Calaveras Grove) south to Deer creek on the southern borders of Tulare county.

The largest tree of the American forest, 76 to 119 meters in height, with a trunk 6 to 11 meters in diameter; valleys and moist swales or hollows between 4,000 and 6,000 feet elevation, growing in small, isolated groves, except toward its southern limits, here mixed with the sugar pine and red and white firs, covering large tracts, often several hundred acres in extent.

Wood very light, soft, weak, brittle, rather coarse-grained, compact, remarkably durable in contact with the soil; bands of small summer cells thin, dark colored, conspicuous; medullary rays numerous, thin; color, bright clear red, turning much darker with exposure, the thin sap-wood white; specific gravity, 0.2882; ash, 0.50; in Fresno county formerly somewhat manufactured into lumber and locally used for fencing, shingles, construction, etc.

342.—Sequoia sempervirens, Endlicher,

Syn. Conif. 198.—Decaisne in Rev. Hort. 1855, 9, t. 11, f. 2.—Carrière, Trait. Conif. 164; 2 ed. 210.—Bigelow in Pacific R. R. Rep. iv, 23.—Newberry in Pacific R. R. Rep. vi, 57, 90, f. 23.—Torrey in Pacific R. R. Rep. iv, 140; Bot. Mex. Boundary Survey, 210; Ives' Rep. 28.—Gordon, Pinetum, 303; Suppl. 97; 2 ed. 379.—Cooper in Smithsonian Rep. 1858, 263.—Murray in Edinburgh New Phil. Jour. new ser. xi. 221 (Trans. Bot. Soc. Edinburgh, vi, 346).—Seemann in Ann. & Mag. Nat. Hist. 3 ser. March, 1859, 165.—Wood, Bot. & Fl. 315.—Bolander in Proc. California Acad. iii, 231.—Hoopes, Evergreens, 244.—Parlatore in De Candolle Prodr. xvi², 436.—Koch, Dendrologie, ii², 193.—Vasey, Cat. Forest Trees, 36.—Stearns in Am. Nat. x, 110.—Watson, Bot. California, ii, 116.—Veitch, Manual Conif. 212.—Lawson, Pinetum Brit. iii, t. 52 & figs.

Taxodium sempervirens, Lambert, Pinus, 114; 2 ed. ii, 107, t. 52.—Loudon, Arboretum, iv, 2487, f. 2340, 2341.—Hooker, Fl. Bor.-Am. ii, 164; Icon. iv, t. 379.—Hooker & Arnott, Bot. Beechey, 1841.—Fremont, Geographical Mem. California, 36, 37.—Henkel & Hochstetter, Nadelhölz. 262.

Taxodii species, Douglas in Companion Bot. Mag. ii, 150.

Sequoia gigantea, Endlicher, Syn. Conif. 190, in part.—Bentham, Pl. Hartweg. 338.

Abies religiosa, Hooker & Arnott, Bot. Beechey, 160.

Schubertia sempervirens, Spach, Hist. Veg. xi, 353.

S. religiosa, Presl, Epimel. Bot. 357.—Walpers, Ann. iii, 448.

Gigantabies taxifolia, Nelson, Pinaceæ, 78.

REDWOOD.

California, from the northern boundary of the state, south through the Coast ranges to "Veers creek" near the southern border of Monterey county.

A large tree of great economic value, 61 to 92 meters in height, with a trunk 2.40 to 7 meters in diameter, sending up from the stump when cut many vigorous shoots; sides of cañons and gulches in low, wet situations, borders of streams, etc., not appearing on dry hillsides; generally confined to the western slopes of the Coast ranges, and nowhere extending far from the coast; most generally multiplied and reaching its greatest average density north of cape Mendocino.

Wood light, soft, not strong, very brittle, rather coarse-grained, compact, susceptible of a good polish, easily split and worked, very durable in contact with the soil; bands of small summer cells thin, dark colored, conspicuous; medullary rays numerous, very obscure; color, clear light red, the thin sap-wood nearly white; specific gravity, 0.4208; ash, 0.14; largely sawed into lumber; the prevailing and most valuable building material of the Pacific coast, and in California almost exclusively used for shingles, fence posts, telegraph poles, railway ties, wine-butts, tanning- and water-tanks, coffins, etc.; forms with curled or contorted grain are highly ornamental.

343.—Taxus brevifolia, Nuttall,

Sylva, iii, 86, t. 108; 2 ed. ii, 149, t. 108 (*T. occidentalis* on plate).—Torrey in Pacific R. R. Rep. iv, 140.—Newberry in Pacific R. R. Rep. vi, 60, 90, f. 26.—Cooper in Smithsonian Rep. 1858, 263; Pacific R. R. Rep. xii², 26, 69; Am. Nat. iii, 414.—Wood, Bot. & Fl. 316.—Bolander in Proc. California Acad. iii, 229.—Carrière, Trait. Conif. 2 ed. 742.—Hoopes, Evergreens, 383.—Parlatore in De Candolle, Prodr. xvi², 501.—Gray in Proc. Am. Acad. vii, 402.—Koch, Dendrologie, ii², 95.—Gordon, Pinetum, 2 ed. 392.—Vasey, Cat. Forest Trees, 35.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Hall in Coulter's Bot. Gazette, ii, 91.—Watson, Bot. California, ii, 110.—G. M. Dawson in Canadian Nat. new ser. ix, 329.—Veitch, Manual Conif. 305.

T. baccata, var. *Canadensis*, Bentham, Pl. Hartweg. 338.

T. baccata, Hooker, Fl. Bor.-Am. ii, 167, in part.

T. Boursierii, Carrière in Rev. Hort. 1854, 228 & t.; Trait. Conif. 523; 2 ed. 739.

T. Lindleyana, Murray in Edinburgh New Phil. Jour. new ser. i, 294; Trans. Bot. Soc. Edinburgh, vi, 1860.—Lawson, Cat. 1855, 15.—Gordon, Pinetum, 316; Suppl. 99.—Henkel & Hochstetter, Nadelhölz. 360.—Nelson, Pinaceæ, 174.

T. Canadensis, Bigelow in Pacific R. R. Rep. iv, 25 [not Willdenow].

YEW

Queen Charlotte islands and the valley of the Skeena river, south through the Coast ranges of British Columbia, through western and the mountain ranges of eastern Washington territory and Oregon to the western slopes of the Rocky mountains of northern Montana (*Canby & Sargent*), through the California Coast ranges to the bay of Monterey and along the western slopes of the Sierra Nevadas to about latitude 37° N.

A tree 18 to 24 meters in height, with a trunk 0.60 to 0.90 meter in diameter, or toward its eastern limits in Idaho and Montana much smaller, often reduced to a low shrub; rare; low, rich woods and borders of streams, reaching its greatest development in western Oregon, Washington territory, and British Columbia.

Wood heavy, hard, strong, brittle, very close-grained, compact, susceptible of a beautiful polish, very durable in contact with the soil; bands of small summer cells thin, dark colored, conspicuous; medullary rays thin, numerous, very obscure; color, light bright red, the thin sap-wood light yellow; specific gravity, 0.6391; ash, 0.22; used for fence posts and by the Indians of the northwest coast for paddles, spear handles, bows, fish-hooks, etc.

344.—Taxus Floridana, Nuttall,

Sylva, iii, 92; 2 ed. ii, 155.—Croom in Am. Jour. Sci. 1 ser. xxvi, 334.—Chapman, Fl. S. States, 436.—Carrière, Trait. Conif. 2 ed. 741.—Hoopes, Evergreens, 384.—Vasey. Cat. Forest Trees, 36.

T. montana, Nuttall, Sylva, iii, 92; 2 ed. ii, 155.

YEW.

Western Florida, banks of the Apalachicola river from Bristol to Aspalaga, Gadsden county, and Watson's Landing? (*Curtiss*).

A small tree, 3 to 6 meters in height, with a trunk 0.15 to 0.25 meter in diameter; rare and very local.

Wood heavy, hard, very close-grained, compact; bands of small summer cells very thin, dark colored, not conspicuous; medullary rays numerous, obscure; color, dark brown tinged with red, the thin sap-wood nearly white; specific gravity, 0.6340; ash, 0.21.

345.—Torreya taxifolia, Arnott,

Ann. Nat. Hist. i, 134; Hooker, Icon. iii, t. 232, 233.—Eaton & Wright, Bot. 454.—Nuttall, Sylva, iii, 91, t. 109; 2 ed. ii, 153, t. 109.—Spach, Hist. Veg. xi, 298.—Endlicher, Syn. Conif. 241.—Lindley & Gordon in Jour. Hort. Soc. London, v, 226.—Darby, Bot. S. States, 516.—Carrière, Trait. Conif. 514; 2 ed. 726.—Gordon, Pinetum, 329; 2 ed. 412.—Cooper in Smithsonian Rep. 1858, 259.—Chapman, Fl. S. States, 436.—Wood, Cl. Book, 664; Bot. & Fl. 316.—Hoopes, Evergreens, 387, f. 62.—Parlatore in De Candolle, Prodr. xvi², 505.—Koch, Dendrologie, ii², 100.—Vasey, Cat. Forest Trees, 35.—Veitch, Manual Conif. 311.

Caryotaxus taxifolia, Henkel & Hochstetter, Nadelhölz. 367.

Fœtataxus montana, Nelson, Pinaceæ, 167.

STINKING CEDAR. SAVIN.

Western Florida, eastern bank of the Apalachicola river from Chattahoochee to the neighborhood of Bristol, Gadsden county; doubtfully reported from the shores of a small lake west of Ocheesee and at Wakulla Springs, Wakulla county (*Curtiss*).

A tree 12 to 18 meters in height, with a trunk 0.60 to 0.90 meter in diameter, sending up when cut many vigorous shoots from the stem and roots; borders of swamps on calcareous soil; very rare and local.

Wood light, rather hard, strong, brittle, very close-grained, compact, susceptible of a beautiful polish, very durable in contact with the soil; bands of small summer cells very thin, not conspicuous; medullary rays numerous, obscure; color, clear bright yellow, the thin sap-wood much lighter; specific gravity, 0.5145; ash, 0.73; largely used locally for fence posts, etc.

346.—Torreya Californica, Torrey,

N. York Jour. Pharm. iii, 49; Pacific R. R. Rep. iv, 140.—Bigelow in Pacific R. R. Rep. iv, 24.—Kellogg in Proc. California Acad. i, 35.—Newberry in Pacific R. R. Rep. vi, 61, 90, f. 27.—Cooper in Smithsonian Rep. 1858, 263.—Bolander in Proc. California Acad. iii, 229.—Hoopes, Evergreens, 385.—Parlatore in De Candolle, Prodr. xvi², 506.—Koch, Dendrologie, ii², 101.—Gordon, Pinetum, 2 ed. 410.—Vasey, Cat. Forest Trees, 35.—Watson, Bot. California, ii, 110.

T. Myristica, Hooker f. in Bot. Mag. t. 4780.—Van Houtte in Fl. des Serres, ix, 175 & t.—Carrière, Conif. 315; 2 ed. 727.—Gordon, Pinetum, 1 ed. 327.—Murray in Edinburgh New Phil. Jour. new ser. x, 7, t. 3.—Veitch, Manual Conif. 311.

Caryotaxus Myristica, Henkel & Hochstetter, Nadelhölz. 368.

Fœtataxus Myristica, Nelson, Pinaceæ, 168.

CALIFORNIA NUTMEG. STINKING CEDAR.

California, Mendocino county, and along the western slope of the Sierra Nevadas to Tulare county, between 3,000 and 5,000 feet elevation.

A tree 15 to 22 meters in height, with a trunk 0.30 to 0.90 meter in diameter, sending up from the stump when cut many vigorous shoots; borders of streams, in moist soil; rare.

Wood light, soft, not strong, very close-grained, compact, susceptible of a fine polish, very durable in contact with the soil; bands of small summer cells broad, not conspicuous; medullary rays numerous, obscure; color, clear light yellow, the thin sap-wood nearly white; specific gravity, 0.4760; ash, 1.34.

347.—Pinus Strobus, Linnæus,

Spec. 1 ed. 1001; Du Roi, Harbk. ii, 57.—Wangenheim, Amer. i, t. 1, f. 1.—Aiton, Hort. Kew. iii, 369; 2 ed. v, 318.—Swartz, Obs. 363.—Mœnch, Meth. 364.—Michaux, Fl. Bor.-Am. ii, 205.—Poiret in Lamarck, Dict. v, 341; Ill. iii, 369, t. 786, f. 2.—Lambert, Pinus, 1 ed. t. 22; 2 ed. i, 27, t. 35; 3 ed. i, 51, t. 32.—Willdenow, Spec. iv, 501; Enum. 989; Berl Baumz. 213.—Persoon, Syn. ii, 579.—Desfontaines, Hist. Arb. ii, 612.—Michaux f. Hist. Arb. Am. i, 104, t. 10; N. American Sylva, 3 ed. iii, 126, t. 145.—Nouveau Duhamel, v, 249, t. 76.—Smith in Rees' Cycl. xxviii, No. 17.—Pursh, Fl. Am. Sept. ii, 644.—Eaton, Manual, 110; 6 ed. 265.—Nuttall, Genera, ii, 223; Sylva, iii, 118; 2 ed. ii, 176 (excl. syn. var. *monticola*).—Hayne, Dend. Fl. 175.—Elliott. Sk. ii, 638.—Sprengel, Syst. ii, 887.—Torrey, Compend. Fl. N. States, 360; Fl. N. York, ii, 229.—Richard, Conif. 60, t. 12, f. 2.—Audubon, Birds, t. 39.—Beck, Bot. 339.—Loudon, Arboretum, iv, 2280, f. 2193–2196.—Forbes, Pinetum Woburn. 83.—Hooker, Fl. Bor.-Am. ii, 161.—Eaton & Wright. Bot. 359.—Bigelow, Fl. Boston. 3 ed. 385.—Antoine, Conif. 43, t. 20, f. 2.—Lindley in Penn. Cycl. xvii, 173.—Link in Linnæa, xv, 514.—Spach, Hist. Veg. xi, 394.—De Chambray, Trait. Arb. Res. Conif. 262, t. 4, 5, f. 8.—Emerson, Trees Massachusetts, 60; 2 ed. i, 73 & t.—Endlicher, Syn. Conif. 147.—Gihoul, Arb. Resin. 35, t. 5.—Knight, Syn. Conif. 34.—Lindley & Gordon in Jour. Hort. Soc. London. v, 215.—Carrière, Trait. Conif. 302; 2 ed. 398.—Buckley in Am. Jour. Sci. 2 ser. xiii, 398.—Darlington, Fl. Cestrica, 3 ed. 290.—Darby, Bot. S. States, 515.—Gordon, Pinetum, 239; 2 ed. 322.—Cooper in Smithsonian Rep. 1858, 257.—Fescali, Forst. Pfl. 56, t. 11, f. 7–13.—Chapman, Fl. S. States, 434.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 25.—Wood, Cl. Book, 660; Bot. & Fl. 312.—Porcher, Resources S. Forests, 505.—Henkel & Hochstetter, Nadelhölz. 92.—Nelson, Pinaceæ, 130.—Hoopes, Evergreens, 136, f. 19.—Gray, Manual N. States, 5 ed. 470.—Parlatore in De Candolle, Prodr. xvi², 405.—Schnizlein, Icon. t. 77, f. 10.—Koch, Dendrologie, ii², 319.—Vasey, Cat. Forest Trees, 32.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Sears in Bull. Essex Inst. xiii, 187.—Veitch, Manual Conif. 183.—Bell in Geological Rep. Canada, 1879–'80. 49c.

P. Strobus, var. *alba*, var. *brevifolia*, var. *compressa*, Loudon, Arboretum, iv, 2280.—Lindley & Gordon in Jour. Hort. Soc. London, v, 215.

P. Strobus, var. *nivea*, Hort.

WHITE PINE. WEYMOUTH PINE.

Newfoundland, northern shores of the gulf of Saint Lawrence to lake Nipigon and the valley of the Winnipeg river, south through the northern states to Pennsylvania, the southern shores of lake Michigan, "Starving rock," near La Salle, Illinois, near Davenport, Iowa (*Parry*), and along the Alleghany mountains to northern Georgia.

A large tree of the first economic value, 24 to 52 meters in height, with a trunk 1.20 to 3.50 meters in diameter; sandy loam upon drift formations, forming extensive forests, or in the region of the great lakes often in small bodies scattered through the hard-wood forests, here reaching its greatest development; north of latitude 47° N. and south of Pennsylvania, central Michigan, and Minnesota much smaller, less common and valuable.

Wood light, soft, not strong, very close, straight-grained, compact, easily worked, susceptible of a beautiful polish; bands of small summer cells thin, not conspicuous, resin passages small, not numerous nor conspicuous; medullary rays numerous, thin; color, light brown, often slightly tinged with red, the sap-wood nearly white; specific gravity, 0.3854; ash, 0.19; more largely manufactured into lumber, shingles, laths, etc., than that of any other North American tree; the common and most valuable building material of the northern states; largely used in cabinet-making, for interior finish, and in the manufacture of matches, woodenware, and for many domestic purposes.

Coniferin, a glucoside principle, has been discovered in the cambium layer of this and several other species of *Coniferæ* (*Jour. für Prakt. Chem.* xcvii, 243.—*Am. Jour. Pharm.* 1867, 261.—*U. S. Dispensatory*, 14 ed. 901).

348.—Pinus monticola, Douglas;

Lambert, Pinus, 1 ed. iii, 27, t. 35.—Loudon, Arboretum, iv, 2291, f. 2208, 2209.—Forbes, Pinetum Woburn. 81, t. 31.—Antoine, Conif. 40, t. 18, f. 3.—Hooker & Arnott, Bot. Beechey, 394.—Endlicher, Syn. Conif. 148.—Lindley & Gordon in Jour. Hort. Soc. London, v, 215.—Carrière, Trait. Conif. 305; 2 ed. 401.—Gordon, Pinetum, 233; 2 ed. 314.—Cooper in Smithsonian Rep. 1858, 262; Pacific R. R. Rep. xii², 27; Am. Nat. iii, 410.—Lyall in Jour. Linnæan Soc. vii, 141.—Henkel & Hochstetter, Nadelhölz. 94.—Nelson, Pinaceæ, 120.—Hoopes, Evergreens, 135.—Bolander in Proc. California Acad. iii, 318.—Parlatore in De Candolle, Prodr. xvi², 405.—Gray in Proc. Am. Acad. vii, 402.—Fowler in London Gard. Chronicle, 1872, 1071.—Koch, Dendrologie, ii², 322.—Vasey, Cat. Forest Trees, 32.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Hall in Coulter's Bot. Gazette, ii, 91.—Engelmann in Bot. California, ii, 123.—G. M. Dawson in Canadian Nat. new ser. ix, 328.—Veitch, Manual Conif. 181, f. 41.—Lawson, Pinetum Brit. i, 69, f. 1–6.

P. Strobus, var. *monticola*, Nuttall, Sylva, iii, 118; 2 ed. ii, 176.

P. Grozelieri, Carrière in Rev. Hort. 1869, 126.

P. porphyrocarpa, Lawson, Pinetum Brit. i, 83, f. 1–8.

WHITE PINE.

Vancouver's island, Coast and Gold ranges of southern British Columbia, through the Cœur d'Alêne and Bitter Root mountains of Idaho to the valley of the Flathead river, northern Montana (*Canby & Sargent*), south along the Cascade mountains of Washington territory and Oregon and the California sierras to Calaveras county.

A large tree, 30 to 46 meters in height, with a trunk 0.90 to 1.50 meter in diameter; most common and reaching its greatest development in the Pend d'Oreille and Clark's Fork regions of Idaho, here a valuable and important timber tree; in British Columbia generally below 3,000 feet, and in California between 7,000 and 10,000 feet elevation; not common.

Wood very light, soft, not strong, close, straight-grained, compact; bands of small summer cells thin, resinous, not conspicuous, resin passages numerous, not large, conspicuous; medullary rays numerous, obscure; color, light brown or red, the sap-wood nearly white; specific gravity, 0.3908; ash, 0.23; inferior in quality, although resembling that of the eastern white pine (*P. Strobus*); in Idaho and Montana somewhat manufactured into lumber.

349.—Pinus Lambertiana, Douglas,

Companion Bot. Mag. ii, 92, 106, 107, 130, 152; Trans. Linnæan Soc. xv, 500.—Lambert, Pinus, 1 ed. iii, 157, t. 68, 69.—London, Arboretum, iv, 2288, f. 2203.—Forbes, Pinetum Woburn. 77, t. 30.—Hooker, Fl. Bor.-Am. ii, 161.—Antoine, Conif. 41, t. 19.—Lindley in Penn. Cycl. xvii, 173.—Hooker & Arnott, Bot. Beechey, 394.—Spach, Hist. Veg. xi, 397.—Nuttall, Sylva, iii, 122, t. 114; 2 ed. ii, 180, t. 114.—De Chambray, Trait. Arb. Res. Conif. 346.—Endlicher, Syn. Conif. 150.—Lindley & Gordon in Jour. Hort. Soc. London, v, 215.—Carrière, Trait. Conif. 307; 2 ed. 403.—Bigelow in Pacific R. R. Rep. iv, 21.—Torrey in Pacific R. R. Rep. iv, 141; Bot. Mex. Boundary Survey, 210; Ives' Rep. 28.—Newberry in Pacific R. R. Rep. vi, 42, 90, f. 14.—Gordon, Pinetum, 228; 2 ed. 307.—Cooper in Smithsonian Rep. 1858, 262.—Murray in Trans. Bot. Soc. Edinburgh, vi, 369.—Lawson, Pinetum Brit. i, 47, t. 7, f. 1-7.—Bolander in Proc. California Acad. iii, 226, 317.—Henkel & Hochstetter, Nadelhölz. 95.—Nelson, Pinaceæ, 115.—Hoopes, Evergreens, 134.—Parlatore in De Candolle, Prodr. xvi², 402.—Fowler in London Gard. Chronicle, 1872, 1071.—Koch, Dendrologie, ii², 323.—Vasey, Cat. Forest Trees, 32.—Veitch, Manual Conif. 179.

SUGAR PINE.

Oregon, Cascade and Coast ranges, from the head of the Mackenzie river and the valley of the Rogue river south along the western flank of the California sierras, through the Coast ranges to the Santa Lucia mountains, and in the San Bernardino and Cuyamaca mountains.

A large tree, 46 to 92 meters in height, with a trunk 3 to 7 meters in diameter; most common and reaching its greatest development upon the sierras of central and northern California between 4,000 and 8,000 feet elevation; in the Oregon Coast ranges descending to 1,000 feet above the sea-level.

Wood very light, soft, coarse, straight-grained, compact, satiny, easily worked; bands of small summer cells thin, resinous, conspicuous, resin passages numerous, very large and conspicuous; medullary rays numerous, obscure; color, light brown, the sap-wood nearly white; specific gravity, 0.3684; ash, 0.22; now largely manufactured into lumber and used for interior finish, door-blinds, sashes, etc., and for cooperage and woodenware; less valuable and less easily worked than that of the eastern white pine (*Pinus Strobus*); its quality injured by the larger and more numerous resin passages.

A saccharine exudation from the stumps of cut or partially-burned trees sometimes used as a substitute for sugar.

350.—Pinus flexilis, James,

Long's Exped. ii, 27, 34.—Torrey in Ann. Lyc. N. York, ii, 249; Pacific R. R. Rep. iv, 141.—Eaton, Manual, 6 ed. 265.—Eaton & Wright, Bot. 359.—Nuttall, Sylva, iii, 107, t. 112; 2 ed. ii, 167, t. 107.—Lindley & Gordon in Jour. Hort. Soc. London, v, 220.—Carrière in Fl. des Serres, ix, 200; Rev. Hort. 1854, 228; Trait. Conif. 310; 2 ed. 392.—Bigelow in Pacific R. R. Rep. iv, 6, 20.—Gordon, Pinetum, 224; 2 ed. 302.—Cooper in Smithsonian Rep. 1858, 262.—Parry in Trans. St. Louis Acad. ii, 121.—Engelmann in Am. Jour. Sci. 2 ser. xxxiv, 331; Trans. St. Louis Acad. ii, 208; Wheeler's Rep. vi, 257; Bot. California, ii, 124.—Henkel & Hochstetter, Nadelhölz. 126.—Nelson, Pinaceæ, 112.—Bolander in Proc. California Acad. iii, 318.—Hoopes, Evergreens, 131, f. 18.—Parlatore in De Candolle, Prodr. xvi², 403.—Porter in Hayden's Rep. 1871, 494.—Watson in King's Rep. v, xxviii, 332; Pl. Wheeler, 17.—Rothrock, Pl. Wheeler, 27, 50; Wheeler's Rep. vi, 9.—Porter & Coulter, Fl. Colorado; Hayden, Surv. Misc. Pub. No. 4, 130.—Murray in London Gard. Chronicle, 1875, 106.—Vasey, Cat. Forest Trees, 32.—Sargent in Am. Jour. Sci. 3 ser. xvii, 420—Lawson, Pinetum Brit. i, 35, f. 1.

P. Lambertiana, var. Hooker, Fl. Bor.-Am. ii, 161.

P. Lambertiana, var. *brevifolia*, Endlicher, Syn. Conif. 150.—Lindley & Gordon in Jour. Hort. Soc. London, v, 215.—Carrière, Trait. Conif. 2 ed. 404.

P. flexilis, var. *serrulata*, Engelmann in Wheeler's Rep. vi, 258.

P. flexilis, var. *macrocarpa*, Engelmann in Wheeler's Rep. vi, 258.

WHITE PINE.

Eastern slopes of the Rocky mountains, Montana, and probably much farther north, south to New Mexico, on the Guadalupe and Limpia mountains, western Texas (*Havard*), on the high mountain ranges of Utah, Nevada, and northern Arizona, Inyo mountains and mount Silliman, California.

A tree 15 to 18 meters in height, with a trunk 0.60 to 1.20 meter in diameter; dry, gravelly slopes and ridges between 4,000 and 10,000 feet elevation; common along the eastern slopes of the Rocky mountains of northern Montana, forming open, scattered forests, here low, round-topped, and the prevailing forest tree; in central Nevada the most valuable lumber tree of the region.

Wood light, soft, close-grained, compact; bands of small summer cells narrow, not conspicuous, resin passages numerous, large; medullary rays numerous, conspicuous; color, light clear yellow, turning red with exposure, the sap-wood nearly white; specific gravity, 0.4358; ash, 0.28; in northern Montana, Nevada, and Utah sometimes sawed into inferior lumber and used in construction and for various domestic purposes.

351.—Pinus albicaulis, Engelmann,

Trans. St. Louis Acad. ii, 209; Coulter's Bot. Gazette, vii, 4.—Gray in Proc. Am. Acad. vii, 402.—Vasey, Cat. Forest Trees, 32.—Hall in Coulter's Bot. Gazette, ii, 91.—Lawson, Pinetum Brit. i, 1, f. 1–4.

P. flexilis, Murray, Rep. Oregon Exped. i, t. 2, f. 1 [not James].—Lyall in Jour. Linnæan Soc. vii, 142.—Parlatore in De Candolle, Prodr. xvi², 403, in part.

P. cembroides, Newberry in Pacific R. R. Rep. vi, 44, 90, f. 15 [not Zuccarini].

P. Shasta, Carrière, Trait. Conif. 2 ed. 390.

P. flexilis, var. *albicaulis*, Engelmann in Bot. California, ii, 124.—G. M. Dawson in Canadian Nat. new. ser. ix, 328.

Coast ranges of British Columbia, from the valley of the Lltasyonco river (*G. M. Dawson*) south along the Cascade and Blue mountains of Washington territory and Oregon, extending east along the high ranges of northern Washington territory to the eastern slope of the Rocky mountains of northern Montana (Old Marias pass, *Canby & Sargent*); California, Scott's mountains, mount Shasta, and on the high peaks of the Sierra Nevadas to mount San Bernardino.

A small alpine tree, 6 to 12 meters in height, with a trunk rarely 0.60 meter in diameter, or at its highest elevation reduced to a low, prostrate shrub; dry, gravelly ridges at the extreme limit of tree growth, reaching in the San Bernardino mountains an elevation of 10,500 feet.

Wood light, soft, not strong, brittle, close-grained, compact; bands of small summer cells thin, not conspicuous, resin passages numerous, not large; medullary rays numerous, obscure; color, light brown, the sap-wood nearly white; specific gravity, 0.4165; ash, 0.27.

352.—Pinus reflexa, Engelmann,

Coulter's Bot. Gazette, vii, 4.—Rusby in Bull. Torrey Bot. Club, ix, 80.

P. flexilis, var. *reflexa*, Engelmann in Wheeler's Rep. vi, 258.

WHITE PINE.

High mountains of southwestern New Mexico (*Greene, Rusby*) to the Santa Rita mountains (*Rothrock, Engelmann & Sargent*) and Santa Catalina mountains (*Lemmon, Pringle*), Arizona.

A tree 24 to 30 meters in height, with a trunk sometimes exceeding 0.60 meter in diameter; rocky ridges and slopes of almost inaccessible cañons between 6,000 to 8,000 feet elevation.

Wood light, hard, not strong, close-grained, compact; bands of small summer cells thin, resinous, not conspicuous, resin passages large, not numerous; medullary rays numerous, obscure; color, light red, the sap-wood nearly white; specific gravity, 0.4877; ash, 0.26.

353.—Pinus Parryana, Engelmann,

Am. Jour. Sci. 2 ser. xxiv, 332, note; Bot. California, ii, 124.—Parlatore in De Candolle, Prodr. xvi², 402.—Vasey, Cat. Forest Trees, 30.

P. Llaveana, Torrey, Bot. Mex. Boundary Survey, 208. t. 55 [not Schiedo & Deppe].—Cooper in Smithsonian Rep. 1858, 262.—Bolander in Proc. California Acad. iii, 318.

PIÑON. NUT PINE.

California, Larkin's station, 20 miles southeast of Campo, San Diego county (*Vasey*), and southward into Lower California.

A small tree, 6 to 9 meters in height, with a trunk 0.30 to 0.45 meter in diameter; very rare within the limits of the United States; south of the boundary forming extensive open forests upon the high *mesas* and slopes of Lower California (*Pringle*).

Wood light, soft, close-grained, compact; bands of small summer cells thin, not conspicuous, resin passages very numerous, large, conspicuous; medullary rays numerous, obscure; color, light brown or yellow, the sap-wood much lighter, nearly white; specific gravity, 0.5675; ash, 0.54.

The large seeds edible.

354.—Pinus cembroides, Zuccarini,

Flora, ii, 93.—Endlicher, Syn. Conif. 182.—Fl. des Serres, iv, 3446, t. 97.—Nelson, Pinaceæ, 107.—Parlatore in De Candolle, Prodr. xvi², 397.—Engelmann in Trans. St. Louis Acad. iv, 176.—Watson in Proc. Am. Acad. xviii, 158.

P. Llaveana, Schiede & Deppe in Linnæa, xii, 488.—Forbes, Pinetum Woburn. 49, t. 17.—Antoine, Conif. 36, t. 16, f. 1.—Spach, Hist. Veg. xi, 401.—Lindley & Gordon in Jour. Hort. Soc. London, v, 216.—Carrière, Trait. Conif. 405; 2 ed. 461.—Gordon, Pinetum, 199; 2 ed. 274 (excl. syn. *edulis*).—Henkel & Hochstetter, Nadelhölz. 64 (excl. syn. *edulis*).—Hoopes, Evergreens, 143.

P. osteosperma, Engelmann in Wislizenus' Rep. No. 3.—Lindley & Gordon in Jour. Hort. Soc. London, v, 216.—Carrière in Fl. des Serres, ix, 200; Rev. Hort. 1854, 227.

NUT PINE.

Santa Catalina mountains, Arizona (*Pringle*); through northern Mexico.

A small tree, in Arizona 6 to 7 meters in height, with a trunk hardly exceeding 0.30 meter in diameter; dry ridges and slopes at 3,500 feet elevation.

Wood light, soft, very close-grained, compact; bands of small summer cells thin, not conspicuous, resin passages few, small; medullary rays numerous, obscure; color, light clear yellow, the sap-wood nearly white; specific gravity, 0.6512; ash, 0.90.

The seeds edible.

355.—Pinus edulis, Engelmann,

Wislizenus' Rep. No. 4; Wheeler's Rep. vi, 260.—Lindley & Gordon in Jour. Hort. Soc. London, v. 216.—Carrière, Fl. des Serres, ix, 201; Rev. Hort. 1854, 227; Trait. Conif. 403.—Torrey in Sitgreaves' Rep. 173, t. 20; Pacific R. R. Rep. iv, 140; Ives' Rep. 28.—Bigelow in Pacific R. R. Rep. iv, 3, 19.—Cooper in Smithsonian Rep. 1858, 261.—Hoopes, Evergreens, 142.—Parlatore in De Candolle, Prodr. xvi², 398.—Watson in Pl. Wheeler, 17.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 130.—Vasey, Cat. Forest Trees, 30.—Rothrock in Wheeler's Rep. vi, 9.—Rusby in Bull. Torrey Bot. Club, ix, 106.—Veitch, Manual Conif. 172.

P. cembroides, Gordon in Jour. Hort. Soc. London, v, 236 & f.; Pinetum, 192; 2 ed. 265 [not Zuccarini].—Fl. des Serres, iv, 324ᵇ, 325ᵇ, t. 331, f. 97.—Lindley & Gordon in Jour. Hort. Soc. London, v, 216.—Carrière, Trait. Conif. 404; 2 ed. 460.

P. futilis, Roezl in herb. *fide* Gordon, Pinetum, Suppl. 76; 2 ed. 265.

PIÑON. NUT PINE.

Eastern base of Pike's peak, Colorado, south through New Mexico to the mountains of western Texas.

A small tree, 6 to 9 meters in height, with a trunk 0.30 to 0.90 meter in diameter; dry *mesas* and slopes, generally on lime or sandstone, reaching in Colorado an elevation of 9,000 feet.

Wood light, soft, not strong, brittle, close-grained, compact, durable in contact with the soil; bands of small summer cells thin, not conspicuous, resin passages few, small; medullary rays numerous, obscure; color, light brown, the sap-wood nearly white; specific gravity, 0.6388; ash, 0.62; largely used for fuel, charcoal, fencing, etc., and in western Texas occasionally manufactured into inferior lumber.

The large edible nuts supply the Indians with a valuable article of food.

356.—Pinus monophylla, Torrey & Fremont,

Fremont's Rep. 319, t. 4.—Cooper in Smithsonian Rep. 1858, 261.—Bolander in Proc. California Acad. iii, 318.—Hoopes, Evergreens, 142.—Parlatore in De Candolle, Prodr. xvi², 378.—Lawson, Pinetum Brit. i, 65, t. 9, f. 1-12 (*P. Fremontiana* on plate).—Watson in King's Rep. v, 330; Pl. Wheeler, 17.—Koch, Dendrologie, ii², 271.—Bertrand in Bull. Soc. Bot. France, xviii, 81, t. 5, f. 81.—Rothrock in Pl. Wheeler, 28, 50.—Vasey, Cat. Forest Trees, 30.—Palmer in Am. Nat. xii, 594.—Engelmann in Wheeler's Rep, vi, 259, 374; Trans. St. Louis Acad. iv, 178; Bot. California, ii, 124.—Sargent in Am. Jour. Sci. 3 ser. xvii, 419.—Masters in London Gard. Chronicle, 1883, p. 48, f. 8.

P. Fremontiana, Endlicher, Syn. Conif. 1831, in part.—Gordon in Jour. Hort. Soc. London, iv, 293 & f.; Pinetum, 194; 2 ed. 235.—Knight, Syn. Conif. 28.—Lindley & Gordon in Jour. Hort. Soc. London, v, 216.—Carrière, Trait. Conif. 194; 2 ed. 462.—Henkel & Hochstetter, Nadelhölz. 62.

PIÑON. NUT PINE.

Near Utah lake, Utah, to the eastern foot-hills of the California sierras, south along the mountain ranges of the Great Basin to the San Francisco mountains of eastern Arizona.

A small, bushy tree, 4 to 6 meters in height, with a trunk sometimes 1 meter in diameter; dry, gravelly slopes and *mesas* between 3,000 and 6,000 feet elevation.

Wood light, soft, weak, brittle, close-grained, compact; bands of small summer cells thin, not conspicuous, resin passages few, not large; medullary rays numerous, obscure; color, yellow or light brown, the sap-wood nearly white; specific gravity, 0.5658; ash, 0.68; largely used for fuel and charcoal.

The large edible seeds furnish the principal food of the Indians of the Great Basin.

357.—Pinus Balfouriana, Murray,

Rep. Oregon Exped. i, t. 3, f. 1.—Gordon, Pinetum, 217; 2 ed. 293.—Henkel & Hochstetter, Nadelhölz. 109.—Bolander in Proc. California Acad. iii, 318.—Carrière, Trait. Conif. 2 ed. 425.—Nelson, Pinaceæ, 104.—Hoopes, Evergreens, 149.—Fowler in London Gard. Chronicle, 1872, 973.—Vasey, Cat. Forest Trees, 32.—Engelmann in Trans. St. Louis Acad. iv, 179; Bot. California, ii, 125.—Veitch, Manual Conif. 175.—Lawson, Pinetum Brit. i, 11, f. 1–5.

California, Scott's mountain, Siskiyou county (*Jeffrey*, *Lemmon*), mount Whitney, and about the headwaters of King and Kern rivers.

A small tree, 15 to 19 meters in height, with a trunk 0.60 to 0.90 meter in diameter; dry, gravelly slopes and ridges, forming upon Scott's mountain a broad belt of open forest growth between 5,000 and 8,000 feet elevation.

Wood light, soft, weak, brittle, very close-grained, compact, satiny, susceptible of a good polish; bands of small summer cells very narrow, dark colored, resin passages few, not conspicuous; medullary rays numerous obscure; specific gravity, 0.5434; ash, 0.41.

Var. aristata, Engelmann,

Wheeler's Rep. vi, 375.—Bot. California, ii, 125.—Veitch, Manual Conif. 175.

P. aristata, Engelmann in Am. Jour. Sci. 2 ser. xxxiv, 331; Trans. St. Louis Acad. ii, 205, t. 5, 6; iv, 179; Bot. California, ii, 125.—Parry in Trans. St. Louis Acad. ii, 123.—Wood, Bot. & Fl. 313.—Regel, Gartenflora, 1863, iii, 91.—Henkel & Hochstetter, Nadelhölz. 417.—Nelson, Pinaceæ, 103.—Carrière, Trait. Conif. 2 ed. 424.—Parlatore in De Candolle, Prodr. xvi², 400.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 130.—Murray in London Gard. Chronicle, 1875, 106.—Gordon, Pinetum, 2 ed. 291.—Vasey, Cat. Forest Trees, 32.—Brandegee in Coulter's Bot. Gazette, 32.—Lawson, Pinetum Brit. i, 5, f. 1.

P. Balfouriana, Watson in King's Rep. v, 331; Pl. Wheeler, 17 [not Murray].—Rothrock in Pl. Wheeler, 28, 50.—Sargent in Am. Jour. Sci. 3 ser. xvii, 419.

FOXTAIL PINE. HICKORY PINE.

Mountains of southeastern California, Nevada, northern Arizona, and southern Utah to Colorado, above 7,500 feet, or in Colorado reaching 12,000 feet elevation.

A tree 15 to 30 meters in height, with a trunk 0.60 to 2.40 meters in diameter; dry, gravelly ridges; not common.

Wood light, soft, not strong, very close-grained, compact; bands of small summer cells thin, dark colored, not conspicuous, resin passages few, not prominent; medullary rays numerous, obscure; color, red, the thin sap-wood nearly white; specific gravity, 0.5572; ash, 0.30; in central Nevada largely used for the timbering of mines, and now nearly exterminated.

358.—Pinus resinosa, Aiton,

Hort. Kew. iii, 367; 2 ed. v, 316.—Lambert, Pinus, 1 ed. t. 14; 2 ed. i, 20, t. 14; 3 ed. i, 17, t. 13.—Willdenow, Spec. iv, 496; Enum. 988; Berl. Baumz. 267.—Poiret in Lamarck, Dict. v, 339.—Persoon, Syn. ii, 578.—Desfontaines, Hist. Arb. ii, 612.—Smith in Rees' Cycl. xxviii, No. 3.—Pursh, Fl. Am. Sept. ii, 642.—Eaton, Manual, 110; 6 ed. 264.—Nuttall, Genera, ii, 223.—Hayne, Dend. Fl. 173.—Sprengel, Syst. ii, 886.—Torrey, Compend. Fl. N. States, 360; Fl. N. York, ii, 227.—Beck, Bot. 339.—Loudon, Arboretum, iv, 2210, f. 2094–2097.—Forbes, Pinetum Woburn. 19, t. 6.—Hooker, Fl. Bor.-Am. ii, 161, in part.—Eaton & Wright, Bot. 358.—Bigelow, Fl. Boston. 3 ed. 384.—Lindley in Penn. Cycl. xvii, 170.—Antoine, Conif. 7, t. 4, f. 1.—Link in Linnæa, xv, 501.—Endlicher, Syn. Conif. 178.—Knight, Syn. Conif. 27.—Lindley & Gordon in Jour. Hort. Soc. London, v, 219.—Parry in Owen's Rep. 618.—Carrière, Trait. Conif. 401.—Gordon, Pinetum, 183 (excl. syn. *Loiseleuriana*); 2 ed. 256.—Richardson Arctic Exped. 441.—Cooper in Smithsonian Rep. 1858, 257.—Wood, Cl. Book, 661; Bot. & Fl. 313.—Henkel & Hochstetter, Nadelhölz. 45 (excl. syn. *Loiseleuriana*).—Hoopes, Evergreens, 102.—Gray, Manual N. States, 5 ed. 470.—Parlatore in De Candolle, Prodr. xvi², 388.—Koch, Dendrologie, ii², 286.—Vasey, Cat. Forest Trees, 30.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Engelmann in Trans. St. Louis Acad. iv, 179.—Sears in Bull. Essex Inst. xiii, 185.—Bell in Geological Rep. Canada, 1879–'80, 50c.—Veitch, Manual Conif. 159.

P. rubra, Michaux f. Hist. Arb. Am. i, 46, t. 1; N. American Sylva, 3 ed. iii, 91, t. 134 [not Lambert].—De Chambray, Trait. Arb. Res. 344.—Giboul, Arb. Resin. 27.—Carrière, Trait. Conif. 2 ed. 496.

P. Laricio, var. *resinosa*, Spach, Hist. Veg. 385.

RED PINE. NORWAY PINE.

Newfoundland, northern shores of the gulf of Saint Lawrence and lake Nipigon to the valley of the Winnipeg river, south through the northern states to Chestnut Hill, Middlesex county, Massachusetts, the mountains of northern Pennsylvania, Isabella county, Michigan, and central Minnesota.

A large tree, 24 to 46 meters in height, with a trunk 0.60 to 1.37 meter in diameter; light sandy loam or dry, rocky ridges, forming scattered groves rarely exceeding a few hundred acres in extent; common and reaching its greatest development through northern Wisconsin and Minnesota; rare in the eastern States, except in the extreme northern portions of New England.

Wood light, not strong, hard, rather coarse-grained, compact; bands of small summer cells broad, dark colored, very resinous, resin passages few, small, not conspicuous; medullary rays numerous, thin; color, light red, the sap-wood yellow or often almost white; specific gravity, 0.4854; ash, 0.27; largely manufactured into lumber and used for all purposes of construction, flooring, piles, etc.

359.—Pinus Torreyana, Parry,

Bot. Mex. Boundary Survey, 210, t. 58, 59; Proc. San Diego Nat. Hist. Soc. Nov. 1883.—Carrière, Trait. Conif. 326; 2 ed. 423.—Gordon, Pinetum, 241.—Cooper in Smithsonian Rep. 1860, 442.—Henkel & Hochstetter, Nadelhölz. 117.—Bolander in Proc. California Acad. iii, 318.—Hoopes, Evergreens, 150.—Vasey, Cat. Forest Trees, 31.—Palmer in Am. Nat. xii, 594.—Engelmann in Trans. St. Louis Acad. iv, 181; Bot. California, ii, 125.—Voitch, Manual Conif. 173.

P. lophosperma, Lindley in London Gard. Chronicle, 1860, 46.—Gordon, Pinetum, Suppl. 69; 2 ed. 310.—Henkel & Hochstetter, Nadelhölz. 112.—Nelson, Pinaceæ, 117.—Parlatore in De Candolle, Prodr. xvi², 391.

California, mouth of the Soledad river, San Diego county; doubtfully reported from one of the islands off Santa Barbara and from Lower California.

A low, short-lived, gnarled, crooked tree, 6 to 8 meters in height, with a trunk 0.23 to 0.33 meter in diameter; crests of sandy bluffs immediately upon the sea-coast; very local and fast disappearing.

Wood light, soft, not strong, brittle, rather close-grained, compact; bands of small summer cells broad, resinous, conspicuous, resin passages small, few; medullary rays numerous, obscure; color, light red, the sap-wood yellow or nearly white; specific gravity, 0.4879; ash, 0.35; locally used for fuel.

360.—Pinus Arizonica, Engelmann,

Wheeler's Rep. vi, 260; Trans. St. Louis Acad. iv, 181; Coulter's Bot. Gazette, vii, 4.

YELLOW PINE.

Santa Rita mountains (*Rothrock, Engelmann & Sargent*), Santa Catalina mountains (*Lemmon, Pringle*), and probably upon other ranges of southern Arizona.

A tree 24 to 30 meters in height, with a trunk 0.60 to 0.90 meter in diameter; high rocky ridges between 6,000 and 8,000 feet elevation; the prevailing forest tree over large areas near the summits of the Santa Catalina mountains (*Lemmon*).

Wood light, soft, not strong, rather brittle, close grained, compact; bands of small summer cells broad, very resinous, conspicuous, resin passages numerous, large; medullary rays thin, obscure; color, light red or often yellow, the sap-wood lighter yellow or white; specific gravity, 0.5038; ash, 0.20; sometimes sawed into inferior lumber.

361.—Pinus ponderosa, Douglas,

Companion Bot. Mag. ii, 111.—London, Arboretum, iv, 2243, f. 2132-2136.—Forbes, Pinetum Woburn. 44, t. 15.—Antoine, Conif. 28, t. 8, f. 1.—Lindley in Penn. Cycl. xvii, 172.—Link in Linnæa, xv, 306.—Nuttall, Sylva, iii, 114; 2 ed. ii, 173.—Spach, Hist. Veg. xi, 389.—Endlicher, Syn. Conif. 163.—Knight, Syn. Conif. 30.—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 340; 2 ed. 445.—Gordon, Pinetum, 205; Suppl. 67; 2 ed. 281.—Newberry in Pacific R. R. Rep. vi, 36, 90, t. 4, f. 12.—Cooper in Smithsonian Rep. 1858, 261; Pacific R. R. Rep. xii², 27, 68; Am. Nat. iii, 409.—Torrey, Bot. Mex. Boundary Survey, 209; Ives' Rep. 28.—Engelmann in Am. Jour. Sci. 2 ser. xxxiv, 332; Proc. Am. Phil. Soc. 2 ser. xii, 209; Wheeler's Rep. vi, 261; Trans. St. Louis Acad. iv, 181; Bot. California, ii, 125.—Lyall in Jour. Linnæan Soc. vii, 142.—Bolander in Proc. California Acad. iii, 226, 317.—Henkel & Hochstetter, Nadelhölz. 71.—Nelson, Pinaceæ, 125.—Hoopes, Evergreens, 117.—Parlatore in De Candolle, Prodr. xvi², 395 (excl. syn. *Sinclairii*).—Watson in King's Rep. v, 331; Pl. Wheeler, 17.—Gray in Proc. Am. Acad. vii, 402.—Fowler in London Gard. Chronicle, 1872, 1326.—Koch, Dendrologie, ii², 310.—Rothrock in Pl. Wheeler, 28, 50; Wheeler's Rep. vi, 9.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 129.—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 121.—Vasey, Cat. Forest Trees, 30.—Hall in Coulter's Bot. Gazette, ii, 91.—Macoun in Geological Rep. Canada, 1875-'76, 211.—Brandegee in Coulter's Bot. Gazette, iii, 32.—G. M. Dawson in Canadian Nat. new ser. ix, 326.—Rusby in Bull. Torrey Bot. Club, ix, 106.

P. Benthamiana, Hartweg in Jour. Hort. Soc. London, ii, 189; iii, 223.—Gordon in Jour. Hort. Soc. London, iv, 212 & t.; (Fl. des Serres, vi, 85 & f.); Pinetum, 188; 2 ed. 261 (excl. syn. *Sinclairii*).—Knight, Syn. Conif. 30.—Lindley & Gordon in Jour. Hort. Soc. London, v, 216.—Carrière, Trait. Conif, 350; 2 ed. 452.—Murray in Edinburgh New Phil. Jour. new ser. i, 287, t. 8.—Henkel & Hochstetter, Nadelhölz. 84.—Nelson, Pinaceæ, 104.—Fowler in London Gard. Chronicle, 1872, 973.

P. resinosa, Torrey in Ann. Lyc. N. York, ii, 249 [not Aiton].—Douglas, Companion Bot. Mag. ii, 126.—Hooker, Fl. Bor.-Am. ii, 161, in part.—Winchell in Ludlow's Rep. Black Hills, 68.

P. brachyptera, Engelmann in Wislizenus' Rep. No. 4.—Lindley & Gordon in Jour. Hort. Soc. London, v, 216.—Carrière in Fl. des Serres, ix, 201; Rev. Hort. 1854, 227; Trait. Conif. 356; 2 ed. 454.—Bigelow in Pacific R. R. Rep. iv 18.—Gordon, Pinetum, 190; 2 ed. 263.—Henkel & Hochstetter, Nadelhölz. 85.—Nelson, Pinaceæ, 454.

P. Beardsleyi, Murray in Edinburgh New Phil. Jour. new ser. i, 286, t. 6.—Carrière, Trait. Conif. 359.

P. Craigana, Murray in Edinburgh New Phil. Jour. new ser. i, 288, t. 7.

P. macrophylla, ? Torrey in Sitgreaves' Rep. 173 [not Engelmann].

P. Engelmanni, Torrey in Pacific R. R. Rep. iv, 141 [not Carrière].

P. Parryana, Gordon, Pinetum, 202; 2 ed. 277 [not Engelmann].—Henkel & Hochstetter, Nadelhölz. 88.—Carrière, Trait. Conif. 2 ed. 446.

P. ponderosa, var. *Benthamiana*, Vasey, Cat. Forest Trees, 30.

P. ponderosa, var. *scopulorum*, Engelmann in Bot. California, ii, 126.

YELLOW PINE. BULL PINE.

Interior of British Columbia, south of latitude 51°, south and east along the mountain ranges of the Pacific region to Mexico, the Black hills of Dakota, Colorado, and western Texas; not detected in central or southern Nevada.

A large tree, 61 to 91 meters in height, with a trunk 3.60 to 4.57 meters in diameter, or throughout the Rocky Mountain region much smaller, rarely exceeding 30 meters in height (var. *scopulorum*); dry, rocky ridges and prairies, or in northern California rarely in cold, wet swamps, reaching its greatest development along the western slope of the sierras of northern and central California; in western Washington territory and Oregon rare and local; after *Pseudotsuga Douglasii* the most generally distributed and valuable timber tree of the Pacific forests, furnishing the principal lumber of eastern Washington territory and Oregon, western Montana, Idaho, the Black hills of Dakota, western Texas, New Mexico, and Arizona.

Wood, varying greatly in quality and value, heavy, hard, strong, brittle, not coarse-grained nor durable, compact; bands of small summer cells broad or narrow, very resinous, conspicuous, resin passages few, small; medullary rays numerous, obscure; color, light red, the very thick sap-wood almost white; specific gravity, 0.4715; ash, 0.35; largely manufactured into lumber, and used for railway ties, fuel, etc.

NOTE.—A form with purple cones and long glaucous foliage, approaching *P. Jeffreyi* in habit, is the prevailing tree of the valley of Flathead lake, Montana (*Canby & Sargent*).

362.—Pinus Jeffreyi, Murray,

Rep. Oregon Exped. 2, t. 1; Edinburgh New Phil. Jour. new ser. xi, 224, t. 8, 9 (Trans. Bot. Soc. Edinburgh, vi, 350 & t.); Carrière, Trait. Conif. 388; 2 ed. 439.—Gordon, Pinetum, 198; 2 ed. 272.—Henkel & Hochstetter, Nadelhölz. 87.—Nelson, Pinaceæ, 115.—Hoopes, Evergreens, 115.—Parlatore in De Candolle, Prodr. xvi², 393.—Lawson, Pinetum Brit. i, 45, t. 6, f. 1-4.—Koch, Dendrologie, ii², 314.—Engelmann in Coulter's Bot. Gazette, vii, 4.—Veitch, Manual Conif. 165.

P. deflexa, Torrey in Bot. Mex. Boundary Survey, 209, t. 56, in part.—Cooper in Smithsonian Rep. 1860, 442.—Henkel & Hochstetter, Nadelhölz, 416.—Carrière, Trait. Conif. 2 ed. 455.—Bolander in Proc. California Acad. iii, 318.—Parlatore in De Candolle, Prodr. xvi², 431.—Fowler in London Gard. Chronicle, 1872, 1070.—Murray in London Gard. Chronicle, 1875, 106.—Gordon, Pinetum, 2 ed. 289.

P. ponderosa, var. *Jeffreyi*, Vasey, Cat. Forest Trees, 31.—Engelmann in Trans. St. Louis Acad. iv, 181; Bot. California, ii, 126.

BULL PINE. BLACK PINE.

California, Scott's mountain, Siskiyou county, south along the Sierra Nevada to the San Bernardino and San Jacinto mountains.

A large tree, 30 to 31 meters in height, with a trunk 1.20 to 4 meters in diameter; dry, gravelly slopes between 6,000 and 8,000 feet elevation; most common and reaching its greatest development on the eastern slope of the Sierra Nevadas, here generally replacing the allied *P. ponderosa*, from which it may be distinguished by its more deeply-cleft bark, glaucous branchlets and leaves, much larger cones, and by the strong, pungent odor of oil of orange of the freshly-cut branchlets.

Wood light, strong, hard, rather coarse-grained, compact; bands of small summer cells not broad, very resinous, conspicuous, resin passages few, not large; medullary rays numerous, obscure; color, light red, the sap-wood pale yellow or nearly white; specific gravity, 0.5206; ash, 0.26; largely manufactured into coarse lumber.

Abietine, a volatile carbo-hydrogen possessing powerful anæsthetic properties, is probably obtained by distilling the resinous exudation of this species, and not of *P. Sabiniana* (*Watt's Dict. Chemistry, 2d Suppl.* 1.—*Am. Jour. Pharm.* 1872, 97.—*U. S. Dispensatory*, 14 ed. 900).

363.—Pinus Chihuahuana, Engelmann,

Wislizenus' Rep. No. 26; Wheeler's Rep. vi, 262; Trans. St. Louis Acad. iv, 181; Coulter's Bot. Gazette, vii, 4.—Lindley & Gordon in Jour. Hort. Soc. London, v, 220.—Carrière in Fl. des Serres, ix, 200; Rev. Hort. 1854, 227; Trait. Conif. 357; 2 ed. 455.—Gordon, Pinetum, 193; 2 ed. 266.—Torrey, Bot. Mex. Boundary Survey, 209.—Cooper in Smithsonian Rep. 1860, 442.—Henkel & Hochstetter, Nadelhölz. 86.—Hoopes, Evergreens, 143.—Parlatore in De Candolle, Prodr. xvi², 397. —Vasey, Cat. Forest Trees, 32.

Santa Rita mountains, Arizona (*Rothrock*, *Engelmann & Sargent*), San Francisco mountains of southwestern New Mexico and Arizona (*Greene*); in Chihuahua.

A small tree, 18 to 24 meters in height, with a trunk 0.45 to 0.60 meter in diameter; dry, rocky ridges and slopes between 5,000 and 7,000 feet elevation; not common.

Wood light, soft, strong, brittle, close-grained, compact; bands of small summer cells not broad, resinous, conspicuous, resin passages few, rather large, conspicuous; medullary rays numerous, thin; color, clear light orange, the thick sap-wood lighter; specific gravity, 0.5457; ash, 0.39.

364.—Pinus contorta, Douglas;

Loudon, Arboretum, iv, 2292, f. 2210, 2211.—Nuttall, Sylva, iii, 117; 2 ed. ii, 176.—Endlicher, Syn. Conif. 168.—Carrière, Trait. Conif. 164; 2 ed. 474.—Torrey in Pacific R. R. Rep. iv, 141.—Gordon, Pinetum, 165; 2 ed. 232.—Cooper in Smithsonian Rep. 1858, 261.—Lyall in Jour. Linnæan Soc. vii, 133, 141, in part.—Henkel & Hochstetter, Nadelhölz. 24.—Rothrock in Smithsonian Rep. 1867, 433.—Hoopes, Evergreens, 81, in part.—Parlatore in De Candolle, Prodr, xvi², 381, in part.—Watson in King's Rep. v, 330.—Fowler in London Gard. Chronicle, 1872, 1070.—Gray in Proc. Am. Acad. vii, 402.—Koch, Dendrologie, ii², 301.—Vasey, Cat. Forest Trees, 29.—Hall in Coulter's Bot. Gazette, ii, 91.—Macoun in Geological Rep. Canada, 1875-'76, 211.—Engelmann in Trans. St. Louis Acad, iv, 182; Bot. California, ii, 126; London Gard. Chronicle, 1883, 351.—G. M. Dawson in Canadian Nat. 2 ser. ix, 327, in part.—Veitch, Manual Conif. 145.—Masters in London Gard. Chronicle, 1883, 45, f. 5.

P. inops, Bongard in Mem. Acad. St. Petersburg, 6 ser. ii, 163 [not Aiton].—Hooker, Fl. Bor.-Am. ii, 161, in part.—Ledebour, Fl. Rossica, iii, 676 [not Aiton].

P. Boursieri, Carrière in Rev. Hort. 1854, 233 & f.; Fl. des Serres, ix, 200 & f.; Trait. Conif. 398; 2 ed. 475.

P. Banksiana, Lindley & Gordon in Jour. Hort. Soc. London, v, 218, in part.

P. muricata, Bolander in Proc. California Acad. iii, 227, 317 [not Don].

P. Bolanderi, Parlatore in De Candolle, Prodr. xvi², 379.

SCRUB PINE.

Alaska, south along the coast to Mendocino county, California, extending inland to the western slopes of the Coast ranges.

A small, stunted tree, 6 to 9 meters in height, with a trunk 0.30 to 0 50 meter in diameter; sandy dunes and exposed rocky points.

Wood light, hard, strong, brittle, coarse-grained; bands of small summer cells very broad, resinous, conspicuous, resin passages numerous, not large; medullary rays numerous, obscure; color, light brown tinged with red, the thick sap-wood nearly white; specific gravity, 0.5815; ash, 0.19.

365.—Pinus Murrayana, Balfour,

Rep. Oregon Exped. 2, t. 3, f. 2.—Murray in Edinburgh New Phil. Jour. new ser. xi, 226 (Trans. Bot. Soc. Edinburgh, vi, 351).

P. inops, Bentham, Pl. Hartweg. 337 [not Aiton].

P. contorta, Newberry in Pacific R. R. Rep. vi, 34, 90, t. 5, f. 11 [not Douglas].—Engelmann in Am. Jour. Sci. 2. ser. xxiv, 332.—Lyall in Jour. Linnæan Soc. vii, 141, in part.—Cooper in Am. Nat. iii, 409.—Parlatore in De Candolle, Prodr. xvi², 381, in part.—Porter in Hayden's Rep. 1871, 494.—Gray in Proc. Am. Acad. vii, 402.—Rothrock in Pl. Wheeler, 27, 50.—Parry in Am. Nat. vii, 179.

P. contorta, var. *latifolia*, Engelmann in King's Rep. v, 331; Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 129; Wheeler's Rep. vi, 262.—Brandegee in Coulter's Bot. Gazette, iii, 32.—G. M. Dawson in Canadian Nat. new ser. ix, 328.

P. contorta, var. *Bolanderi*, Vasey, Cat. Forest Trees, 29.

TAMARACK. BLACK PINE. LODGE-POLE PINE. SPRUCE PINE.

Valley of the Yukon river, Alaska (Fort Selkirk, *Dall*), south through the interior of British Columbia, along the mountain ranges of Washington territory and Oregon and the Sierra Nevadas of California to mount San Jacinto; on the high plateau east of the Rocky mountains in about latitude 56°, and south through the mountains of Idaho, Montana, Wyoming, Colorado, and Utah to New Mexico and northern Arizona.

A tree 18 to 24 meters in height, with a trunk 0.60 to 1.20 meter in diameter; reaching its greatest development in the California Sierras; in the interior regions in dry, gravelly soil, here the prevailing tree, covering immense areas, and generally replacing other species destroyed by fire; western Washington territory and southward only along the borders of moist alpine meadows between 6,000 and 9,000 feet elevation; generally confounded with the closely-allied *P. contorta* of the coast, from which it may be distinguished by its longer, broader leaves, very thin, scaly bark, thin sap-wood, and less resinous and finer-grained wood, resembling that of the white pines; the distribution of the two species in northern British Columbia and Alaska still undetermined.

Wood light, soft, not strong, close, straight-grained, easily worked, compact, not durable; bands of small summer cells narrow, not conspicuous, resin passages few, not large; medullary rays numerous, obscure; color, light yellow or nearly white, the thin sap-wood lighter; specific gravity, 0.4096; ash, 0.32; occasionally manufactured into lumber, and used for fuel, railway ties, etc.

366.—Pinus Sabiniana, Douglas,

Companion Bot. Mag. ii, 150.—Lambert, Pinus, 1 ed. iii, 137, t. 58.—Loudon, Arboretum, iv, 2246, f. 2138–2143.—Forbes, Pinetum Woburn. 63, t. 23, 24.—Hooker, Fl. Bor.-Am. ii, 162.—Lindley in Penn. Cycl. xvii, 172.—Antoine, Conif. 30, t. 11.—Hooker & Arnott, Bot. Beechey, 393.—Link in Linnæa, xv, 509.—Nuttall, Sylva, iii, 110, t. 113; 2 ed. ii, 169, t. 113.—Spach, Hist. Veg. xi, 390.—De Chambray, Trait. Arb. Res. 347.—Endlicher, Syn. Conif. 159.—Knight, Syn. Conif. 30.—Lindley & Gordon in Jour. Hort. Soc. London, v, 216.—Fl. des Serres, ix, 275, t. 964.—Carrière, Trait. Conif. 334; 2 ed. 435.—Torrey & Gray in Pacific R. R. Rep. ii, 130.—Bigelow in Pacific R. R. Rep, iv, 25.—Torrey in Pacific R. R. Rep. iv, 141; Bot. Mex. Boundary Survey, 210; t. 57; Ives' Rep. 28.—Newberry in Pacific R. R. Rep. vi, 39, 90, f. 13.—Gordon, Pinetum, 208; 2 ed. 284.—Cooper in Smithsonian Rep. 1858, 261.—Walpers, Ann. v, 799.—Bolander in Proc. California Acad. iii, 226, 318.—Henkel & Hochstetter, Nadelhölz. 75.—Lawson, Pinetum Brit. i, 85, t. 11, t. 1–3.—Nelson, Pinaceæ, 129.—Hoopes, Evergreens, 121.—Parlatore in De Candolle, Prodr. xvi², 391.—Fowler in London Gard. Chronicle, 1872, 1325.—Koch, Dendrologie, ii², 312.—Vasey, Cat. Forest Trees, 31.—Engelmann in Wheeler's Rep. vi, 375; Trans. St. Louis Acad. iv, 182; Bot. California, ii, 127.—Veitch, Manual Conif. 169.

DIGGER PINE. BULL PINE.

California, Portuguese Flat, Shasta county, south along the foot-hills of the Coast ranges and the western slope of the Sierra Nevadas below 4,000 feet elevation.

A large tree, 24 to 30 meters in height, with a trunk 0.60 to 1.20 meter in diameter; very common through all the foot-hills region.

Wood light, soft, not strong, brittle, very coarse-grained, compact, not durable; bands of small summer cells broad, very resinous, conspicuous, resin passages few, large, prominent; medullary rays numerous, obscure; color, light brown or red, the thick sap-wood yellow or nearly white; specific gravity, 0.4840; ash, 0.40; largely used for fuel.

The large edible nuts furnish the Indians an important article of food.

367.—Pinus Coulteri, D. Don,

Trans. Linnæan Soc. xvii, 440.—Loudon, Arboretum, iv, 2250, f. 2144–2146.—Forbes, Pinetum Woburn. 67, t. 25, 26.—Antoine, Conif. 31, t. 12, 13.—Penn. Cycl. xvii, 172.—Link in Linnæa, xv, 510.—Hooker & Arnott, Bot. Beechey, 393.—Nuttall, Sylva, iii, 112; 2 ed. ii, 171.—Endlicher, Syn. Conif. 160.—Carrière in Fl. des Serres, ix, 275 & t.; Trait. Conif. 334; 2 ed. 435.—Cooper in Smithsonian Rep. 1858, 261.—Torrey in Ives' Rep. 28.—Henkel & Hochstetter, Nadelhölz. 76.—Bolander in Proc. California Acad. iii, 318.—Parlatore in De Candolle, Prodr. xvi, 392.—Vasey, Cat. Forest Trees, 31.—Gordon, Pinetum, 2 ed. 266.—Engelmann in Trans. St. Louis Acad. iv, 182; Bot. California, ii, 127.—Lawson, Pinetum Brit. i, 23, f. 1–5.

P. macrocarpa, Lindley in Bot. Reg. xxvi, Misc. 61.—Knight, Syn. Conif. 30.—Lindley & Gordon in Jour. Hort. Soc. London, v, 216.—Gordon, Pinetum, 201.—Nelson, Pinaceæ, 117.—Hoopes, Evergreens, 115.—Veitch, Manual Conif. 166.

P. Sabiniana Coulteri, Loudon, Encycl. Pl. 985, f. 1839–1841.

P. Sabiniana macrocarpa, Hort.

California, Monte Diablo, south through the Coast ranges to the Cuyamaca mountains, and probably in Lower California.

A tree 24 to 46 meters in height, with a trunk 0.90 to 1.80 meter in diameter; dry ridges and slopes between 3,000 and 6,000 feet elevation; most common and reaching its greatest development in the San Jacinto mountains.

Wood light, soft, not strong, brittle, coarse-grained; bands of small summer cells broad, very resinous, conspicuous, resin passages few, large; medullary rays numerous, prominent; color, light red, the thick sap-wood nearly white; specific gravity, 0.4133; ash, 0.37.

368.—Pinus insignis, Douglas;

Loudon, Arboretum, iv, 2243, f. 2132-2137.—Forbes, Pinetum Woburn. 51, t. 18.—Lindley in Penn. Cycl. xvii, 171.—Antoine, Conif. 27, t. 8, f. 1.—Hooker & Arnott, Bot. Beechey, 393.—Spach, Hist. Veg. xi, 389.—Nuttall, Sylva, iii, 115; 2 ed. ii, 174.—Bentham, Bot. Sulphur, 55.—Endlicher, Syn. Conif. 163.—Knight, Syn. Conif. 30.—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 339; 2 ed. 440.—Bigelow in Pacific R. R. Rep. iv, 25.—Torrey in Pacific R. R. Rep. iv, 141; Bot. Mex. Boundary Survey, 209, t. 55; Ives' Rep. 28.—Newberry in Pacific R. R. Rep. vi, 90.—Gordon, Pinetum, 197; 2 ed. 270.—Cooper in Smithsonian Rep. 1858, 261.—Murray in Edinburgh New Phil. Jour. new ser. xi, 222 (Trans. Bot. Soc. Edinburgh, vi, 347).—Henkel & Hochstetter, Nadelhölz. 69.—Bolander in Proc. California Acad. iii, 262, t. 317.—Nelson, Pinaceæ, 114.—Hoopes, Evergreens, 143.—Parlatore in De Candolle, Prodr. xvi², 395.—Lawson, Pinetum Brit. i, 37 t. 1, 5, f. 1-14.—Fowler in London Gard. Chronicle, 1872, 1070.—Vasey, Cat. Forest Trees, 31.—Engelmann in Trans. St. Louis Acad. iv, 182; Bot. California, ii, 128.—Veitch, Manual Conif. 163, f. 39.

?*P. Californica*, Loiseleur in Nouveau Duhamel, v, 243.—Loudon, Arboretum, iv, 2268.—Endlicher, Syn. Conif. 162.—Hooker & Arnott, Bot. Beechey, 393.—Nuttall, Sylva, iii, 117; 2 ed. ii, 175.—Carrière, Trait. Conif. 1 ed. 253.

P. adunca, Bosc in Poiret, Suppl. iv, 418.

P. Sinclairii, Hooker & Arnott, Bot. Beechey, 392, 393, t. 93, in part.—Nuttall, Sylva, iii, 141; 2 ed. ii, 198.—Carrière, Trait. Conif. 2 ed. ii, 198.

P. radiata, D. Don in Trans. Linnæan Soc. xvii, 442; Lambert, Pinus, 1 ed. iii, 133, t. 86.—Loudon, Arboretum, iv, 2270, f. 2182.—Antoine, Conif. 33, t. 14, f. 3.—Hooker & Arnott, Bot. Beechey, 392, 393, in part.—Nuttall, Sylva, iii, 116; 2 ed. ii, 175.—Endlicher, Syn. Conif. 161.—Hartweg in Jour. Hort. Soc. London, iii, 226.—Gordon in Jour. Hort. Soc. London, iv, 214 & f. (Fl. des Serres, vi, 434 & t.); Pinetum, 206; 2 ed. 282.—Knight, Syn. Conif. 37.—Lindley & Gordon in Jour. Hort. Soc. London, v, 216.—Carrière, Trait. Conif. 1 ed. 337.—Nelson, Pinaceæ, 127.—Hoopes, Evergreens, 118.—Koch, Dendrologie, ii², 307.—Vasey, Cat. Forest Trees, 31.

P. tuberculata, D. Don in Trans. Linnæan Soc. xvii, 441 [not Gordon].—Lambert, Pinus, 1 ed. iii, 131, t. 85.—Loudon, Arboretum, iv, 2270, f. 2181.—Antoine, Conif. 33, t. 14, f. 2.—Hooker & Arnott, Bot. Beechey, 394.—Endlicher, syn. Conif. 162.—Carrière, Trait. Conif. 338; 2 ed. 441, in part.—Nelson, Pinaceæ, 137.—Hoopes, Evergreens, 123 (excl. syn. *Californica*).—Parlatore in De Candolle, Prodr. xvi², 394, in part.

P. rigida,? Hooker & Arnott, Bot. Beechey, 160 [not Miller].

P. insignis macrocarpa, Hartweg in Jour. Hort. Soc. London, iii, 226.—Carrière, Trait. Conif. 440.

MONTEREY PINE.

California, Pescadero to Monterey and San Simeon bay.

A tree 24 to 30 meters in height, with a trunk 0.60 to 0.90 meter in diameter; sandy soil, in immediate proximity to the sea-coast; rare and local; now widely cultivated on the Pacific coast for shelter and ornament. A form of Guadalupe island, off the coast of Lower California, with leaves in pairs, is var. *binata* (*Engelmann in Proc. Am. Acad.* xi, 119; *Bot. California*, ii, 128).

Wood light, soft, not strong, brittle, close-grained, compact; bands of small summer cells not broad, resinous, conspicuous; color, light brown, the very thick sap-wood nearly white; specific gravity, 0.4574; ash, 0.30; locally somewhat used for fuel.

369.—Pinus tuberculata, Gordon,

Jour. Hort. Soc. London, iv, 218 & f. (Fl. des Serres, v, 517ᶜ & f.); Pinetum, 211; 2 ed. 288 [not Don].—Rep. Oregon Exped. 2, t. 2, f. 2.—Henkel & Hochstetter, Nadelhölz. 78, in part.—Bolander in Proc. California Acad. iii, 262, 317.—Lawson, Pinetum Brit. i, 93, t. 13, f. 1-9.—Carrière, Trait. Conif. 2 ed. 441, in part.—Parlatore in De Candolle, Prodr. xvi², 394 (excl. bib.).—Koch, Dendrologie, ii², 309.—Vasey, Cat. Forest Trees, 31.—Engelmann in Trans. St. Louis Acad. iv, 183; Bot. California, ii, 128.—Veitch, Manual Conif. 170.

P. Californica, Hartweg in Jour. Hort. Soc. London, ii, 189 [not Loiseleur].

KNOB-CONE PINE.

Valley of the Mackenzie river, Oregon, south along the western slope of the Cascade and Sierra Nevada mountains, and in the California Coast ranges from the Santa Cruz to the San Jacinto mountains.

A tree 18 to 22 meters in height, with a trunk 0.60 to 0.90 meter in diameter, or, rarely, reduced to a low shrub, fruiting when not more than 1 meter in height; dry, gravelly ridges and slopes from 2,500 (San Bernardino mountains) to 5,500 (mount Shasta) feet elevation; not common.

Wood light, soft, not strong, brittle, coarse-grained, compact; bands of small summer cells very broad, not conspicuous, resin passages numerous, large, prominent; medullary rays numerous, thin; color, light brown, the thick sap-wood nearly white or slightly tinged with red; specific gravity, 0.3499; ash, 0.33.

370.—Pinus Tæda, Linnæus,

Spec. 1 ed. 1000, in part.—Du Roi, Harbk. ii, 63.—Wangenheim, Amer. 41.—Aiton, Hort. Kew. iii, 368; 2 ed. v, 317.—Mœnch, Meth. 365.—Michaux, Fl. Bor.-Am. ii, 205.—Lambert, Pinus, 1 ed. i, 23, t. 16, 17; 2 ed. i, 26, t. 17, 18; 3 ed. i, 30, t. 15.—Willdenow, Spec. iv, 498; Berl. Baumz. 269.—Persoon, Syn. ii, 578.—Desfontaines, Hist. Arb. ii, 612.—Michaux f. Hist. Arb. Am. i, 98, t. 9; N. American Sylva, 3 ed. iii, 123, t. 143.—Nouveau Duhamel, v, 245, t. 75, f. 2.—Smith in Rees' Cycl. xxviii, No. 13.—Pursh, Fl. Am. Sept. ii, 644.—Nuttall, Genera, ii, 223.—Hayne, Dend. Fl. 175.—Elliott, Sk. ii, 636.—Sprengel, Syst. ii, 887.—Eaton, Manual, 6 ed. 265.—Lawson, Ag. Manual, 351; Pinetum Brit. i, 89, t. 12.—Loudon, Arboretum, iv, 2237, f. 2118-2122.—Forbes, Pinetum Woburn. 43, t. 14.—Antoine, Conif. 25, t. 7, f. 1.—Eaton & Wright, Bot. 359.—Link in Linnæa, xv, 503.—Spach, Hist. Veg. xi, 391.—Griffith, Med. Bot. 609.—Gihoul, Arb. Resin, 32.—Endlicher, Syn. Conif. 164.—Scheele in Rœmer, Texas, Appx. 447.—Knight, Syn. Conif. 30.—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 344; 2 ed. 448.—Darby, Bot. S. States, 515.—Gordon, Pinetum, 210; 2 ed. 286.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 433.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 22.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 660; Bot. & Fl. 313.—Porcher, Resources S. Forests, 506.—Henkel & Hochstetter, Nadelhölz. 65.—Nelson, Pinaceæ, 136.—Gray, Manual N. States, 5 ed. 469; Hall's Pl. Texas, 21.—Hoopes, Evergreens, 122.—Parlatore in De Candolle, Prodr. xvi², 393.—Young, Bot. Texas, 516.—Koch, Dendrologie, ii², 304.—Vasey, Cat. Forest Trees, 31.—Bentley & Trimen, Med. Pl. iv, 259, t. 259.—Engelmann in Trans. St. Louis Acad. iv, 183.—Veitch, Manual Conif. 172.

P. Tæda, var. *tenuifolia*, Aiton, Hort. Kew. iii, 368.

LOBLOLLY PINE. OLD-FIELD PINE. ROSEMARY PINE.

Southern Delaware, south to cape Malabar and Tampa bay, Florida, generally near the coast, through the Gulf states to the valley of the Colorado river, Texas, and north through southern Arkansas to the valley of the Arkansas river.

A tree 24 to 46 meters in height, with a trunk 0.90 to 1.50 meter in diameter; low, wet clay or dry sandy soil; springing up on all abandoned lands from Virginia southward, and now often replacing in the southern pine belt the original forests of *Pinus palustris;* in eastern North Carolina rarely on low, rich swamp ridges, here known as rosemary pine and attaining its greatest development and value.

Wood light, not strong, brittle, very coarse-grained, not durable; bands of small summer cells broad, very resinous, conspicuous, resin passages few, not prominent; medullary rays numerous, obscure; color, light brown, the very thick sap-wood orange, or often nearly white; wood of the rosemary pine close-grained, less resinous, lighter, with much thinner sap; specific gravity, 0.5441; ash, 0.26; largely used for fuel and manufactured into lumber of inferior quality.

Turpentine is occasionally manufactured from this species (*U. S. Dispensatory*, 14 ed. 901.—*Flückiger & Hanbury, Pharmacographia*, 545).

371.—Pinus rigida, Miller,

Dict. 7 ed. No. 10.—Du Roi, Harbk. ii, 60.—Marshall, Arbustum, 101.—Wangenheim, Amer. 41.—Lambert, Pinus, 1 ed. i, 25, t. 18, 19; 2 ed. i, 28; t. 18, 19; 3 ed. i, 32, t. 16, 17.—Willdenow, Spec. iv, 498; Enum. 988; Berl. Baumz. 268.—Persoon, Syn. ii, 578.—Desfontaines, Hist. Arb. ii, 612.—Michaux f. Hist. Arb. Am. i, 89, t. 8; N. American Sylva, 3 ed. iii, 118, t. 144.—Nouveau Duhamel, v, 244, t. 74.—Aiton, Hort. Kew. 2 ed. v, 317.—Smith in Rees' Cycl. xxviii, No. 14.—Pursh, Fl. Am. Sept. ii, 643.—Poiret, Suppl. iv, 417.—Eaton, Manual, 110; 6 ed. 265.—Barton, Compend. Fl. Philadelph. ii, 183.—Nuttall, Genera, ii, 223.—Hayne, Dend. Fl. 175.—Elliott, Sk. ii, 635.—Sprengel, Syst. ii, 887.—Torrey, Compend. Fl. N. States, 360; Fl. N. York, ii, 227.—Beck, Bot. 339.—Loudon, Arboretum, iv, 2239, f. 2123-2126.—Forbes, Pinetum Woburn. 41, t. 13.—Eaton & Wright, Bot. 358.—Antoine, Conif. 26, t. 7, f. 2.—Bigelow, Fl. Boston. 3 ed. 385.—Lindley in Penn. Cycl. xvii, 172.—Link in Linnæa, xv, 503.—Spach, Hist. Veg. xi, 388.—Griffith, Med. Bot. 604.—Gihoul, Arb. Resin, 31.—Endlicher, Syn. Conif. 164.—Knight, Syn. Conif. 30.—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 342; 2 ed. 447.—Darlington, Fl. Cestrica, 3 ed. 290.—Darby, Bot. S. States, 514.—Gordon, Pinetum, 207; 2 ed. 283.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 433.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 21.—Wood, Cl. Book, 660; Bot. & Fl. 313.—Henkel & Hochstetter, Nadelhölz, 67.—Nelson, Pinaceæ, 128.—Gray, Manual N. States, 5 ed. 469.—Hoopes, Evergreens, 119.—Parlatore in De Candolle, Prodr. xvi², 394.—Koch, Dendrologie, ii², 307.—Vasey, Cat. Forest Trees, 31.—Engelmann in Trans. St. Louis Acad. iv, 183.—Sears in Bull. Essex Inst. xiii, 186.—Veitch, Manual Conif. 169.

P. Tæda, var. *rigida*, Aiton, Hort. Kew. iii, 368.

P. Tæda, var. a. Poiret in Lamarck, Dict. v, 340.

P. Fraseri, Loddiges, Cat. ed. 1836, 50 [not Pursh].

P. Loddigesii, Loudon, Arboretum, iv, 2269.

PITCH PINE.

Valley of the Saint John's river, New Brunswick, to the northern shores of lake Ontario, south through the Atlantic states to northern Georgia, extending to the western slope of the Alleghany mountains in West Virginia and Kentucky (Pineville, Bell county, *De Friese*).

A tree 12 to 24 meters in height, with a trunk 0.60 to 0.90 meter in diameter; dry, sandy, barren soil, or less commonly in deep, cold swamps; very common.

Wood light, soft, not strong, brittle, coarse-grained, compact; bands of small summer cells broad, very resinous, conspicuous, resin passages numerous, not large; medullary rays numerous, obscure; color, light brown or red, the thick sap-wood yellow or often nearly white; specific gravity, 0.5151; ash, 0.23; largely used for fuel, charcoal, and occasionally manufactured into coarse lumber.

NOTE.—Upon the island of Nantucket, Massachusetts, this species is now greatly injured by the attacks of the destructive caterpillar of the pine moth (*Retina frustrana*, Scudder in *Pub. Massachusetts Ag. Soc.* 1883 & t).

372.—Pinus serotina, Michaux,

Fl. Bor.-Am. ii, 205.—Willdenow, Spec. iv, 499.—Persoon, Syn. ii, 578.—Michaux f. Hist. Arb. Am. i, 86, t. 7; N. American Sylva, 3 ed. iii, 117, t. 142.—Nouveau Duhamel, v, 246, t. 75, f. 1.—Pursh, Fl. Am. Sept. ii, 643.—Poiret, Suppl. iv, 417.—Nuttall, Genera, ii, 223.—Lambert, Pinus, 1 ed. iii, 35, t. 18.—Elliott, Sk. ii, 634.—Sprengel, Syst. ii, 887.—Torrey, Compend. Fl. N. States, 360.—Beck, Bot. 339.—Eaton, Manual, 6 ed. 265.—Loudon, Arboretum, iv, 2242, f. 2127-2131.—Forbes, Pinetum Woburn. 47, t. 16.—Eaton & Wright, Bot. 359.—Antoine, Conif. 27, t. 8, f. 2.—Lindley in Penn. Cycl. xvii, 172.—Link in Linnæa, xv, 504.—Spach, Hist. Veg. xi, 389.—Gihoul, Arb. Resin. 32.—Endlicher, Syn. Conif. 163.—Knight, Syn. Conif. 30.—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 341; 2 ed. 449.—Darby, Bot. S. States, 514.—Gordon, Pinetum, 209; 2 ed. 285.—Chapman, Fl. S. States, 433.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 21.—Henkel & Hochstetter, Nadelhölz. 70.—Nelson, Pinaceæ, 129.—Parlatore in De Candolle, Prodr. xvi², 394.—Koch, Dendrologie, ii², 305.—Vasey, Cat. Forest Trees, 31.

P. Tæda, var. *alopecuroidea*, Aiton, Hort. Kew. 2 ed. v, 317.—Loudon, Arboretum, iv, 2237.

P. rigida, var. *serotina*, Loudon, Encycl. Pl. 979, f. 1824-1827.—Cooper in Smithsonian Rep. 1858, 257.—Hoopes, Evergreens, 120.—Engelmann in Trans. St. Louis Acad. iv, 183.

POND PINE.

North Carolina, south near the coast to the head of the Saint John's river, Florida.

A tree 12 to 24 meters in height, with a trunk 0.60 to 0.90 meter in diameter; inundated borders of streams and ponds in low, peaty soil; not common.

Wood heavy, soft, not strong, brittle, coarse-grained, compact; bands of small summer cells broad, forming fully one-half the annual growth, very resinous, dark colored, conspicuous, resin passages few, large; medullary rays numerous, obscure; color, dark orange, the thick sap-wood pale yellow; specific gravity 0.7942; ash, 0.17.

373.—Pinus inops, Aiton,

Hort. Kew. iii, 367; 2 ed. v, 316.—Michaux, Fl. Bor.-Am. ii, 204.—Lambert, Pinus, 1 ed. i, 18, t. 13; 2 ed. i, 21, t. 14; 3 ed. i, 25, t. 12.—Willdenow, Spec. iv, 496; Enum. 988; Berl. Baumz. 266.—Persoon, Syn. ii, 578.—Michaux f. Hist. Arb. Am. i, 58, t. 4; N. American Sylva, 3 ed. iii, 103, t. 139.—Nouveau Duhamel, v, 235, t. 69, f. 1.—Pursh, Fl. Am. Sept. ii, 641.—Smith in Rees' Cycl. xxviii, No. 10.—Barton, Prodr. Fl. Philadelph. 93.—Compend. Fl. Philadelph. ii, 183.—Nuttall, Genera, ii, 223.—Hayne, Dend. Fl. 173.—Elliott, Sk. ii, 633.—Sprengel, Syst. ii, 886.—Torrey, Compend. Fl. N. States, 359.—Audubon, Birds, t. 97.—Beck, Bot. 338.—Eaton, Manual, 6 ed. 265.—Bon Jard. 1837, 976.—Loudon, Arboretum, iv, 2192, f. 2068-2071.—Forbes, Pinetum Woburn. 15, t. 4.—Hooker, Fl. Bor.-Am. ii, 161, in part.—Eaton & Wright, Bot. 358.—Antoine, Conif. 17, t. 5, f. 3.—Lindley in Penn. Cycl. xvii, 171.—Link in Linnæa, xv, 500.—Spach, Hist. Veg. xi, 386.—Endlicher, Syn. Conif. 167.—Knight, Syn. Conif. 26.—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 361; 2 ed. 471.—Darlington, Fl. Cestrica, 3 ed. 290.—Darby, Bot. S. States, 514.—Gordon, Pinetum, 167; 2 ed. 238.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 433.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 20.—Wood, Cl. Book, 661; Bot. & Fl. 313.—Henkel & Hochstetter, Nadelhölz. 22.—Nelson, Pinaceæ, 113.—Gray, Manual N. States, 5 ed. 470.—Hoopes, Evergreens, 84.—Parlatore in De Candolle, Prodr. xvi², 380 (excl. syn. *variabilis*).—Vasey, Cat. Forest Trees, 30.—Veitch, Manual Conif. 158.

P. Virginiana, Miller, Gard. Dict. 7 ed. No. 9.—Du Roi, Obs. Bot. 43; Harbk. 2 ed. ii, 35.—Marshall, Arbustum, 102.—Wangenheim, Amer. 74.—Koch, Dendrologie, ii², 299.

P. Tæda, var. *Virginiana*, Poiret in Lamarck, Dict. v, 340.

JERSEY PINE. SCRUB PINE.

Middle Island, Long island, Tottenville, and Clifton, Staten island, New York, south, generally near the coast, to the valley of the Savannah river (Aiken, South Carolina), and through eastern and middle Kentucky to "the knobs" of southeastern Indiana.

A tree 24 to 36 meters in height, with a trunk 0.60 to 0.90 meter in diameter, or in the Atlantic states generally much smaller; sandy, generally barren soil, reaching its greatest development west of the Alleghany mountains.

Wood light, soft, not strong, brittle, very close-grained, compact, durable; bands of small summer cells broad, very resinous, conspicuous, resin passages few, not prominent; medullary rays numerous, thin; color, light orange, the thick sap-wood nearly white; specific gravity, 0.5309; ash, 0.30; largely used for fuel, and in Kentucky and Indiana preferred for and largely manufactured into water-pipes and pump-logs.

374.—Pinus clausa, Vasey,

Cat. Forest Trees, 30.

P. inops, var. *clausa*, Engelmann in Trans. St. Louis Acad. iv, 183.—Chapman, Fl. S. States, Suppl. 650.

SAND PINE. SCRUB PINE. SPRUCE PINE.

Florida, shores of Pensacola bay, south, generally within 30 miles of the coast, to Pease creek, and occupying a narrow ridge along the east coast south of Saint Augustine.

A tree 21 to 24 meters in height, with a trunk 0.60 to 0.75 meter in diameter, or on the west coast rarely 6 to 9 meters in height; barren, sandy dunes and ridges; most common and reaching its greatest development about the head of Halifax bay.

Wood light, soft, not strong, brittle; bands of small summer cells broad, very resinous, conspicuous, resin passages numerous, prominent; medullary rays numerous, thin; color, light orange or yellow, the thick sap-wood nearly white; specific gravity, 0.5576; ash, 0.31; occasionally used for the masts of small vessels.

375.—Pinus pungens, Michaux f.

Hist. Arb. Am. i, 61, t. 5; N. American Sylva, 3 ed. iii, 105, t. 140.—Nouveau Duhamel, v. 236, t. 67, f. 4.—Aiton, Hort. Kew. 2 ed. v, 314.—Pursh, Fl. Am. Sept. ii, 643.—Poiret, Suppl. iv, 417.—Elliott, Sk. ii, 635.—Sprengel, Syst. ii, 886.—Eaton, Manual, 6 ed. 265.—Lambert, Pinus, 1 ed. iii, 34, t. 17.—Loudon, Arboretum, iv, 2197, f. 2077–2080.—Forbes, Pinetum Woburn. 17, t. 5.—Eaton & Wright, Bot. 359.—Antoine, Conif. 18, t. 5, f. 4.—Lindley in Penn. Cycl. xvii, 171.—Nuttall, Sylva, iii, 125; 2 ed. ii, 184.—Spach, Hist. Veg. xi, 287.—Endlicher, Syn. Conif. 166.—Knight, Syn. Conif. 27.—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 359; 2 ed. 470.—Darby, Bot. S. States, 515.—Gordon, Pinetum, 181; 2 ed. 254.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 432.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 20.—Wood, Cl. Book, 660; Bot. & Fl. 313.—Henkel & Hochstetter, Nadelhölz, 21.—Nelson, Pinaceæ, 127.—Gray, Manual N. States, 5 ed. 469.—Hoopes, Evergreens, 98.—Parlatore in De Candolle, Prodr. xvi², 379.—Koch, Dendrologie ii², 304.—Vasey, Cat. Forest Trees, 30.—Meehan in Rep. Penn. Fruit Growers' Soc. 1877 & t.—Engelmann in Trans. St. Louis. Acad. iv, 183.—Veitch, Manual Conif. 158.

TABLE-MOUNTAIN PINE. HICKORY PINE.

Alleghany mountains, Pennsylvania to Tennessee.

A tree 9 to 18 meters in height, with a trunk 0.60 to 1.05 meter in diameter; most common and reaching its greatest development upon the high mountains of East Tennessee, here often the prevailing species and forming extensive forests.

Wood light, soft, not strong, brittle, coarse-grained, compact; bands of small summer cells broad, resinous, conspicuous, resin passages numerous, large; medullary rays numerous, prominent; color, light brown, the thick sap-wood nearly white; specific gravity, 0.4935; ash, 0.27; in Pennsylvania largely manufactured into charcoal.

376.—Pinus muricata, D. Don,

Trans. Linnæan Soc. xvii, 441.—Lambert, Pinus, 1 ed. iii, t. 84.—Loudon, Arboretum, iv, 2269, f. 2180.—Hooker & Arnott, Bot. Beechey, 393.—Antoine, Conif. 32, t. 14, f. 1.—Nuttall, Sylva, iii, 113; 2 ed. ii, 172.—Endlicher, Syn. Conif. 161.—Knight, Syn. Conif. 26.—Gordon in Jour. Hort. Soc. London, iv, 216 & f. (Fl. des Serres, v, 517ᵇ & f.); Pinetum, 173; 2 ed. 246 (excl. syn. *Murrayana*).—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 359; 2 ed. 470.—Torrey, Bot. Mex. Boundary Survey, 209, t. 54 (*P. Edgariana* on plate).—Cooper in Smithsonian Rep. 1858, 261.—Henkel & Hochstetter, Nadelhölz. 60.—Nelson, Pinaceæ, 121.—Hoopes, Evergreens, 92.—Parlatore in De Candolle, Prodr. xvi², 379.—Fowler in London Gard. Chronicle, 1872, 1164.—Koch, Dendrologie, ii², 302.—Vasey, Cat. Forest Trees, 30.—Engelmann in Trans. St. Louis Acad. iv, 183; Bot. California, ii, 128.—Veitch, Manual Conif. 151.—London Gard. Chronicle, 1884, 49, f. 7–9.

P. inops, var. Bentham, Pl. Hartweg. 337.

P. Edgariana, Hartweg in Jour. Hort. Soc. London, iii, 217, 226.

P. contorta, Bolander in Proc. California Acad. iii, 227, 317 [not Douglas].

OBISPO PINE. BISHOP'S PINE.

California, Mendocino county south through the Coast ranges to San Luis Obispo county.

A tree 24 to 36 meters in height, with a trunk 0.30 to 0.90 meter in diameter, or more often not exceeding 15 meters in height; cold peat bogs or barren, sandy gravel; always exposed to the winds and fogs of the ocean, and not found above 2,000 feet elevation, reaching its greatest development in Mendocino county; rare and local.

Wood light, very strong and hard, rather coarse-grained, compact; bands of small summer cells broad, resinous, resin passages few, not prominent; medullary rays numerous, thin; color, light brown, the thick sap-wood nearly white; specific gravity, 0.4942; ash, 0.26.

377.—Pinus mitis, Michaux,

Fl. Bor.-Am. ii, 204.—Michaux f. Hist. Arb. Am. i, 52, t. 3; N. American Sylva, 3 ed. iii, 96, t. 137.—Barton, Prodr. Fl. Philadelph 93.—Poiret, Suppl. iv, 417.—Loudon, Arboretum, iv, 2195, f. 2072-2076.—Antoine, Conif. 16, t. 5, f. 1.—Lindley in Penn. Cycl. xvii, 171.—Spach, Hist. Veg. xi, 386.—Torrey, Fl. N. York, ii, 229.—Endlicher, Syn. Conif. 167.—Knight, Syn. Conif. 26.—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 361; 2 ed. 472.—Gordon, Pinetum, 170; 2 ed. 243 (excl. syn. *Roylei*).—Cooper in Smithsonian Rep. 1858, 275.—Chapman, Fl. S. States, 433.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 19.—Lesquereux in Owen's 2d Rep. Arkansas, 389.—Wood, Cl. Book, 660; Bot. & Fl. 313.—Henkel & Hochstetter, Nadelhölz. 23.—Gray, Manual N. States, 5 ed. 470.—Hoopes, Evergreens, 88.—Parlatore in De Candolle, Prodr. xvi², 380.—Young, Bot. Texas, 516.—Koch, Dendrologie, ii², 300.—Vasey, Cat. Forest Trees, 30.—Broadhead in Coulter's Bot. Gazette, iii, 60.—Engelmann in Trans. St. Louis Acad. iv, 184.—Ridgway in Proc. U. S. Nat. Mus. 88.

P. echinata, Miller, Dict. 7 ed. No. 12.—Marshall, Arbustum, 180?—Wangenheim, Amer. 74.

P. Virginiana, var. *echinata*, Du Roi, Harbk. ii, 38.

P. Tæda, var. *variabilis*, Aiton, Hort. Kew. iii, 368.

P. variabilis, Lambert, Pinus, 1 ed. i, 22, t. 15; 2 ed. i, 25, t. 16; 3 ed. i, 29, t. 14.—Willdenow, Spec. iv, 498.—Persoon, Syn. ii, 578.—Nouveau Duhamel, v, 235, t. 69, f. 2.—Aiton, Hort. Kew. 2 ed. v, 316.—Pursh, Fl. Am. Sept. ii, 643.—Smith in Rees' Cycl. xxviii, No. 12.—Barton, Compend. Fl. Philadelph. ii, 183.—Nuttall, Genera, ii, 223.—Elliott, Sk. ii, 633.—Sprengel, Syst. ii, 886.—Torrey, Compend. Fl. N. States, 360.—Beck, Bot. 339.—Eaton, Manual, 6 ed. 265.—Forbes, Pinetum Woburn. 35, t. 11.—Eaton & Wright, Bot. 358.—Antoine, Conif. 15, t. 5, f. 2.—Link in Linnæa, xv, 502.—Endlicher, Syn. Conif. 168 (excl. syn.).—Darby, Bot. S. States, 514.

P. rigida, Porcher, Resources S. States, 504 [not Miller].

YELLOW PINE. SHORT-LEAVED PINE. SPRUCE PINE. BULL PINE.

Staten island, New York, south to the Chattahoochee region of western Florida, through the Gulf states to Tennessee and eastern Texas, and through Arkansas to the Indian territory, southeastern Kansas, southern Missouri, and in Union county, Illinois.

A tree 24 to 30 meters in height, with a trunk 0.60 to 1.35 meter in diameter; light sandy soil or, less commonly, along the low borders of swamps; forming west of the Mississippi river, mixed with oaks and other deciduous trees, extensive forests; the only species of northern Arkansas, Kansas, and Missouri, reaching its greatest development in western Louisiana, southern Arkansas, and eastern Texas.

Wood, varying greatly in quality and amount of sap, heavy, hard, strong, generally coarse-grained, compact; bands of small summer cells broad, often occupying half the width of the annual growth; very resinous, resin passages numerous, large; medullary rays numerous, conspicuous; color, orange, the sap-wood nearly white; specific gravity, 0.6104; ash, 0.29; largely manufactured into lumber, especially in the states west of the Mississippi river, and among yellow pines only inferior in value to that of *P. palustris*.

378.—Pinus glabra, Walter,

Fl. Caroliniana, 237.—Poiret in Lamarck, Dict. v, 342.—Ravenel in Proc. Elliott Soc. i, 52.—Chapman, Fl. S. States, 433.—Porcher, Resources S. Forests, 506.—Hoopes, Evergreens, 82.—Vasey, Cat. Forest Trees, 30.—Engelmann in Trans. St. Louis Acad. iv, 184.

?*P. mitis*, var. *paupera*, Wood, Cl. Book, 660.

CEDAR PINE. SPRUCE PINE. WHITE PINE.

South Carolina, south to the Chattahoochee region of western Florida, generally near the coast, and through the Gulf states south of latitude 32° 30′ to the valley of the Pearl river, Louisiana.

A tree 24 to 30 meters in height, with a trunk 0.60 to 1.20 meter in diameter; rich bottom lands and hummocks in dense forests of hard-wood trees, reaching its greatest development in Alabama and Mississippi; not common and local.

Wood light, soft, not strong, brittle, very coarse-grained, not durable; bands of small summer cells broad, not resinous, resin passages few, not large; medullary rays numerous, obscure; color, light brown, the sap-wood nearly white; specific gravity, 0.3931; ash, 0.45.

379.—Pinus Banksiana, Lambert,

Pinus, 1 ed. i, 7, t. 3; 2 ed. i, 7, t, 3; 3 ed. i, 9, t. 3.—Persoon, Syn. ii, 578.—Desfontaines, Hist. Arb. ii, 611.—Nouveau Duhamel, v, 234, t. 67, f. 3.—Aiton, Hort. Kew. 2 ed. v, 315.—Pursh, Fl. Am. Sept. ii, 642.—Smith in Rees' Cycl. xxviii, No. 4.—Nuttall, Genera, ii, 223; Sylva, iii, 124; 2 ed. ii, 182.—Sprengel, Syst. ii, 886.—Torrey, Compend. Fl. N. States, 360.—Beck, Bot. 339.—Eaton, Manual, 6 ed. 265.—London, Arboretum, iv, 2190, f. 2064-2067.—Forbes, Pinetum Woburn. 13, t. 3.—Hooker, Fl. Bor.-Am. ii, 161.—Eaton & Wright, Bot. 358.—Antoine, Conif. 8, t. 4, f. 2.—Lindley in Penn. Cycl. xvii, 171.—Link in Linnæa, xv, 491.—Spach, Hist. Veg. xi, 379.—Endlicher, Syn. Conif. 177.—Knight, Syn. Conif. 26.—Lindley & Gordon in Jour. Hort. Soc. London, v, 218 (excl. syn. *contorta*).—Parry in Owen's Rep. 618.—Carrière, Trait. Conif. 381; 2 ed. 485.—Gordon, Pinetum, 163; 2 ed. 230.—Richardson, Arctic Exped. 441.—Cooper in Smithsonian Rep. 1858, 257.—Hooker f. in Trans. Linnæan Soc. xxiii[2], 301.—Wood, Cl. Book, 661.—Henkel & Hochstetter, Nadelhölz. 44.—Nelson, Pinaceæ, 104.—Gray, Manual N. States, 5 ed. 470.—Hoopes, Evergreens, 78.—Vasey, Cat. Forest Trees, 29.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Engelmann in Trans. St. Louis Acad. iv, 184.—Sears in Bull. Essex Inst. xiii, 186.—Bell in Geological Rep. Canada, 1879–'80, 46[c].—Veitch, Manual Conif. 158.

P. sylvestris*, var. *divaricata, Aiton, Hort. Kew. iii, 366.

P. Hudsonica, Poiret in Lamarck, Dict. v, 339.—Parlatore in De Candolle, Prodr. xvi[2], 380.—Wood, Bot. & Fl. 313.—Koch, Dendrologie, ii[2], 298.

P. rupestris, Michaux f. Hist. Arb. Am. i, 49, t. 2; N. American Sylva, 3 ed. iii, 95, t. 136.

GRAY PINE. SCRUB PINE. PRINCE'S PINE.

Bay of Chaleur, New Brunswick, to the southern shores of Hudson bay, northwest to the Great Bear lake, the valley of the Mackenzie river, and the eastern slope of the Rocky mountains between the fifty-second and sixty-fifth degrees of north latitude; south to northern Maine, Ferrisburg, Vermont (*R. E. Robinson*), the southern shore of lake Michigan, and central Minnesota.

A small tree, 9 to 22 meters in height, with a trunk rarely exceeding 0.75 meter in diameter; barren, sandy soil or, less commonly, in rich loam; most common north of the boundary of the United States, and reaching its greatest development in the region north of lake Superior, here often forming considerable forests; toward its extreme western limits associated and often confounded with the closely allied *P. contorta* and *P. Murrayana* of the Pacific region.

Wood light, soft, not strong, rather close-grained, compact; bands of small summer cells not broad, very resinous, conspicuous, resin passages few, not large; medullary rays numerous, obscure; color, clear light brown or, rarely, orange, the thick sap-wood almost white; specific gravity, 0.4761; ash, 0.23; largely used for fuel, railway ties, etc.

380.—Pinus palustris, Miller,

Dict. 7 ed. No. 14.—Marshall, Arbustum, 100.—Wangenheim, Amer. 73.—Walter, Fl. Caroliniana, 237.—Aiton, Hort. Kew. iii, 368; 2 ed. v, 317.—Abbot, Insects Georgia, i, t. 42.—Du Roi, Harbk. 2 ed. ii, 66.—Michaux, Fl. Bor.-Am. ii, 204.—Lambert, Pinus, 1 ed. i, 27, t. 20; 2 ed. i, 30, t. 21; 3 ed. i, 41, t. 24, 25.—Willdenow, Spec. iv, 499.—Poiret in Lamarck, Dict. v, 341.—Persoon, Syn. ii, 578.—Desfontaines, Hist. Arb. ii, 612.—Pursh, Fl. Am. Sept. ii, 644.—Smith in Rees' Cycl. xxviii, No. 15.—Nuttall, Genera, ii, 223; Sylva, iii, 126; 2 ed. ii, 185.—Hayne, Dend. Fl. 174.—Elliott, Sk. ii, 637.—Sprengel, Syst. ii, 887.—Eaton, Manual, 6 ed. 266.—Forbes, Pinetum Woburn. 59, t. 22.—Eaton & Wright, Bot. 359.—Antoine, Conif. 23, t. 6, f. 2.—Link in Linnæa, xv, 206.—Griffith, Med. Bot. 604.—Darby, Bot. S. States, 515.—Cooper in Smithsonian Rep. 1858, 257.—Wood, Cl. Book, 660.—Porcher, Resources S. Forests, 495.—Michaux f. N. American Sylva, 3 ed. iii, 106, t. 141 (the plate as *P. australis*).

P. australis, Michaux f. Hist. Arb. Am. i, 64, t. 6.—Nouveau Duhamel, v, 246, t. 75, f. 3.—London, Arboretum, iv, 2255, f. 2156-2160.—Lindley in Penn. Cycl. xvii, 171.—Spach, Hist. Veg. xi, 392.—Endlicher, Syn. Conif. 165.—Carson, Med. Bot. ii, 43, t. 87.—Gihoul, Arb. Resin. 33.—Knight, Syn. Conif. 30.—Lindley & Gordon in Jour. Hort. Soc. London, v, 217.—Carrière, Trait. Conif. 345; 2 ed. 450.—Gordon, Pinetum, 187; Suppl. 63; 2 ed. 260.—Chapman, Fl. S. States, 434.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 24.—Wood, Bot. & Fl. 313.—Henkel & Hochstetter, Nadelhölz. 65.—Nelson, Pinaceæ, 103.—Hoopes, Evergreens, 109.—Parlatore in De Candolle, Prodr. xvi[2], 392.—Young, Bot. Texas, 517.—Vasey, Cat. Forest Trees, 31.—Bentley & Trimen, Med. Pl. iv, 258, t. 258.—Engelmann in Trans. St. Louis Acad. iv, 185.—Veitch, Manual Conif. 172.

LONG-LEAVED PINE. SOUTHERN PINE. GEORGIA PINE. YELLOW PINE. HARD PINE.

Southeastern Virginia, south to cape Canaveral and Tampa bay, Florida, and through the Gulf states to the valley of the Red river, Louisiana, and the Trinity river, Texas, rarely extending beyond 150 miles from the coast.

A tree of the first economic value, 18 to 29 meters in height, with a trunk 0.60 to 1.20 meter in diameter; dry, sandy loam of the maritime plain, generally of Tertiary formation, and forming, outside of the river bottoms, extensive forests almost to the exclusion of other species, or toward its extreme interior range, especially in the Gulf states, occupying rolling hills, here mixed with oaks and various deciduous trees; rarely along the borders of swamps in low, wet soil.

Wood heavy, exceedingly hard, very strong, tough, coarse-grained, compact, durable; bands of small summer cells broad, occupying fully half the width of the annual growth, very resinous, dark colored, resin passages few, not conspicuous; medullary rays numerous, conspicuous; color, light red or orange, the thin sap-wood nearly white; specific gravity, 0.6999; ash, 0.25; largely manufactured into lumber and used in construction of all sorts, for ship-building, fencing, railway ties, etc.

The turpentine, tar, pitch, rosin, and spirits of turpentine manufactured in the United States are almost exclusively produced by this species (*U. S. Dispensatory*, 14 ed. 709, 899.—*Nat. Dispensatory*, 2 ed. 1417.—*Flückiger & Hanbury*, *Pharmacographia*, 545).

381.—Pinus Cubensis, Grisebach,

Mem. Am. Acad. viii, 530; Cat. Pl. Cuba, 217.—Parlatore in De Candolle, Prodr. xvi², 396.

P. Tæda, var. *heterophylla*, Elliott, Sk. ii, 636.

P. Elliottii, Engelmann; Vasey, Cat. Forest Trees, 30; Trans. St. Louis Acad. iv, 186, t. 1, 2, 3.—Chapman, Fl. S. States, Suppl. 650.

P. Cubensis, var. *terthrocarpa*, Wright.—Grisebach, Cat. Pl. Cuba, 217.

SLASH PINE. SWAMP PINE. BASTARD PINE. MEADOW PINE.

South Carolina (Bluffton, *Mellichamp*), south near the coast to the southern keys of Florida, west along the Gulf coast to the valley of the Pearl river, Louisiana, not extending beyond 50 or 60 miles inland; in the West Indies.

A tree 24 to 30 meters in height, with a trunk 0.60 to 0.90 meter in diameter; light sandy soil along the dunes and marshes of the coast, or wet clay borders of ponds, abandoned fields, etc., and now rapidly taking possession of ground from which the forests of *P. palustris* have been removed; the only species of Florida south of cape Canaveral and bay Biscayne.

Wood heavy, exceedingly hard, very strong, tough, coarse-grained, compact, durable; bands of small summer cells very broad, occupying fully half the width of the annual growth, very resinous, conspicuous, resin passages few, not large; medullary rays numerous, rather prominent; color, rich dark orange, the sap-wood lighter, often nearly white; specific gravity, 0.7504; ash, 0.26; hardly inferior in value to that of *P. palustris*, although rarely manufactured into lumber.

Turpentine is occasionally manufactured in southern Florida from this species.

NOTE.—Specimens collected upon the southern keys of Florida by A. H. Curtiss connect the forms of South Carolina, Georgia, and northern Florida with the West Indian tree.

382.—Picea nigra, Link,

Linnæa, xv, 520.—Carrière, Trait. Conif. 241; 2 ed. 323.—Hooker f. in Trans. Linnæan Soc. xxiii², 301.—Brunet, Hist. Picea, 10 & t. f. B.—Peck in Trans. Albany Inst. viii, 283.—Engelmann in London Gard. Chronicle, 1879, 334.—Sears in Bull. Essex Inst. xiii, 185.

Abies Mariana, Miller, Dict.—Wangenheim, Amer. 75.

Pinus Mariana, Du Roi, Obs. Bot. 38; Harbk. ii, 107.—Ehrhart, Beitr. iii, 24.

Pinus Abies Canadensis, Marshall, Arbustum, 103.

Pinus Americana rubra, Wangenheim, Amer. 75.

Pinus nigra, Aiton, Hort. Kew. iii, 370; 2 ed. v, 319.—Lambert, Pinus, 1 ed. i, 41, t. 27; 2 ed. i, 45, t. 27; 3 ed. i, 64, t. 37.—Willdenow, Spec. iv, 506; Enum. 990; Berl. Baumz. 278.—Persoon, Syn. ii, 579.—Pursh. Fl. Am. Sept. ii, 640.—Smith in Rees' Cycl. xxviii, No. 20.—Barton, Compend. Fl. Philadelph. ii, 182.—Nuttall, Genera, ii, 223.—Hayne, Dend. Fl. 177.—Elliott, Sk. ii, 640.—Sprengel, Syst. ii, 885.—Torrey, Compend. Fl. N. States, 359; Fl. N. York, ii, 230.—Beck, Bot. 340.—Eaton, Manual, 6 ed. 264.—Hooker, Fl. Bor.-Am. ii, 163.—Eaton & Wright, Bot. 358.—Bigelow, Fl. Boston. 3 ed. 386.—Antoine, Conif. 88, t. 34, f. 3.—Endlicher, Syn. Conif. 115.—Darby, Bot. S. States, 515.—Porcher, Resources S. Forests, 505.—Parlatore in De Candolle, Prodr. xvi², 413.

Pinus Americana, Gærtner, Fruct. ii, 60, t. 91, f. 1.

Pinus rubra, Lambert, Pinus, 1 ed. i, 48, t. 28; 2 ed. i, 47, t. 30; 3 ed. i, 66, t. 38 [not Michaux f.].—Persoon, Syn. ii, 579.—Aiton, Hort. Kew. 2 ed. v, 319.—Pursh, Fl. Am. Sept. ii, 640.—Smith in Rees' Cycl. xxviii, No. 23.—Nuttall, Genera, ii, 223.—Sprengel, Syst. ii, 885.—Torrey, Compend. Fl. N. States, 359.—Beck, Bot. 340.—Eaton, Manual, 6 ed. 264.—Hooker, Fl. Bor.-Am. ii, 164.—Eaton & Wright, Bot. 358.—Antoine, Conif. 87, t. 34, f. 2.—Endlicher, Syn. Conif. 113.—Gihoul, Arb. Resin. 44.—Parlatore in De Candolle, Prodr. xvi², 413.

Abies denticulata, Michaux, Fl. Bor.-Am. ii, 206.—Poiret in Lamarck, Dict. vi, 520.

Abies nigra, Poiret in Lamarck, Dict. vi, 520.—Desfontaines, Hist. Arb. ii, 580.—Michaux f. Hist. Arb. Am. i, 124, t. 11; N. American Sylva, 3 ed. iii, 139, t. 147.—Nouveau Duhamel, v, 292, t. 81, f. 1.—Lindley in Penn. Cycl. i, 32.—Loudon, Arboretum, iv, 2312, f. 2225–2227.—Spach, Hist. Veg. xi, 410, in part.—Emerson, Trees Massachusetts, 81; 2 ed. ii, 96.—Griffith, Med. Bot. 606.—Knight, Syn. Conif. 36.—Lindley & Gordon in Jour. Hort. Soc. London, v, 211.—Parry in Owen's Rep. 618.—Gordon, Pinetum, 11; 2 ed. 17.—Richardson, Arctic Exped. 442.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 434.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 27.—Wood, Cl. Book, 662; Bot. & Fl. 313.—Porcher, Resources S. Forests, 507.—Henkel & Hochstetter, Nadelhölz. 191.—Nelson, Pinaceæ, 50.—Gray, Manual N. States, 5 ed. 471.—Hoopes, Evergreens, 169.—Vasey, Cat. Forest Trees, 33.—Guibourt, Hist. Drogues, 7 ed. ii, 247.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Bell in Geological Rep. Canada, 1879–'80, 44c.—Veitch, Manual Conif. 74.

Abies rubra, Poiret in Lamarck, Dict. vi, 520.—Desfontaines, Hist. Arb. ii, 580.—Loudon, Arboretum, iv, 2316, f. 2228.—Forbes, Pinetum Woburn. 101, t. 35.—Knight, Syn. Conif. 37.—Lindley & Gordon in Jour. Hort. Soc. London, v, 211.—Gordon, Pinetum, 11; 2 ed. 17.—Henkel & Hochstetter, Nadelhölz. 189.—Nelson, Pinaceæ, 51.

P. rubra, Link in Linnæa, xv, 521.—Carrière, Trait. Conif. 240; 2 ed. 322.

Abies nigra, var. *rubra*, Michaux f. Hist. Arb. Am. i, 123; N. American Sylva, 3 ed. iii, 141.—Spach, Hist. Veg. xi, 411.—Hoopes, Evergreens, 170.

? *Abies rubra*, var. *arctica*, Lindley & Gordon in Jour. Hort. Soc. London, v, 211.

Abies alba, Chapman, Fl. S. States, 435 [not Poiret].

Abies Americana, Koch, Dendrologie, ii², 241.

P. nigra, var. *rubra*, Engelmann in London Gard. Chronicle, 1879, 334.

Abies arctica, Hort.

Abies Marylandica, Hort.

BLACK SPRUCE.

Newfoundland, northern Labrador to Ungava bay, Nastapokee sound, cape Churchill, Hudson bay, and northwest to the mouth of the Mackenzie river and the eastern slope of the Rocky mountains; south through the northern states to Pennsylvania, central Michigan, Wisconsin, and Minnesota, and along the Alleghany mountains to the high peaks of North Carolina.

A tree 15 to 21 meters in height, with a trunk 0.60 to 0.90 meter in diameter; light, dry, rocky soil, forming, especially north of the fiftieth degree of latitude, extensive forests on the water-sheds of the principal streams or in cold, wet swamps; then small, stunted, and of little value (*P. rubra*).

Wood light, soft, not strong, close, straight-grained, compact, satiny; bands of small summer cells thin, resinous, resin passages few, minute; medullary rays few, conspicuous; color, light red or often nearly white, the sap-wood lighter; specific gravity, 0.4584; ash, 0.27; largely manufactured into lumber, used in construction, for ship-building, piles, posts, railway ties, etc.

Essence of spruce, prepared by boiling the young branches of this species, is used in the manufacture of spruce beer, a popular beverage (*U. S. Dispensatory*, 14 ed. 901).

383.—Picea alba, Link,

Linnæa, xv, 519.—Carrière, Trait. Conif. 238; 2 ed. 319.—Fl. des Serres, xxi, 157, t. 2251.—Brunet, Hist. Picea, 4 & t. f. A.—Engelmann in London Gard. Chronicle, 1879, 334.—Sears in Bull. Essex Inst. xiii, 184.

Abies Canadensis, Miller, Dict. No. 1.

Pinus Canadensis, Du Roi, Obs. Bot. 38; Harbk. ii, 124 [not Linnæus].—Wangenheim, Amer. 5, t. 1, f. 2.

P. laxa, Ehrhart, Beitr. iii, 24.

P. glauca, Mœnch, Weiss. 73.

Pinus alba, Aiton, Hort. Kew. iii, 371; 2 ed. v, 318.—Lambert, Pinus, 1 ed. i, 39 t. 26; 2 ed. i, 43, t. 28; 3 ed. i, 61, t. 35.—Willdenow, Spec. iv, 507; Enum. 990; Berl. Baumz. 280.—Persoon, Syn. ii, 579.—Pursh, Fl. Am. Sept. ii, 641.—Smith in Rees' Cycl. xxviii, No. 21.—Eaton, Manual, 6 ed. 264.—Nuttall, Genera, ii, 223.—Hayne, Dend. Fl. 177.—Elliott, Sk. ii, 640.—Sprengel, Syst. ii, 885.—Torrey, Compend. Fl. N. States, 359; Fl. N. York, ii, 231.—Meyer, Pl. Labrador, 30.—Beck, Bot. 340.—Hooker, Fl. Bor.-Am. ii, 163.—Eaton & Wright, Bot. 358.—Bigelow, Fl. Boston. 3 ed. 386.—Antoine, Conif. 86, t. 34, f. 1.—Endlicher, Syn. Conif. 112.—Darby, Bot. S. States, 515.—Tuinbouw Flora, 1855, 1, t. 14, 15.—Walpers, Ann. v, 799.—Parlatore in De Candolle, Prodr. xvi², 414.

Pinus tetragona, Mœnch, Meth. 364.

Abies alba, Poiret in Lamarck, Dict. vi, 521.—Michaux, Fl. Bor.-Am. ii, 207.—Desfontaines, Hist. Arb. ii, 580.—Michaux f. Hist. Arb. Am. i, 133, t. 12; N. American Sylva, 3 ed. iii, 144, t. 148.—Nouveau Duhamel, v, 291, t. 81, f. 2.—Loudon, Arboretum, iv, 2310, f. 2224.—Forbes, Pinetum Woburn. 95, t. 33.—Nuttall, Sylva, iii, 129; 2 ed. ii, 189.—Spach, Hist. Veg. xi, 412.—Emerson, Trees Massachusetts, 84; 2 ed. i, 99.—Gihoul, Arb. Resin. 43.—Knight, Syn. Conif. 36.—Lindley & Gordon in Jour. Hort. Soc. London, v, 211.—Parry in Owen's Rep. 618.—Gordon, Pinetum, 2; 2 ed. 3.—Richardson, Arctic Exped. 442.—Cooper in Smithsonian Rep. 1858, 257.—Hooker f. in Trans. Linnæan Soc. xxiii², 301.—Engelmann in Am. Jour. Sci. 2 ser. xxxiv, 330.—Wood, Cl. Book, 661; Bot. & Fl. 313.—Porcher, Resources S. Forests, 507.—Henkel & Hochstetter, Nadelhölz. 188.—Nelson, Pinaceæ, 47.—Gray, Manual N. States, 5 ed. 471.—Murray in Seemann, Jour. Bot. v, 253, t. 69, f. 2-7.—Hoopes, Evergreens, 157, f. 20.—Vasey, Cat. Forest Trees, 32.—Guibourt, Hist. Drogues, 7 ed. ii, 247.—Macoun in Geological Rep. Canada, 1875-'76, 211.—Bell in Geological Rep. Canada, 1879-'80, 44ᶜ.

Abies rubra, var. *cærulea*, Loudon, Arboretum, iv, 2316.—Lindley & Gordon in Jour. Hort. Soc. London, v, 211.

Abies cærulea, Forbes, Pinetum Woburn. 99.

P. cærulea, Link in Linnæa, xv, 522.

Pinus rubra, var. *violacea*, Endlicher, Syn. Conif. 114.

P. nigra, var. *glauca*, Carrière, Trait. Conif. 1 ed. 242.

Abies arctica, Murray in Seemann, Jour. Bot. v, 253, t. 69, f. 1, 8-13.

Abies laxa, Koch, Dendrologie, ii², 243.

Abies alba, var. *cærulea*, Carrière, Trait. Conif. 2 ed. 320.

Abies alba, var. *arctica*, Parlatore in De Candolle, Prodr. xvi², 414.

WHITE SPRUCE.

Newfoundland, northern shore of Labrador to Ungava bay, cape Churchill, and northwestward to the mouth of the Mackenzie river and the valley of the Yukon river, Alaska; south to the coast of Maine, northeastern Vermont (West Burke and Elmwood, *Pringle*), northern Michigan, Minnesota to Moose lake and the White Earth Indian reservation, the Black hills of Dakota (*R. Douglas*), along the Rocky mountains of northern Montana to the valley of the Blackfoot river (*Canby & Sargent*), Sitka, and British Columbia.

A tree 15 to 50 meters in height, with a trunk 0.60 to 0.90 meter in diameter; low, rather wet soil, borders of ponds and swamps; most common north of the boundary of the United States, and reaching its greatest development along the streams and lakes of the Flathead region of northern Montana at an elevation of 2,500 to 3,500 feet; the most important timber tree of the American subarctic forests north of the sixtieth degree of latitude, here more generally multiplied and of larger size than the allied *P. nigra*, with which it is associated; its distribution southward in British Columbia not yet satisfactorily determined.

Wood light, soft, not strong, close, straight-grained, compact, satiny; bands of small summer cells thin, not conspicuous, resin passages few, minute; medullary rays numerous, prominent; color, light yellow, the sap-wood hardly distinguishable; specific gravity, 0.4051; ash, 0.32; largely manufactured into lumber, although not distinguished in commerce from that of the black spruce (*P. nigra*).

384.—Picea Engelmanni, Engelmann,

Trans. St. Louis Acad. ii, 212; Wheeler's Rep. vi, 256; London Gard. Chronicle, 1879, 334; 1882, 145.—Carrière, Trait. Conif. 2 ed. 348.—G. M. Dawson in Canadian Nat. new ser. ix, 325.—Rusby in Bull. Torrey Bot. Club, ix, 80.

Abies alba, ? Torrey in Fremont's Rep. 97.

Abies nigra, Engelmann in Am. Jour. Sci. 2 ser. xxxiii, 330 [not Poiret].

Abies Engelmanni, Parry in Trans. St. Louis Acad. ii, 122; London Gard. Chronicle, 1863, 1035; Am. Nat. viii, 179; Proc. Davenport Acad. i, 149.—Regel, Gartenflora, 1864, 244.—Henkel & Hochstetter, Nadelhölz. 418.—Hoopes, Evergreens, 177, f. 22.—Watson in King's Rep. v, 332; Pl. Wheeler, 17.—Porter in Hayden's Rep. 1871, 494.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 130.—Vasey, Cat. Forest Trees, 33.—Koch, Dendrologie, ii², 242.—Hall in Coulter's Bot. Gazette, ii, 91.—Sargent in London Gard. Chronicle, 1877, 631.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Brandegee in Coulter's Bot. Gazette, iii, 32.—Bell in Geological Rep. Canada, 1879–'80, 56ᶜ.—Veitch, Manual Conif. 68.

Pinus Engelmanni, Engelmann in Proc. Am. Phil. Soc. new ser. xii, 209.

Pinus commutata, Parlatore in De Candolle, Prodr. xvi², 417.—Gordon, Pinetum, 2 ed. 5.

WHITE SPRUCE.

Peace River plateau, in latitude 55° 46′ N. (*G. M. Dawson*), through the interior of British Columbia and along the Cascade mountains of Washington territory and Oregon to the valley of the Mackenzie river; along the principal ranges of the Rocky and Wahsatch mountains to the San Francisco mountains, Sierra Blanco, and mount Graham, Arizona.

A large tree, 24 to 46 meters in height, with a trunk 0.90 to 1.20 meter in diameter, or at its extreme elevation reduced to a low, prostrate shrub; dry, gravelly slopes and ridges between 5,000 and 11,500 feet elevation; the most valuable timber tree of the central Rocky Mountain region, here forming extensive forests, generally above 8,500 feet elevation; rare and of small size in the mountains of Washington territory, Oregon, and Montana.

Wood very light, soft, not strong, very close, straight-grained, compact, satiny; bands of small summer cells narrow, not conspicuous, resin passages few, minute; medullary rays numerous, conspicuous; color, pale yellow tinged with red, the sap-wood hardly distinguishable; specific gravity, 0.3449; ash, 0.32; in Colorado manufactured into lumber and largely used for fuel, charcoal, etc.

The bark rich in tannin, and in Utah sometimes used in tanning leather.

NOTE.—Forms of northern Montana too closely connect this species with the allied *P. alba.* The two species occur here, however, only at different elevations, in different soils, and never mingle.

385.—Picea pungens, Engelmann,

London Gard. Chronicle, 1879, 331; 1882, 145.—Masters in London Gard. Chronicle, 1883, 725, f. 130.

P. Menziesii, Engelmann in Trans. St. Louis Acad. ii, 214 [not Carrière].

Abies Menziesii, Engelmann in Am. Jour. Sci. 2 ser. xxxiii, 330 [not Lindley].—Gray in Proc. Philadelphia Acad. 1863, 76.—Watson in King's Rep. v, 333, in part.—Parry in Am. Nat. viii, 179 [not Lindley].—Porter in Hayden's Rep. 1871, 494.—Hoopes, Evergreens, 166, in part.—Rothrock in Pl. Wheeler, 28; Wheeler's Rep. vi, 10 [not Lindley].—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 131 [not Lindley].—Vasey, Cat. Forest Trees, 33, in part.—Brandegee in Coulter's Bot. Gazette, iii, 32.

Abies Menziesii Parryana, André in Ill. Hort. xxiii, 198; xxiv, 53, 119.—Roezl in Ill. Hort. xxiv, 86.

Abies Engelmanni glauca, Veitch, Manual Conif. 69.

WHITE SPRUCE. BLUE SPRUCE.

Valley of the Wind river, south through the mountain ranges of Wyoming, Colorado, and Utah.

A tree 30 to 46 meters in height, with a trunk 0.60 to 0.90 meter in diameter; borders of streams, in damp or wet soil, generally between 6,000 and 9,000 feet elevation, never forming forests or reaching as high elevations as the allied *P. Engelmanni;* rare and local.

Wood very light, soft, weak, close-grained, compact, satiny; bands of small summer cells narrow, not conspicuous, resin passages few, small; medullary rays numerous, prominent; color, very light brown or often nearly white, the sap-wood hardly distinguishable; specific gravity, 0.3740; ash, 0.38.

386.—Picea Sitchensis, Carrière,

Trait. Conif. 1 ed. 260; Engelmann in London Gard. Chronicle, 1879, 344; Bot. California, ii, 122.

Pinus Sitchensis, Bongard in Mem. Acad. St. Petersburg, 6 ser. ii, 104.—Hooker, Fl. Bor.-Am. ii, 164.—Endlicher, Syn. Conif. 123.

Abies Menziesii, Lindley in Penn. Cycl. 1, 32.—Loudon, Arboretum, iv, 2321, f. 2232.—Forbes, Pinetum Woburn. 93, t. 32.—Nuttall, Sylva, iii, 131, t. 116; 2 ed. ii, 189, t. 116.—Knight, Syn. Conif. 37.—Lindley & Gordon in Jour. Hort. Soc. London, v, 211.—Newberry in Pacific R. R. Rep. vi, 56, 90, t. 9, f. 21.—Gordon, Pinetum, 6; 2 ed. 12.—Cooper in Smithsonian Rep. 1858, 262; Pacific R. R. Rep. xii², 25, 69, in part.—Wood, Bot. & Fl. 314.—Lyall in Jour. Linnæan Soc. vii, 131, 133, 144.—Henkel & Hochstetter, Nadelhölz. 187.—Nelson, Pinaceæ, 148.—Rothrock in Smithsonian Rep. 1867, 433.—Hoopes, Evergreens, 166, in part.—Watson in King's Rep. v, 333, in part.—Veitch, Manual Conif. 73.

Pinus Menziesii, Douglas in Lambert, Pinus, 1 ed. iii, 161, t. 71.—Hooker, Fl. Bor.-Am. ii, 162.—Antoine, Conif. 85, t. 33, f. 1, 2.—Hooker & Arnott, Bot. Beechey, 394.—Endlicher, Syn. Conif. 112.—Parlatore in De Candolle, Prodr. xvi², 418.

? *Abies trigona*, Rafinesque, Atlant. Jour. 119.—Endlicher, Syn. Conif. 124.—Carrière, Trait. Conif. 1 ed. 264.

? *Abies falcata*, Rafinesque, Atlant. Jour. 119.—Endlicher, Syn. Conif. 124.—Lindley & Gordon in Jour. Hort. Soc. London, v, 213.—Carrière, Trait. Conif. 268; 2 ed. 314.

Pinus Menziesii, var. *crispa*, Antoine, Conif. 85, t. 35, f. 2.

Abies Sitchensis, Lindley & Gordon in Jour. Hort. Soc. London, v, 212.—Koch, Dendrologie, ii², 247.

P. Menziesii, Carrière, Man. des Pl. iv, 339; Trait. Conif. 237; 2 ed. 318.

? *Sequoia Rafinesquei*, Carrière, Trait. Conif. 2 ed. 213.

TIDE-LAND SPRUCE.

Alaska, south to Mendocino county, California, not extending more than 50 miles inland from the coast.

A large tree of great economic value, 46 to 61 meters in height, with a trunk 2.40 to 5.19 meters in diameter; gravelly ridges and swamps, reaching its greatest development in Washington territory and Oregon near the mouth of the Columbia river, here forming a belt of nearly continuous forest growth 50 or, farther north and south, rarely more than 10 or 15 miles in width.

Wood light, soft, not strong, close, straight-grained, compact, satiny; bands of small summer cells narrow, not conspicuous, resin passages few, obscure; medullary rays numerous, rather prominent; color, light brown tinged with red, the sap-wood nearly white; specific gravity, 0.4287; ash, 0.17; largely manufactured into lumber and used for construction, interior finish, fencing, boat-building, the dunnage of vessels, cooperage, woodenware, etc.

387.—Tsuga Canadensis, Carrière,

Trait. Conif. 189; 2 ed. 248.—Sears in Bull. Essex Inst. xiii, 181.—Engelmann in Coulter's Bot. Gazette, vi, 224.

Pinus Canadensis, Linnæus, Spec. 2 ed. 1421.—Wangenheim, Amer. 39, t. 15, f. 36.—Ehrhart, Beitr. iii, 23.—Aiton, Hort. Kew. iii, 370; 2 ed. v, 320.—Michaux, Fl. Bor.-Am. ii, 206.—Lambert, Pinus, 1 ed. 50, t. 32; 2 ed. i, 56, t. 35; 3 ed. ii, 79, t. 45.—Willdenow, Spec. iv, 505; Enum. 989; Berl. Baumz. 277.—Poiret in Lamarck, Dict. vi, 521.—Persoon, Syn. ii, 579.—Pursh, Fl. Am. Sept. ii, 640.—Smith in Rees' Cycl. xxviii, No. 29.—Barton, Compend. Fl. Philadelph. ii, 182.—Nuttall, Genera, ii, 223.—Hayne, Dend. Fl. 176.—Elliott, Sk. ii, 639.—Sprengel, Syst. ii, 885.—Torrey, Compend. Fl. N. States, 359; Fl. New York, ii, 230.—Beck, Bot. 340.—Eaton, Manual, 6 ed. 264.—Darlington, Fl. Cestrica, 2 ed. 548.—Hooker, Fl. Bor.-Am. ii, 164, in part.—Eaton & Wright, Bot. 358.—Bigelow, Fl. Boston. 3 ed. 386.—Antoine, Conif. 80, t. 32, f. 3.—Endlicher, Syn. Conif. 86.—Gihoul, Arb. Resin. 46.—Darby, Bot. S. States, 515.—Parlatore in De Candolle, Prodr. xvi², 428.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 211, 212, t. 23, f. 3.—Bentley & Trimen, Med. Pl. iv, 264, t. 264.

Pinus Americana, Miller, Dict. 7 ed. No. 6.—Du Roi, Obs. Bot. 41; Harbk. 2 ed. ii, 151.

Pinus Abies Americana, Marshall, Arbustum, 103.

Abies Canadensis, Desfontaines, Hist. Arb. ii, 580.—Michaux f. Hist. Arb. Am. i, 138, t. 13; N. American Sylva, 3 ed. iii, 146, t. 140.—Nouveau Duhamel, v, 293, t. 83, f. 1.—Eaton, Manual, 111.—Richard, Conif. 77, t. 17, f. 2.—Audubon, Birds, t. 197.—Loudon, Arboretum, iv, 2322 & t.—Forbes, Pinetum Woburn. 129.—Nuttall, Sylva, iii, 133; 2 ed. ii, 190.—Spach, Hist. Veg. xi, 424.—Emerson, Trees Massachusetts, 77; 2 ed. i, 92 & t.—Griffith, Med. Bot. 606.—Knight, Syn. Conif. 37.—Lindley & Gordon in Jour. Hort. Soc. London, v, 209.—Parry in Owen's Rep. 618.—Darlington, Fl. Cestrica, 3 ed. 291.—Gordon, Pinetum, 14; 2 ed. 22.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 434.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 27.—Wood, Cl. Book, 661; Bot. & Fl. 313.—Porcher, Resources S. Forests, 505.—Henkel & Hochstetter, Nadelhölz. 153 (excl. syn. *aromatica*).—Nelson, Pinaceæ, 30.—Gray, Manual N. States, 5 ed. 471.—Hoopes, Evergreens, 184, f. 23.—Koch, Dendrologie, ii², 249.—Vasey, Cat. Forest Trees, 23.—Fl. des Serres, xxii, 203.—Guibourt, Hist. Drogues, ii, 247.—Bell in Geological Rep. Canada, 1879-'80, 51ᶜ.—Veitch, Manual Conif. 114, f. 29.

Picea Canadensis, Link in Linnæa, xv, 524.

HEMLOCK.

Nova Scotia, southern New Brunswick, valley of the Saint Lawrence river to the shores of lake Temiscaming, and southwest to the western borders of northern Wisconsin; south through the northern states to New Castle county, Delaware, southeastern Michigan, central Wisconsin, and along the Alleghany mountains to Clear Creek falls, Winston county, Alabama (*Mohr*).

A tree 21 to 33 meters in height, with a trunk 0.90 to 1.15 meter in diameter; dry, rocky ridges, generally facing the north and often forming extensive forests almost to the exclusion of other species, or, less commonly, borders of swamps in deep, rich soil; most common at the north, although reaching its greatest individual development in the high mountains of North Carolina and Tennessee.

Wood light, soft, not strong, brittle, coarse, crooked-grained, difficult to work, liable to wind-shake and splinter, not durable; bands of small summer cells rather broad, conspicuous; medullary rays numerous, thin; color, light brown tinged with red or often nearly white, the sap wood somewhat darker; specific gravity, 0.4239; ash, 0.46; largely manufactured into coarse lumber and used in construction for outside finish, railway ties, etc.; two varieties, red and white, produced apparently under precisely similar conditions of growth, are recognized by lumbermen.

The bark, rich in tannin, is the principal material used in the northern states in tanning leather, and yields a fluid extract sometimes used medicinally as a powerful astringent.

Canada or hemlock pitch, prepared from the resinous secretion of this species, is used in the preparation of stimulating plasters, etc. (*U. S. Dispensatory*, 14 ed. 709, 903.—*Nat. Dispensatory*, 2 ed. 1109.—*Flückiger & Hanbury, Pharmacographia*, 552).

388.—Tsuga Caroliniana, Engelmann,

Coulter's Bot. Gazette, vi, 223.

Abies species, Gibbs in Proc. Elliott Soc. i, 286.

Abies Caroliniana, Chapman, Fl. S. States, Suppl. 650.

HEMLOCK.

Southern Alleghany region, Bluff mountain, North Carolina (*A. Gray*), "Saluda mountain," South Carolina (*L. S. Gibbs*), Pinnacle mountain, North Carolina (*Curtiss*), New river, North Carolina, and Cæsar's head, South Carolina (*Canby*), Whitesides mountain and Devil's Court-House peak, Jackson county, North Carolina (*J. Donnell Smith*).

A small tree, 12 to 15 meters in height, with a trunk 0.60 to 0.75 meter in diameter; dry, rocky ridges between 4,000 and 5,000 feet elevation; rare and local; long confounded with the closely allied *T. Canadensis*, from which it may be distinguished by its larger, glossier, blunter leaves, and larger cones with wide-spreading scales.

Wood light, soft, not strong, brittle, coarse-grained; bands of small summer cells narrow, not conspicuous; medullary rays numerous, thin; color, light brown tinged with red, the sap-wood nearly white; specific gravity, 0.4275; ash, 0.40.

389.—Tsuga Mertensiana, Carrière,

Trait. Conif. 2 ed. 250.—Engelmann in Bot. California, ii, 121; Coulter's Bot. Gazette, vi, 224.—G. M. Dawson in Canadian Nat. new ser. ix, 324.

?*Abies heterophylla*, Rafinesque, Atlant. Jour. 119.—Endlicher, Syn. Conif. 124.—Carrière, Trait. Conif. 1 ed. 265.

Pinus Mertensiana, Bongard in Mem. Acad. St. Petersburg, 6 ser. iii, 163.—Hooker, Fl. Bor.-Am. ii, 164.—Endlicher, Syn. Conif. 111.—Ledebour, Fl. Rossica, iii, 668.—Parlatore in De Candolle, Prodr. xvi², 428.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 211, 212, t. 23, f. 4.

Pinus Canadensis, Bongard in Mem. Acad. St. Petersburg, 6 ser. iii, 163 [not Linnæus].—Douglas in Companion Bot. Mag. ii, 127.—Hooker, Fl. Bor.-Am. ii, 164, in part.—Ledebour, Fl. Rossica, iii, 668.

Abies Mertensiana, Lindley & Gordon in Jour. Hort. Soc. London, v, 211.—Carrière, Trait. Conif. 1 ed. 232.—Gordon, Pinetum, 18; Suppl. 12; 2 ed. 29.—Lyall in Jour. Linnæan Soc. vii, 133, 144.—Henkel & Hochstetter, Nadelhölz. 152.—Rothrock in Smithsonian Rep. 1867, 433.—Cooper in Am. Nat. iii, 412.—Gray in Proc. Am. Acad. vii, 402.—Hoopes, Evergreens, 192.—Koch, Dendrologie, ii², 250.—Vasey, Cat. Forest Trees, 33.—Macoun in Geological Rep. Canada 1875–'76, 211.—Hall in Coulter's Bot. Gazette, ii, 91.

Abies Canadensis, ? Cooper in Smithsonian Rep. 1858, 262; Pacific R. R. Rep. xii², 69 [not Desfontaines].

Abies Bridgesii, Kellogg in Proc. California Acad. ii, 37.

Abies Albertiana, Murray in Proc. Hort. Soc. London, iii, 149 & f.—Lawson, Pinetum Brit. ii, 111, t. 16, f. 1–18.—Nelson, Pinaceæ, 31.—Fowler in London Gard. Chronicle, 1872, 75.

Abies taxifolia, Hartweg, *ined.* (*fide* Murray in Proc. Hort. Soc. London, iii, 148).

Pinus Pattoniana, McNab in Proc. Royal Irish Acad. 2 ser. ii, 211, 212, t. 23, f. 2 [not Parlatore] (*fide* Engelmann in London Gard. Chronicle, 1882, 145).

Abies Pattonii, McNab in Jour. Linnæan Soc. xix, 208.

HEMLOCK.

Alaska, south along the islands and coast of British Columbia, and through the Selkirk, Gold, and other interior ranges to the Bitter Root mountains of Idaho, and the western slopes of the Rocky mountains of Montana (valley of the Flathead river, *Canby & Sargent*), extending south along the Cascade mountains to southern Oregon and in the Coast ranges to Marin county, California, between 1,000 and 4,000 feet elevation.

A large tree, 30 to 61 meters in height, with a trunk 1.20 to 3 meters in diameter; low, moist bottoms or rocky ridges; very common and reaching its greatest development in western Oregon and Washington territory, often forming extensive forests, especially along the western base of the Cascade mountains.

Wood light, hard, not strong, rather close-grained; bands of small summer cells thin, not conspicuous; medullary rays numerous, prominent; color, light brown tinged with yellow, the sap-wood nearly white; specific gravity, 0.5182; ash, 0.42; occasionally manufactured into coarse lumber.

The bark, rich in tannin, is the principal material used on the northwest coast in tanning leather.

390.—Tsuga Pattoniana, Engelmann,

Bot. California, ii, 121; London Gard. Chronicle, 145.

Abies Pattoniana, Jeffrey in Rep. Oregon Exped. i, t. 4, f. 2.—Murray in Edinburgh New Phil. Jour. new ser. i, 291, t. 9, f. 1–7.—Lawson, Pinetum Brit. ii, 157, t. 22.—Gray in Proc. Am. Acad. vii, 402.—Koch, Dendrologie, ii², 252.—Hoopes, Evergreens, 172.—Carrière, Trait. Conif. 2 ed. 30.—Hall in Coulter's Bot. Gazette, ii, 91.—Veitch, Manual Conif. 116, f. 31, 32.

? *Picea Californica*, Carrière, Trait. Conif. 261; 2 ed. 346.

Abies Hookeriana, Murray in Edinburgh New Phil. Jour. new ser. i, 289, t. 9, f. 11–17.—Lawson, Pinetum Brit. ii, 153, t. 21, 22, f. 1–22.—Nelson, Pinaceæ, 31.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 211, 212, t. 23, f. 1.—Veitch, Manual Conif. 115, t. 32.

Abies Williamsonii, Newberry in Pacific R. R. Rep. vi, 53, 90, t. 7, f. 19.—Wood, Bot. & Fl. 313.—Cooper in Am. Nat. iii, 412.—Vasey, Cat. Forest Trees, 33.

Pinus Pattoniana, Parlatore in De Candolle, Prodr. xvi², 429.

Abies Pattonii, Gordon, Pinetum, 1 ed. 10 (excl. syn. *trigona*).

Abies Pattoni, Gordon, Pinetum, Suppl. 12.—Henkel & Hochstetter, Nadelhölz. 151 (excl. syn. *trigona*).

Valley of the Fraser river, British Columbia, and probably much farther north, south along the Cascade mountains and the California Sierras to the headwaters of the San Joaquin river, extending east along the high mountains of northern Washington territory to the western slopes and summits of the Cœur d'Alêne and Bitter Root mountains of Idaho (Lolo trail, *Watson*), and the divide between Thompson and Little Bitter Root creeks, northern Montana (*H. B. Ayres*).

An alpine tree, rarely 30 meters in height, with a trunk 1.50 to 2.10 meters in diameter; dry slopes and ridges near the limits of tree growth, ranging from an elevation of 2,700 feet in British Columbia to 10,000 feet in the Sierras of central California.

Wood light, soft, not strong, close-grained, satiny, susceptible of a good polish; bands of small summer cells thin, not conspicuous; medullary rays numerous, obscure; color, light brown or red, the sap-wood nearly white; specific gravity, 0.4454; ash, 0.44.

391.—Pseudotsuga Douglasii, Carrière,

Trait. Conif. 2 ed. 256.—Engelmann in Wheeler's Rep. vi, 257; Bot. California, ii, 120.—G. M. Dawson in Canadian Nat. new ser. ix, 323.—Eichler in Monatsb. Acad. Berl. 1881, f. 18–22.—Rusby in Bull. Torrey Bot. Club, ix, 79.

Pinus taxifolia, Lambert, Pinus, 1 ed. i, 51, t. 33; 2 ed. i, 58, t. 36; 3 ed. ii, 82, t. 47.—Pursh, Fl. Am. Sept. ii, 640.—Smith in Rees' Cycl. xxviii, No. 28.—Sprengel, Syst. ii, 885.—Eaton, Manual, 6 ed. 264.—Eaton & Wright, Bot. 358.

Abies taxifolia, Poiret in Lamarck, Dict. vi, 523.—Nouveau Duhamel, v, 293.—Torrey & Gray in Pacific R. R. Rep. ii, 130.—Cooper in Smithsonian Rep. 1858, 262; Pacific R. R. Rep. xii², 69.

Abies Douglasii, Lindley in Penn. Cycl. i, 32.—Loudon, Arboretum, iv, 2319, f. 2230.—Forbes, Pinetum Woburn. 127, t. 45.—Bentham, Pl. Hartweg. 57.—Nuttall, Sylva, iii, 129, t. 115; 2 ed. ii, 187, t. 115.—Spach, Hist. Veg. xi, 423.—Knight, Syn. Conif. 37.—Lindley & Gordon in Jour. Hort. Soc. London, v, 209.—London Gard. Chronicle, 1854, 163.—Bigelow in Pacific R. R. Rep. iv, 17.—Torrey in Pacific R. R. Rep. iv, 141; Bot. Mex. Boundary Survey, 210; Ives' Rep. 28.—Newberry in Pacific R. R. Rep. vi, 54, 90, t. 8, f. 20.—Gordon, Pinetum, 15; Suppl. 10; 2 ed. 24.—Cooper in Smithsonian Rep. 1858, 262; Pacific R. R. Rep. xii², 24, 69; Am. Nat. iii, 411.—Wood, Bot. & Fl. 313.—Engelmann in Am. Jour. Sci. 2 ser. xxxiv, 330; Proc. Am. Phil. Soc. new ser. xii, 209.—Lyall in Jour. Linnæan Soc. vii, 131, 133, 143.—Henkel & Hochstetter, Nadelhölz. 155.—Nelson, Pinaceæ, 32.—Rothrock in Smithsonian Rep. 1867, 433; Pl. Wheeler, 28, 50; Wheeler's Rep. vi, 9.—Hoopes, Evergreens, 189.—Lawson, Pinetum Brit. ii, 115, t. 17, 18, f. 1–23.—Porter in Hayden's Rep. 1871, 494.—Watson in King's Rep. v, 334; Pl. Wheeler, 17.—Fowler in London Gard. Chronicle, 1872, 75.—Gray in Proc. Am. Acad. vii, 402.—Koch, Dendrologie, ii², 255.—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 131.—Murray in London Gard. Chronicle, 1872, 106.—Vasey, Cat. Forest Trees, 33—Hayden in Warren's Rep. Nebraska & Dakota, 2 ed. 122.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Hall in Coulter's Bot. Gazette, ii, 91.—Brandegee in Coulter's Bot. Gazette, iii, 32.—Veitch, Manual Conif. 119, f. 35.

Abies mucronata, Rafinesque, Jour. Atlant. 119.—Endlicher, Syn. Conif. 126.—Lindley & Gordon in Jour. Hort. Soc. London, v, 213.—Carrière, Trait. Conif. 268; 2 ed. 312.

?*Abies mucronata palustris*, Rafinesque, Jour. Atlant. 129.—Carrière, Trait. Conif. 268; 2 ed. 313.

Pinus Douglasii, Lambert, Pinus, 1 ed. iii, 163, t. 21.—Hooker, Fl. Bor.-Am. ii, 162, t. 183.—Antoine, Conif. 84, t. 33, f. 3.—Hooker & Arnott, Bot. Beechey, 394.—Endlicher, Syn. Conif. 87.—Torrey in Sitgreaves' Rep. 173.—Parlatore in De Candolle, Prodr. xvi², 430.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 703, t. 49, f. 32, 32ᵃ, 32ᵇ.

Abies Douglasii, var. *taxifolia*, Loudon, Arboretum, iv, 2319, f. 2231.—Gordon, Pinetum, 16; 2 ed. 25.—Henkel & Hochstetter, Nadelhölz. 156.

Pinus Douglasii, var. *brevibracteata*, Antoine, Conif. 84, t. 33, f. 4.

Picea Douglasii, Link in Linnæa, xv, 524.

Tsuga Douglasii, Carrière, Trait. Conif. 192.—Bolander in Proc. California Acad. iii, 232.

Tsuga Lindleyana, Roezl, Cat. Grain Mex. 8.

RED FIR. YELLOW FIR. OREGON PINE. DOUGLAS FIR.

Coast ranges and interior plateau of British Columbia south of latitude 55° N. (not reaching the coast archipelago north of Vancouver's island), east to the eastern slope of the Rocky mountains in latitude 51° N. (Bow River pass, *Macoun*); south along the mountain ranges of Washington territory, Oregon, the California Coast ranges, and the western slope of the Sierra Nevadas, through the mountain ranges east to Montana, Wyoming, Colorado, and the Guadalupe mountains of Texas; in the Wahsatch and Uintah mountains, the ranges of northern and eastern Arizona, and southward into Mexico; not detected in the interior region between the Sierra Nevada and the Wahsatch mountains, south of the Blue mountains of Oregon, and north of Arizona.

A large tree, 61 to 92 meters in height, with a trunk 0.83 to 3.66 meters in diameter, or in the Rocky mountains much smaller, here rarely 30 meters in height; the most generally-distributed and valuable timber tree of the Pacific region, growing from the sea-level to an elevation in Colorado of nearly 10,000 feet; often forming extensive forests, almost to the exclusion of other species, and reaching in western Oregon and Washington territory its greatest development and value.

Wood hard, strong, varying greatly with age and conditions of growth in density, quality, and amount of sap; difficult to work, durable; bands of small summer cells broad, occupying fully half the width of the annual growth, dark colored, conspicuous, soon becoming flinty and difficult to cut; medullary rays numerous, obscure; color, varying from light red to yellow, the sap-wood nearly white; specific gravity, 0.5157; ash, 0.08; largely manufactured into lumber and used for all kinds of construction, railway ties, piles, fuel, etc.; two varieties, red and yellow fir, are distinguished by lumbermen, dependent probably upon the age of the tree; the former coarse-grained, darker colored, and considered less valuable than yellow fir.

The bark is found valuable in tanning leather.

Var. macrocarpa, Engelmann,

Bot California, ii, 120.

Abies Douglasii, var. *macrocarpa*, Torrey in Ives' Rep. 28.—Vasey, Cat. Forest Trees, 33.

Abies macrocarpa, Vasey in Gard. Monthly, Jan. 1876.

HEMLOCK.

California Coast ranges; San Bernardino mountains to the Cuyamaca mountains.

A tree 30 to 54 meters in height, with a trunk 1.20 to 1.80 meter in diameter; dry ridges and cañons between 2,500 and 4,000 feet elevation.

Wood heavy, hard, strong, cross-grained, very durable, difficult to work; color, rather darker red than that of the species; specific gravity, 0.4563; ash, 0.08; somewhat manufactured into coarse lumber and largely used for fuel.

392.—Abies Fraseri, Lindley,

Penn. Cycl. i, 30.—Forbes, Pinetum Woburn. iii, t. 38.—Link in Linnæa, xv, 531.—Nuttall, Sylva, iii, 139, t. 119; 2 ed. ii, 196, t. 119.—Lindley & Gordon in Jour. Hort. Soc. London, v, 209.—Carrière, Trait. Conif. 200; 2 ed. 270.—Cooper in Smithsonian Rep. 1858, 257.—Chapman, Fl. S. States, 434.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 26.—Wood, Cl. Book, 661; Bot. & Fl. 314.—Henkel & Hochstetter, Nadelhölz. 169.—Gray, Manual N. States, 5 ed. 472, in part.—Hoopes, Evergreens, 202.—Bertrand in Bull. Soc. Bot. France, xviii, 379.—Koch, Dendrologie, ii², 216.—Vasey, Cat. Forest Trees, 35.—Engelmann in Trans. St. Louis Acad. iii, 596; London Gard. Chronicle, 1877, 147.—Veitch, Manual Conif. 96.

Pinus Fraseri, Pursh, Fl. Am. Sept. ii, 639.—Smith in Rees' Cycl. xxviii, No. 27.—Poiret, Suppl. v, 35.—Sprengel, Syst. ii, 884.—Beck, Bot. 340.—Eaton, Manual, 6 ed. 264.—Lambert, Pinus, 1 ed. iii, 74, t. 42.—Eaton & Wright, Bot. 358.—Antoine, Conif. 76, t. 29, f. 1.—Endlicher, Syn. Conif. 91.—Parlatore in De Candolle, Prodr. xvi², 419.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 684, t. 47, f. 10.

A. balsamea, var. *Fraseri*, Nuttall, Genera, ii, 223.—Spach, Hist. Veg. xi, 422.

Pinus balsamea, var. *Fraseri*, Torrey, Compend. Fl. N. States, 359.

Picea Fraseri, Loudon, Arboretum, iv, 2340, f. 2243, 2244.—Knight, Syn. Conif. 39.—Gordon, Pinetum, 148; 2 ed. 205.

BALSAM. SHE BALSAM.

High mountains of North Carolina and Tennessee.

A tree 18 to 24 meters in height, with a trunk sometimes 0.60 meter in diameter; moist slopes between 5,000 and 6,500 feet elevation, often forming considerable forests.

Wood very light, soft, not strong, coarse-grained, compact; bands of small summer cells rather broad, light colored, not conspicuous; medullary rays numerous, thin; color, light brown, the sap-wood lighter, nearly white; specific gravity, 0.3565; ash, 0.54.

393.—Abies balsamea, Miller,

Dict. No. 5.—Desfontaines, Hist. Arb. ii, 579.—Nouveau Duhamel, v, 295, t. 83, f. 2.—Richard, Conif. 74, t. 16.—Lindley, Penn. Cycl. i, 30; Fl. Med. 554—Forbes, Pinetum Woburn. 109, t. 37.—Link in Linnæa, xv, 530.—Spach, Hist. Veg. xi, 421.—Griffith, Med. Bot. 605, f. 268.—Lindley & Gordon in Jour. Hort. Soc. London, v, 210.—Carrière, Trait. Conif. 217; 2 ed. 292.—Richardson, Arctic Exped. 441.—Darlington, Fl. Cestrica, 3 ed. 291.—Cooper in Smithsonian Rep. 1858, 257.—Wood, Cl. Book, 661; Bot. & Fl. 314.—Porcher, Resources S. Forests, 506.—Henkel & Hochstetter, Nadelhölz. 176.—Gray, Manual N. States, 5 ed. 471.—Hoopes, Evergreens, 197.—Bertrand in Bull. Soc. Bot. France, xviii, 379.—Koch, Dendrologie, ii², 214.—Vasey, Cat. Forest Trees, 34.—Guibourt, Hist. Drogues, 7 ed. ii, 246.—Engelmann in Trans. St. Louis Acad. iii, 597.—Macoun in Geological Rep. Canada, 1875-'76, 211.—Sears in Bull. Essex Inst. xiii, 184.—Bell in Geological Rep. Canada, 1879-'80, 46ᶜ.—Veitch, Manual Conif. 88.

Pinus balsamea, Linnæus, Spec. 1 ed. 1002.—Wangenheim, Amer. 40.—Aiton, Hort. Kew. iii, 370; 2 ed. v, 319.—Mœnch, Meth. 364.—Du Roi, Harbk. 2 ed. 144.—Lambert, Pinus, 1 ed. i, 48, t. 31; 2 ed. i, 52, t. 33; 3 ed. i, 72, t. 41.—Willdenow, Spec. iv, 504; Enum. 989; Berl. Baumz. 276.—Persoon, Syn. ii, 579.—Pursh, Fl. Am. Sept. ii, 639.—Eaton, Manual, 111; 6 ed. 264.—Nuttall, Genera, ii, 223.—Hayne, Dend. Fl. 176.—Elliott, Sk. ii, 639.—Sprengel, Syst. ii, 884.—Torrey, Compend. Fl. N. States, 359; Fl. N. York, ii, 229.—Descourtilz, Fl. Med. Antilles, iv, 59, t. 246.—Woodville, Med. Bot. 3 ed. v, 1, t. 1.—Beck, Bot. 340.—Hooker, Fl. Bor.-Am. ii, 163.—Eaton & Wright, Bot. 358.—Bigelow, Fl. Boston. 3 ed. 385.—Antoine, Conif. 66, t. 26, f. 3.—Endlicher, Syn. Conif. 103.—Giboul, Arb. Resin. 45.—Darby, Bot. S. States, 515.—Parlatore in De Candolle, Prodr. xvi², 423.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 684, t. 47, f. 11.—Bentley & Trimen, Med. Pl. iv, 263, t. 263.

Pinus Abies Balsamea, Marshall, Arbustum, 102.

A. balsamifera, Michaux, Fl. Bor.-Am. ii, 207, in part.—Michaux f. Hist. Arb. Am. i, 145, t. 14; N. American Sylva, 3 ed. iii, 150, t. 150, in part.

Picea balsamea, Loudon, Arboretum, iv, 2339, f. 2240, 2241.—Knight, Syn. Conif. 39.—Gordon, Pinetum, 143; 2 ed. 200.—Henkel & Hochstetter, Nadelhölz. 176.—Emerson, Trees Massachusetts, 85; 2 ed. i, 101.—Nelson, Pinaceæ, 37.

Picea balsamea, var. *longifolia*, Hort.—Loudon, Arboretum, iv, 2339.

Picea Fraseri, Emerson, Trees Massachusetts, 88; 2 ed. i, 104 [not Loudon].

BALSAM FIR. BALM OF GILEAD FIR.

Northern Newfoundland and Labrador to the southern shores of Hudson bay, northwest to the Great Bear lake and the eastern base of the Rocky mountains; south through the northern states to Pennsylvania, central Michigan and Minnesota, and along the Alleghany mountains to the high peaks of Virginia.

A tree 21 to 27 meters in height, with a trunk rarely exceeding 0.60 meter in diameter, or at high elevations reduced to a low, prostrate shrub (*A. Hudsonica*, Hort.); damp woods and mountain swamps.

Wood very light, soft, not strong, coarse-grained, compact, not durable; bands of small summer cells not broad, resinous, conspicuous; medullary rays numerous, obscure; color, light brown, often streaked with yellow, the sap-wood lighter; specific gravity, 0.3819; ash, 0.45.

Canadian balsam or balm of fir, an aromatic liquid oleo-resin obtained from this and other species of *Abies* by puncturing the vesicles formed under the bark of the stem and branches, is used medicinally, chiefly in the treatment of chronic catarrhal affections, and in the arts (*U. S. Dispensatory*, 14 ed. 898, 900.—*Nat. Dispensatory*, 2 ed. 1417.—*Flückiger & Hanbury, Pharmacographia*, 552).

394.—Abies subalpina, Engelmann,

Am. Nat. x, 554; Trans. St. Louis Acad. iii, 597; Wheeler's Rep. vi, 255.—Vasey, Cat. Forest Trees, 34.—Hall in Coulter's Bot. Gazette, ii, 91.—Brandegee in Coulter's Bot. Gazette, iii, 32.—G. M. Dawson in Canadian Nat. new ser. ix, 326.—Masters in London Gard. Chronicle, 1881, 236, f. 43, 44, 45.

?*Pinus lasiocarpa*, Hooker, Fl. Bor.-Am. ii, 163 [not Hort.].—Endlicher, Syn. Conif. 105.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 682, t. 46, f. 7, 7ª; t. 47, 48, 49 (excl. syn.).

?*A. lasiocarpa*, Nuttall, Sylva, iii, 138; 2 ed. ii, 195.—Lindley & Gordon in Jour. Hort. Soc. London, v, 210.—Carrière, Trait. Conif. 1 ed. 221.—Cooper in Smithsonian Rep. 1858, 262.—Murray in Proc. Hort. Soc. London, iii, 313, f. 27-31.—Henkel & Hochstetter, Nadelhölz. 161 (excl. syn.).

?*Pinus* species, Torrey in Fremont's Rep. 97.

Picea amabilis, Gordon, Pinetum, 154, in part; 2 ed. 213, in part.

A. bifolia, Murray in Proc. Hort. Soc. London, iii, 320, f. 51-56; London Gard. Chronicle, 1875, 465, f. 96, 97.—Regel, Gartenflora, xiii, 119.—Henkel & Hochstetter, Nadelhölz. 420.

A. grandis, Engelmann in Am. Jour. Sci. 2 ser. xxxiv, 310 [not Lindley].—Carrière, Trait. Conif. 2 ed. 296, in part.—Watson in King's Rep. v, 334, in part.—Gray in Proc. Am. Acad. vii, 402 [not Lindley].—Porter & Coulter, Fl. Colorado; Hayden's Surv. Misc. Pub. No. 4, 131 [not Lindley].

Pinus amabilis, Parlatore in De Candolle, Predr. xvi², 426, in part.

Picea bifolia, Murray in London Gard. Chronicle, 1875, 105.

A. subalpina, var. *fallax*, Engelmann in Trans. St. Louis Acad. iii, 597.

BALSAM.

Valley of the Stakhin river, Alaska, in latitude 60° N. (*Muir*), south through British Columbia and along the Cascade mountains to northern Oregon (*Collier*), through the Blue mountains of Oregon and the ranges of Idaho, Montana, Wyoming, Utah, and Colorado.

A tree 24 to 40 meters in height, with a trunk rarely exceeding 0.60 meter in diameter; mountain slopes and cañons between 4,000 (British Columbia) and 12,000 (Colorado) feet elevation; generally scattered and rarely forming the prevailing forest growth.

Wood very light, soft, not strong, rather close-grained, compact; bands of small summer cells very narrow, not conspicuous; medullary rays numerous, obscure; color, light brown or nearly white, the sap-wood lighter; specific gravity, 0.3476; ash, 0.44.

395.—Abies grandis, Lindley,

Penn. Cycl. i, 30.—Forbes, Pinetum Woburn. 123, t. 43.—Spach, Hist. Veg. xi, 422.—Nuttall, Sylva, iii, 134; 2 ed. ii, 192.—Lindley & Gordon in Jour. Hort. Soc. London, v, 210.—Carrière, Trait. Conif, 220; 2 ed. 296 (excl. syn.).—Cooper in Smithsonian Rep. 1858, 262; Pacific R. R. Rep. xii², 25, 69; Am. Nat. iii, 410.—Wood, Bot. & Fl. 314.—Lyall in Jour. Linnæan Soc. vii, 143.—Bolander in Proc. California Acad. iii, 232.—Henkel & Hochstetter, Nadelhölz. 160.—Nelson, Pinaceæ, 38.—Hoopes, Evergreens, 211.—Bertrand in Bull. Soc. Bot. France, xviii, 378.—Vasey, Cat. Forest Trees, 34.—Hall in Coulter's Bot. Gazette, ii, 91.—Macoun in Geological Rep. Canada, 1875-'76, 211.—Engelmann in Trans. St. Louis Acad. iii, 593; London Gard. Chronicle, 1879, 684; 1880, 660, f. 119; Bot. California, ii, 118.—G. M. Dawson in Canadian Nat. new ser. ix, 326.—Masters in London Gard. Chronicle, 1881, 179, f. 33-36.—Veitch, Manual Conif. 97, f. 23, 24.

Pinus grandis, Douglas in Companion Bot. Mag. ii, 147.—Hooker, Fl. Bor.-Am. ii, 163.—Antoine, Conif. 63, t. 25, f. 1.—Hooker & Arnott, Bot. Beechey, 394.—Endlicher, Syn. Conif. 105.—Parlatore in De Candolle, Prodr. xvi², 427 (excl. syn.).—McNab in Proc. Royal Irish Acad. 2 ser. ii, 678, t. 46, f. 4, 4ᵃ.

?*A. aromatica*, Rafinesque, Atlant. Jour. 119.—Endlicher, Syn. Conif. 125.—Lindley & Gordon in Jour. Hort. Soc. London, v, 213.—Carrière, Trait. Conif. 266; 2 ed. 310.

Picea grandis, London, Arboretum, iv, 2341, f. 2245, 2246, in part.—Knight, Syn. Conif. 39.—Gordon, Pinetum, 155; Suppl. 5 (excl. syn. *Parsonsii*); 2 ed. 216.—Newberry in Pacific R. R. Rep. vi, 46, 90, f. 16, t. 6, in part.—Murray in London Gard. Chronicle, 1875, 135, f. 28.

A. Gordoniana, Carrière, Trait. Conif. 2 ed. 298 (excl. syn. *Parsonsii*).—Bertrand in Bull. Soc. Bot. France, xviii, 379.

A. amabilis, Murray in Proc. Hort. Soc. London, iii, 310, f. 22-24 [not Forbes].

WHITE FIR.

Vancouver's island, south to Mendocino county, California, near the coast; interior valleys of western Washington territory and Oregon south to the Umpqua river, Cascade mountains below 4,000 feet elevation, through the Blue mountains of Oregon (*Cusick*) to the eastern slope of the Cœur d'Alêne mountains (*Cooper*), the Bitter Root mountains, Idaho (*Watson*), and the western slopes of the Rocky mountains of northern Montana (Flathead region, *Canby & Sargent*).

A large tree, 61 to 92 meters in height, with a trunk 0.90 to 1.50 meter in diameter; most common and reaching its greatest development in the bottom lands of western Washington territory and Oregon in rich, moist soil; or moist mountain slopes, then much smaller, rarely exceeding 30 meters in height.

Wood very light, soft, not strong, coarse-grained, compact; bands of small summer cells broader than in other American species, dark colored, resinous, conspicuous; medullary rays numerous, obscure; color, light brown, the sap-wood rather lighter; specific gravity, 0.3545; ash, 0.49; in western Oregon manufactured into lumber and used for interior finish, packing-cases, cooperage, etc.

396.—Abies concolor, Lindley & Gordon,

Jour. Hort. Soc. London, v, 210.—Parry in Am. Nat. ix, 204.—Vasey, Cat. Forest Trees, 34.—Engelmann in Trans. St. Louis Acad. iii, 600; Wheeler's Rep. vi, 255; London Gard. Chronicle, 1879, 684, f. 114, 115; Bot. California, ii, 118.—Brandegee in Coulter's Bot. Gazette, iii, 32.—Masters in London Gard. Chronicle, 1879, 684, f. 114, 115.—Veitch, Manual Conif. 93.

Pinus concolor, Engelmann in herb.; Parlatore in De Candolle, Prodr. xvi², 426.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 681, t. 46, f. 6.

Picea concolor, Gordon, Pinetum, 155; 2 ed. 216.—Murray in London Gard. Chronicle, 1875, 135, f. 26.

Pinus lasiocarpa, Balfour in Rep. Oregon Exped. i, t. 4, f. 1 [not Hooker].—Murray in Proc. Hort. Soc. London, iii, 314, f. 25.—Henkel & Hochstetter, Nadelhölz. 429.

?*A. balsamea*, Bigelow in Pacific R. R. Rep. iv, 18 [not Miller].—Torrey in Pacific R. R. Rep. iv, 141.

Picea grandis, Newberry in Pacific R. R. Rep. vi, 46, in part.

Abies grandis, Carrière, Trait. Conif.; 2 ed. 296, in part.—Watson in Pl. Wheeler, 17 [not Lindley].

Picea Lowiana, Gordon, Pinetum, Suppl. 53; 2 ed. 218.—Henkel & Hochstetter, Nadelhölz. 419.

A. Lowiana, Murray in Proc. Hort. Soc. London, iii, 317, f. 38-41.

A. amabilis, Watson in King's Rep. v, 333 [not Forbes].

A. grandis, var. *Lowiana*, Hoopes, Evergreens, 212.

Pinus grandis, Parlatore in De Candolle, Prodr. xvi², 427, in part.

Picea concolor, var. *violacea*, Murray in London Gard. Chronicle, 1875, 464, f. 94, 95.

Pinus Lowiana, McNab in Proc. Royal Irish Acad. 2 ser. ii, 680, t. 46, f. 5.

A. lasiocarpa, Hort. [not Nuttall].

A. Parsonsii, Hort.

WHITE FIR. BALSAM FIR.

Northern slopes of the Siskiyou mountains, Oregon, and perhaps farther north in the Cascade mountains, south along the western slope of the Sierra Nevadas to the San Bernardino and San Jacinto mountains, California; along the high mountains of northern Arizona to the Mogollon mountains, New Mexico, northward to the Pike's Peak region of Colorado, and in the Wahsatch mountains of Utah.

A large tree, 30 to 40 meters in height, with a trunk 1.20 to 1.50 meter in diameter; moist slopes and cañons between 3,000 and 9,000 feet elevation, reaching its greatest development in the California sierras, varying greatly in the color and length of leaves, habit, etc., and perhaps merely a southern form of the too nearly allied *A. grandis*, from which it cannot be always readily distinguished.

Wood very light, soft, not strong, coarse-grained, compact; bands of small summer cells narrow, resinous, not conspicuous; medullary rays, numerous, obscure; color, very light brown or nearly white, the sap-wood somewhat darker; specific gravity, 0.3638; ash, 0.85; occasionally manufactured into lumber and used for packing-cases, butter-tubs, and other domestic purposes.

397.—Abies bracteata, Nuttall,

Sylva, iii, 137, t. 118; 2 ed. ii, t. 118.—Hartweg in Jour. Hort. Soc. London, iii, 225.—Lindley & Gordon in Jour. Hort. Soc. London, v, 209.—Carrière, Trait. Conif. 193; 2 ed. 265.—London Gard. Chronicle, 1853, 435; 1854, 459; 1859, 928.—Bot. Mag. t. 4740.—Lemaire in Ill. Hort. i, 14, t. 5.—Fl. des Serres, ix, 109 & t.—Naudin in Rev. Hort. 1854, 31.—Cooper in Smithsonian Rep. 1858, 262.—Murray in Edinburgh New Phil. Jour. new ser. x, 1, t. 1, 2 (Trans. Bot. Soc. Edinburgh, vi, 211, t. 1, 2).—Henkel & Hochstetter, Nadelhölz. 167.—Hoopes, Evergreens, 199.—Bertrand in Bull. Soc. Bot. France, xviii, 379.—Vasey, Cat. Forest Trees, 35.—Engelmann in Trans. St. Louis Acad. iii, 691; London Gard. Chronicle, 1879, 684; Bot. California, ii, 118.—Veitch, Manual Conif. 89, f. 14, 15.

Pinus venusta, Douglas in Companion Bot. Mag. ii, 152.

Pinus bracteata, D. Don in Trans. Linnæan Soc. xvii, 443.—Lambert, Pinus, 1 ed. iii, 169, t. 91.—Antoine, Conif. 77, t. 30.—Hooker & Arnott, Bot. Beechey, 394.—Hooker, Icon. t. 379.—Endlieber, Syn. Conif. 89.—Walpers, Ann. v, 798.—Parlatore in De Candolle, Prodr. xvi², 419.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 674, t. 46, f. 1.

Picea bracteata, London, Arboretum, iv, 2348, f. 2256.—Gordon, Pinetum, 145; 2 ed. 202.—Lawson, Pinetum Brit. ii, 171, t. 25, 26, f. 1-7.—Nelson, Pinaceæ, 37.—Fowler in London Gard. Chronicle, 1872, 286.

A. venusta, Koch, Dendrologie, ii², 210.

Santa Lucia mountains, California, from the northern boundary of San Luis Obispo county about 40 miles northward.

A tree 46 to 61 meters in height, with a trunk 0.90 to 1.20 meter in diameter; moist, cold soil, occupying 4 or 5 cañons between 3,000 and 6,000 feet elevation, generally west of the summit of the range (*G. R. Vasey*).

Wood heavy, not hard, coarse-grained, compact; bands of small summer cells broad, resinous, conspicuous; medullary rays numerous, obscure; color, light brown tinged with yellow, the sap-wood not seen; specific gravity, 0.6783; ash, 2.04; probably more valuable than the wood of the other North American *Abies*.

398—Abies amabilis, Forbes,

Pinetum Woburn. 125, t. 44.—Lindley & Gordon in Jour. Hort. Soc. London, v, 210.—Carrière, Trait. Conif. 219; 2 ed. 296.—Cooper in Smithsonian Rep. 1858, 232.—Lyall in Jour. Hort. Soc. London, vii, 143.—Henkel & Hochstetter, Nadelhölz. 159.—Nelson, Pinaceæ, 36.—Hoopes, Evergreens, 209 (excl. syn. *lasiocarpa*).—Fowler in London Gard. Chronicle, 1872, 285.—Koch, Dendrologie, ii², 211 (excl. syn. *lasiocarpa*).—Macoun in Geological Rep. Canada, 1875-'76, 211.—Engelmann in London Gard. Chronicle, 1880, 720, f. 136-141; Coulter's Bot. Gazette, vii, 4.—Veitch, Manual Conif. 86.

Pinus amabilis, Douglas in Companion Bot. Mag. ii, 93.—Antoine, Conif. 63, t. 25, f. 2.—Hooker & Arnott, Bot. Beechey, 394.—Endlicher, Syn. Conif. 104.—Parlatore in De Candolle, Prodr. xvi², 426, in part.

Pinus grandis, Lambert, Pinus, 1 ed. iii, t. 26 [not Douglas].

Picea amabilis, London, Arboretum, iv, 2342, f. 2247, 2248.—Knight, Syn. Conif. 39.—Gordon, Pinetum, 154; 2 ed. 213 (excl. syn.).—Newberry in Pacific R. R. Rep. vi, 51, 90, f. 18.

A. grandis, Murray in Proc. Hort. Soc. London, iii, 308, f. 18-21 [not Lindley].

A. grandis, var. *densiflora*, Engelmann in Trans. St. Louis Acad. iv, 599.

Valley of the Fraser river, British Columbia (*Engelmann & Sargent*), and probably farther north, south along the Cascade mountains of Washington territory and Oregon.

A tree 30 to 45 meters in height, with a trunk sometimes 1.20 meter in diameter, forming extensive forests on the mountains of British Columbia, between 3,500 and 5,000 feet, and upon the mountains south of the Columbia river between 3,000 and 4,000 feet elevation, here reaching its greatest development; its northern range not yet determined.

Wood light, hard, not strong, close-grained, compact; bands of small summer cells broad, resinous, dark colored, conspicuous; medullary rays numerous, thin; color, light brown, the sap-wood nearly white; specific gravity, 0.4228; ash, 0.23.

399.—Abies nobilis, Lindley.

Penn. Cycl. i, 30.—Forbes, Pinetum Woburn. 115, t. 40.—Link in Linnæa, xv, 532.—Spach, Hist. Veg. xi, 419.—Nuttall, Sylva, iii, 136, t. 117; 2 ed. ii, 193, t. 117.—Lindley & Gordon in Jour. Hort. Soc. London, v, 209.—Carrière, Trait. Conif. 198; 2 ed. 268.—Jour. Bot. & Kew Gard. Misc. ix, 85.—Cooper in Smithsonian Rep. 1858, 262.—Henkel & Hochstetter, Nadelhölz. 168.—Hoopes, Evergreens, 203.—Koch, Dendrologie, ii², 209.—Vasey, Cat. Forest Trees, 34.—Engelmann in Trans. St. Louis Acad. iii, 601, in part; London Gard. Chronicle, 1879, 885; Bot. California, ii, 119, in part; Coulter's Bot. Gazette, vii, 4.—Veitch, Manual Conif. 101.

Pinus nobilis, Douglas in Companion Bot. Mag. ii, 147.—Lambert, Pinus, 1 ed. iii, 167, t. 74.—Hooker, Fl. Bor.-Am. ii, 162.—Antoine, Conif. 77, t. 29, f. 2.—Hooker & Arnott, Bot. Beechey, 394.—Endlicher, Syn. Conif. 90.

Picea nobilis, Loudon, Arboretum, iv, 2342, f. 2249, 2250.—Knight, Syn. Conif. 39.—Lindley & Gordon in Jour. Hort. Soc. London, v, 209.—Gordon, Pinetum, 149; Suppl. 48; 2 ed. 207.—Newberry in Pacific R. R. Rep. vi, 49, 90, f. 17.—Lawson, Pinetum, Brit. ii, 181, t. 28, 29, f. 1-18.—Nelson, Pinaceæ, 39.

Pseudotsuga nobilis, Bertrand in Bull. Soc. Bot. France, xviii, 86.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 699, t. 49, f. 29, 29ª.

A. magnifica, Engelmann in Bot. California, ii, 119, in part.

RED FIR.

Oregon, Cascade mountains from the Columbia river south to the valley of the upper Rogue river, and along the summits of the Coast Range from the Columbia to the Nestucca river (*Collier*).

A large tree, 61 to 92 meters in height, with a trunk 2.40 to 3 meters in diameter, forming, with *A. amabilis*, extensive forests along the slopes of the Cascade Range, between 3,000 and 4,000 feet elevation; less multiplied in the coast ranges, here reaching its greatest individual development.

Wood light, hard, strong, rather close grained, compact; bands of small summer cells broad, resinous, dark colored, conspicuous; medullary rays thin, hardly distinguishable; color, light brown streaked with red, the sap-wood a little darker; specific gravity, 0.4561; ash, 0.34.

400.—Abies magnifica, Murray,

Proc. Hort. Soc. London, iii, 318, f. 42-50; London Gard. Chronicle, 1875, 134.—Regel, Gartenflora, xiii, 119.—Henkel & Hochstetter, Nadelhölz. 419.—Koch, Dendrologie, ii², 213.—Engelmann in Trans. St. Louis Acad. iii, 601; London Gard. Chronicle, 1879, 885, f. 116; Bot. California, ii, 119; Coulter's Bot. Gazette, vii, 4.—Veitch, Manual Conif. 99.

A. campylocarpa, Murray in Trans. Bot. Soc. Edinburgh, vi, 370.

A. nobilis robusta, Hort.—Carrière, Trait. Conif. 2 ed. 269.

Picea magnifica, Gordon, Pinetum, 2 ed. 219.—Murray in London Gard. Chronicle, 1875, 105.

Pinus amabilis, Parlatore in De Candolle, Prodr. xvi², 426, in part.—McNab in Proc. Royal Irish Acad. 2 ser. ii, 677, t. 46, f. 3, 3ª?

A. amabilis, Vasey, Cat. Forest Trees, 34 [not Forbes].

Pseudotsuga magnifica, McNab in Proc. Royal Irish Acad. 2 ser. ii, 700, t. 49, f. 30, 30ª.

A. nobilis, Engelmann, Bot. California, ii, 119, in part.

RED FIR.

California, mount Shasta, south along the western slope of the Sierra Nevadas to Kern county.

A large tree, 61 to 76 meters in height, with a trunk 2.40 to 3 meters in diameter, forming about the base of mount Shasta extensive forests between 4,900 and 8,000 feet elevation; farther south less common and reaching an extreme elevation of 10,000 feet.

Wood light, soft, not strong, rather close-grained, compact, satiny, durable in contact with the soil, liable to twist and warp in seasoning; bands of small summer cells broad, resinous, dark colored, conspicuous; medullary rays numerous, thin; color, light red, the sap-wood somewhat darker; specific gravity, 0.4701; ash, 0.30; largely used for fuel and occasionally manufactured into coarse lumber.

401.—Larix Americana, Michaux,

Fl. Bor.-Am. ii, 203.—Michaux f. Hist. Arb. Am. iii, 37, t. 4; N. American Sylva, 3 ed. iii, 167, t. 153.—Audubon, Birds, t. 4.—London, Arboretum, iv, 2399.—Emerson, Trees Massachusetts, 89; 2 ed. i, 105 & t.—Gihoul, Arb. Resin. 51.—Parry in Owen's Rep. 618.—Richardson, Arctic. Exped. 442.—Cooper in Smithsonian Rep. 1858, 257.—Hooker f. in Trans. Linnæan Soc. xxiii, 302.—Wood, Cl. Book, 662; Bot. & Fl. 314.—Nelson, Pinaceæ, 86.—Gray, Manual N. States, 5 ed. 442.—Hoopes, Evergreens, 247.—Regel, Gartenflora, xx, 105, t. 684, f. 7, 8 (Belg. Hort. xxii, 105, t. 10, f. 2, 3).—Bertrand in Ann. Sci. Nat. 5 ser. xx, 90.—Vasey, Cat. Forest Trees, 35.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Sears in Bull. Essex Inst. xiii, 185.

Pinus laricina, Du Roi, Obs. Bot. 49; Harbk. ii, 83.—Wangenheim, Amer. 42, t. 16, f. 37.—Mœnch, Meth. 364.

Pinus Larix rubra, alba and *nigra*, Marshall, Arbustum, 103, 104.

Pinus intermedia, Wangenheim, Amer. 42, t. 16, f. 37.—Du Roi, Harbk. 2 ed. ii, 114.

Pinus pendula, Aiton, Hort. Kew, iii, 369; 2 ed. v, 320.—Lambert, Pinus, 1 ed. i, 55, t. 36; 2 ed. ii, 63, t. 39; 3 ed. ii, 86, t. 49.—Willdenow, Spec. iv, 502.—Persoon, Syn. ii, 579.—Pursh, Fl. Am. Sept. ii, 645.—Smith in Rees' Cycl. xxviii, No. 32.—Eaton, Manual, 110; 6 ed. 365.—Nuttall, Genera, ii, 223.—Sprengel, Syst. ii, 887.—Audubon, Birds, t. 90, 180.—Beck, Bot. 339.—Hooker, Fl. Bor.-Am. ii, 164.—Eaton & Wright, Bot. 359.—Torrey, Fl. N. York, ii, 232.—Parlatore in De Candolle, Prodr. xvi², 409.

Pinus microcarpa, Lambert, Pinus, 1 ed. i, 56, t. 37; 2 ed. ii, 65, t. 40; 3 ed. ii, 88, t. 50.—Willdenow, Spec. iv, 502; Enum. 989; Berl. Baumz. 273.—Persoon, Syn. ii, 579.—Aiton, Hort. Kew. 2 ed. v, 321.—Pursh. Fl. Am. Sept. ii, 645.—Smith in Rees' Cycl. xxviii, No. 33.—Eaton, Manual, 110; 6 ed. 365.—Nuttall, Genera, ii, 223.—Hayne, Dend. Fl. 175.—Sprengel, Syst. ii, 887.—Torrey, Compend. Fl. N. States, 360.—Meyer, Pl. Labrador, 30.—Beck, Bot. 340.—Hooker, Fl. Bor.-Am. ii, 164.—Eaton & Wright, Bot. 359.—Bigelow, Fl. Boston. 3 ed. 387.—Antoine, Conif. 54, t. 21, f. 1.—Endlicher, Syn. Conif. 132.

Abies pendula, Poiret in Lamarck, Dict. vi, 514.—Nouveau Duhamel, v, 288.—Lindley & Gordon in Jour. Hort. Soc. London, v, 213.

Abies microcarpa, Poiret in Lamarck, Dict. vi, 514.—Nouveau Duhamel, v, 289, t. 79, f. 2.—Lindley in Penn. Cycl. i, 33.—Lindley & Gordon in Jour. Hort. Soc. London, 213.

L. tenuifolia, Salisbury in Trans. Linnæan Soc. viii, 313.

L. pendula, Salisbury in Trans. Linnæan Soc. viii, 313.—Forbes, Pinetum Woburn. 137, t. 46.—Carrière, Trait. Conif. 1 ed. 272.—Gordon, Pinetum, 129; 2 ed. 177.—Hooker f. in Trans. Linnæan Soc. xxiii, 302.

L. microcarpa, Desfontaines, Hist. Arb. ii, 597.—Forbes, Pinetum Woburn. 139, t. 47.—Spach. Hist. Veg. xi, 436.—Link in Linnæa, xv, 536.—Carrière, Trait. Conif. 275; 2 ed. 355.—Gordon, Pinetum, 129; 2 ed. 175.—Henkel & Hochstetter, Nadelhölz. 137.—Hooker f. in Trans. Linnæan Soc. xxiii, 302, 341.—Veitch, Manual Conif. 180.

L. intermedia, Loddiges, Cat. ed. 1836, 50.—Forbes, Pinetum Woburn. 141.—Link in Linnæa, xv, 535.

L. Americana rubra, Loudon, Arboretum, iv, 2400.—Knight, Syn. Conif. 40.

L. Americana, var. *pendula*, Loudon, Arboretum, iv, 2400.—Carrière, Trait. Conif. 2 ed. 356.

L. Americana, var. *prolifera*, Loudon, Arboretum, iv, 2401.—Carrière, Trait. Conif. 2 ed. 356.

L. decidua, var. *Americana*, Henkel & Hochstetter, Nadelhölz. 133.

LARCH. BLACK LARCH. TAMARACK. HACKMATACK.

Northern Newfoundland and Labrador to the eastern shores of Hudson bay, cape Churchill and northwest to the northern shores of the Great Bear lake and the valley of the Mackenzie river within the Arctic circle; south through the northern states to northern Pennsylvania, northern Indiana and Illinois, and central Minnesota.

A tree 24 to 30 meters in height, with a trunk 0.60 to 0.90 meter in diameter; moist uplands and intervale lands, or south of the boundary of the United States in cold, wet swamps, often covering extensive areas, here much smaller and less valuable.

Wood heavy, hard, very strong, rather coarse-grained, compact, durable in contact with the soil; bands of small summer cells broad, very resinous, dark colored, conspicuous, resin passages few, obscure; medullary rays numerous, hardly distinguishable, color, light brown, the sap-wood nearly white; specific gravity, 0.6236; ash, 0.33; preferred and largely used for the upper knees of vessels, for ship timbers, fence posts, telegraph poles, railway ties, etc.

The inner bark of the closely-allied European larch is recommended in the treatment of chronic catarrhal affections of the pulmonary and urinary passages; probably that of the American species would be equally efficacious.

402.—Larix occidentalis, Nuttall,

Sylva, iii. 143, t. 120; 2 ed. ii, 199, t. 120.—Newberry in Pacific R. R. Rep. vi, 59, f. 24, 25.—Cooper in Smithsonian Rep. 1858, 262; Am. Nat. iii, 412.—Lyall in Jour. Linnæan Soc. vii, 143.—Nelson, Pinaceæ, 91.—Hoopes, Evergreens, 253.—Regel, Gartenflora, xx, 103, t. 685, f. 8–10 (Belg. Hort. xxii, 101, t. 8, f. 3–5).—Vasey, Cat. Forest Trees, 35.—Gordon, Pinetum, 2 ed. 176.—Macoun in Geological Rep. Canada, 1875–'76, 211.—G. M. Dawson in Canadian Nat. new ser. ix, 329.—Veitch, Manual Conif. 130.

Pinus Larix, Douglas in Companion Bot. Mag. ii, 109 [not Linnæus].

L. Americana, var. *brevifolia*, Carrière, Trait. Conif. 2 ed. 357.

Pinus Nuttallii, Parlatore in De Candolle, Prodr. xvi², 412.

TAMARACK.

British Columbia, Selkirk and Gold ranges, south of latitude 53° N., extending west to the head of Okanagan lake (*G. M. Dawson*), south along the eastern slopes of the Cascade mountains to the Columbia river, through the mountain ranges of northern Washington territory to the western slopes of the Rocky mountains of Montana, and in the Blue mountains of Washington territory and Oregon.

A noble tree of great economic value, 30 to 45 meters in height, with a trunk 0.90 to 1.50 meter in diameter; moist mountain slopes and benches between 2,500 and 5,000 feet elevation; scattered among other trees and never exclusively forming forests; the thick bark long resisting the action of forest fires; very common, and perhaps reaching its greatest development in the region north of the Big Blackfoot river and in the valley of the Flathead river, Montana, here the largest and most valuable timber tree.

Wood heavy, exceedingly hard and strong, rather coarse-grained, compact, satiny, susceptible of a fine polish, very durable in contact with the soil; bands of small summer cells broad, occupying fully half the width of annual growth, very resinous, dark colored, conspicuous, resin passages few, obscure; medullary rays numerous, thin; color, light bright red, the thin sap-wood nearly white; specific gravity, 0.7407; ash, 0.09; occasionally manufactured into lumber, but principally used for fuel, posts, railway ties, etc.

403.—Larix Lyallii, Parlatore,

Enum. Sem. Hort. Reg. Mus. Flor. 1863; London Gard. Chronicle, 1863, 916 (Regel, Gartenflora, xiii, 244).—Lyall in Jour. Linnæan Soc. vii, 143.—Henkel & Hochstetter, Nadelhölz. 417.—Carrière, Trait. Conif. 2 ed. 361.—Hoopes, Evergreens, 256.—Regel, Gartenflora, xx, 103, t. 685, f. 11–13 (Belg. Hort. xxii, 102, t. 9, f. 1–3).—Bertrand in Ann. Sci. Nat. 5 ser. xx, 90.—Vasey, Cat. Forest Trees, 35.—Macoun in Geological Rep. Canada, 1875–'76, 211.—Veitch, Manual Conif, 130.

Pinus Lyallii, Parlatore in De Candolle, Prodr. xvi², 412.

"Cascade mountains, 6,500 to 7,000 feet, forming an open belt of trees mingled with *P. flexilis* (*P. albicaulus*); on the Galton range at 6,000 feet and in the Rocky mountains at 7,000 feet, growing with *P. flexilis*" (*Lyall*); mount Stewart, Washington territory (*Brandegee & Tweedy*, August, 1883); Grave Creek pass, northern Montana (*H. B. Ayres*, September, 1883).

A low, much-branched, straggling, alpine tree, rarely exceeding 15 meters in height, with a trunk sometimes 1.50 meter in diameter; dry, rocky soil, generally upon northern exposures, and associated with *Pinus albicaulis* and *Tsuga Pattoniana* along the upper limits of tree-growth between 5,500 and 7,000 feet elevation (*Brandegee*).

The wood not collected.

NOTE.—A well-marked species, distinguished from *L. occidentalis* by its alpine habit, the larger green or purple deciduous cones with ciliated scales, and by the dense tomentum covering the young shoots and leaf buds.

PALMACEÆ.

404.—Sabal Palmetto, Loddiges;

Rœmer & Schultes, Syst. vii, 1487.—Croom in Am. Jour. Sci. 1 ser. xxvi, 315.—Martius, Hist. Palm. iii, 247.—Kunth, Enum. iii, 247.—Spach, Hist. Veg. xii, 107.—Chapman, Fl. S. States, 438.—Curtis in Rep. Geological Surv. N. Carolina, 1860, iii, 64.—Wood, Cl. Book, 666; Bot. & Fl. 317.—Vasey, Cat. Forest Trees, 38.

Corypha Palmetto, Walter, Fl. Caroliniana, 119.

Chamærops Palmetto, Michaux, Fl. Bor.-Am. i, 206.—Michaux f. Hist. Arb.-Am. ii, 186, t. 10; N. American Sylva, 3 ed. iii, 5, t. 101.—Aiton, Hort. Kew. 2 ed. v, 490.—Nuttall, Genera, i, 231.—Elliott, Sk. i, 431.—Sprengel, Syst. ii, 137.—Eaton, Manual, 6 ed. 89.—Eaton & Wright, Bot. 191.—Darby, Bot. S. States, 546.—Cooper in Smithsonian Rep. 258.—Porcher, Resources, S. Forests, 526.

CABBAGE TREE. CABBAGE PALMETTO.

Smith island, off the mouth of Cape Fear river, North Carolina, south along the coast to Key Largo, Florida, and along the Gulf coast to the Apalachicola river.

A tree 7 to 12 meters in height, with a trunk 0.60 to 0.90 meter in diameter; sandy maritime shores; very common and reaching its greatest development upon the west coast of the Florida peninsula south of Cedar Keys.

Wood light, soft; fibro-vascular bundles hard, difficult to work, dark colored; color, light brown; specific gravity, 0.4404; ash, 7.66; impervious to the attacks of the teredo, and very durable under water; largely used for piles, wharves, etc.

405.—Washingtonia filifera, Wendland,

Bot. Zeit. xxxvii, 68.—Watson, Bot. California, ii, 211, 485.

Brahea dulcis, Cooper in Smithsonian Rep. 1860, 442 [not Martius].

Pritchardia filamentosa, Wendland [illegible] xxxiv, 807.—Vasey, Cat. Forest Trees, 38.—Fenzi in Bull Soc. Tosc. Ort. i, 116 & f.—Palmer in Am. Nat.

Brahea filamentosa, Hort.—Williams in London [illegible] Chronicle, 1876, 80.

FAN-LEAF PALM.

San Bernardino county, California, from the eastern base of the San Bernardino mountains to the valley of the Colorado river.

A tree 12 to 18 meters in height, with a trunk 0.60 to 1.05 meter in diameter, forming groves of 250 to 500 plants in the depressions of the desert, in moist alkaline soil, or solitary and scattered near the heads of small ravines formed by water-courses; often stunted and greatly injured by fire.

Wood light, soft; fibro-vascular bundles hard, difficult to cut, dark colored, conspicuous; specific gravity 0.5173; ash, 1.89.

406.—Thrinax parviflora, Swartz,

Prodr. 57; Fl. Ind. Occ. i, 614.—Aiton, Hort. Kew. iii, 614; 2 ed. ii, 307.—Willdenow, Spec. ii, 202.—Persoon, Syn. i, 383.—Poiret in Lamarck, Dict. vii, 633.—Titford, Hort. Bot. Am. 112.—Sprengel, Syst. ii, 20.—Rœmer & Schultes, Syst. vii, 1300.—Martius, Hist. Palm. iii, 255, t. 103.—Kunth, Enum. iii, 253.—Dietrich, Syn. ii, 1091.—Walpers, Ann. v, 818.—Grisebach, Fl. British West Indies, 515.—Vasey, Cat. Forest Trees, 38.—Chapman in Coulter's Bot. Gazette, iii, 12; Fl. S. States, Suppl. 651.

T. Garberi, Chapman in Coulter's Bot. Gazette, iii, 12; Fl. S. States, Suppl. 651.

SILK-TOP PALMETTO.

Semi-tropical Florida, southern keys from Bahia Honda to Long's Key; in the West Indies.

A small tree, 9 meters in height with a trunk rarely exceeding 0.10 meter in diameter, or in pine-barren soil often low and stemless (*T. Garberi*).

Wood light, soft; fibro-vascular bundles small, hard, not conspicuous; color, light brown; specific gravity, 0.5991; ash, 3.99; the trunk used in making sponge- and turtle-crawls.

407.—Thrinax argentea, Loddiges;

Desfontaines, Cat. 3 ed. 31.—Rœmer & Schultes, Syst. vii, 1300.—Martius, Hist. Palm. iii, 256, t. 103, f. 3, t. 163.—Kunth, Enum. iii, 253.—Dietrich, Syn. ii, 1091.—Walpers, Ann. v, 818.—Grisebach, Fl. British West Indies, 515.—Chapman, Fl. S. States, Suppl. 651.

Palma argentea, Jacquin, Fragm. 38, No. 125, t. 43, f. 1.—Märter in Bom. Physik. Arbeiten. ii, 76.

SILVER-TOP PALMETTO. BRICKLEY THATCH. BRITTLE THATCH.

Semi-tropical Florida, on a nameless key 10 miles west of Key West, Elliott's Key, Key Largo, Piney Key, Boca Chica Key, Key West, Gordon Key, and on the small keys south and west of Bahia Honda Key (*Curtiss*); in the West Indies.

A small tree, 7 to 9 meters in height, with a trunk 0.15 to 0.20 meter in diameter.

Wood light, soft; fibro-vascular bundles small, very numerous; interior of the trunk spongy, much lighter than the exterior; specific gravity, 0.7172; ash, 3.01; used for piles, the foliage in the manufacture of ropes, for thatch, etc.

408.—Oreodoxa regia, HBK.

Nov. Genera & Spec. i, 305.—Martius, Hist. Palm. iii, 168, t. 156, f. 3-5.—Richard, Fl. Cuba, 348.—Kunth, Enum. iii, 182.—Spach, Hist. Veg. xii, 68.—Ill. Hort. ii, 28 & t.—Walpers, Ann. v, 807.—Grisebach, Fl. British West Indies, 327.—London Gard. Chronicle, 1875, 302, f. 66.—Chapman, Fl. S. States, Suppl. 651.

Œnocarpus regia, Sprengel, Syst. ii, 140.

O. oleracea, ? Cooper in Smithsonian Rep. 1860, 440.

ROYAL PALM.

Semi-tropical Florida, "Little and Big Palm hummocks," 15 and 25 miles east of cape Romano (*Curtiss*), near the mouth of Little river, and on Elliott's Key; in the West Indies.

A tree 18 to 30 meters in height, with a trunk 0.60 meter in diameter; rich hummocks, often forming extensive groves; in Florida rare and local.

Wood heavy, hard; fibro-vascular bundles large, very dark, conspicuous; interior of the trunk spongy, much lighter than the exterior; color, brown; specific gravity, exterior of the trunk, 0.7032; interior, 0.2128; ash, 2.54.

LILIACEÆ.

409.—Yucca canaliculata, Hooker,

Bot. Mag. t. 5201.—Baker in London Gard. Chronicle, 1870, 1217.—Engelmann in Trans. St. Louis Acad. iii, 43.

Y. Treculiana, Carrière in Rev. Hort. vii, 280.—Baker in London Gard. Chronicle, 1870, 828.—Engelmann in Trans. St. Louis Acad. iii, 41.—Vasey, Cat. Forest Trees, 38.—London Garden, xii, 328, t. 94.

SPANISH BAYONET.

Southern Texas, Matagorda bay, and from the Brazos and Guadalupe rivers south into Mexico.

A small tree, 5 to 8 meters in height, with a trunk 0.30 to 0.75 meter in diameter; dry, gravelly, arid soil.

Wood, like that of the whole genus, showing distinct marks of concentric arrangement, fibrous, spongy, heavy, difficult to cut and work; color, light brown; specific gravity, 0.6677; ash, 6.27.

The bitter, sweetish fruit cooked and eaten by the Mexicans; the root stock, as in the whole genus, saponaceous and largely used by the Mexicans as a substitute for soap.

410.—Yucca brevifolia, Engelmann,

King's Rep. v, 496; Trans. St. Louis Acad. iii, 47.—Parry in Am. Nat. ix, 141, 351.—Vasey, Cat. Forest Trees, 38.—Watson, Bot. California, ii, 164.

Y. Draconis, ? var. *arborescens*, Torrey in Pacific R. R. Rep. iv, 147.

THE JOSHUA. JOSHUA TREE.

Southwestern Utah, northwestern Arizona to southern Nevada, and the valley of the Mohave river, California.

A tree 6 to 12 meters in height, with a trunk 0.60 to 0.90 meter in diameter; dry, gravelly soil, forming upon the Mohave desert at 2,500 feet elevation an open, straggling forest.

Wood light, soft, spongy, difficult to work; color, very light brown or nearly white; specific gravity, 0.3737; ash, 4.00; occasionally manufactured into paper-pulp.

411.—Yucca elata, Engelmann,

Coulter's Bot. Gazette, vii, 17.

Y. angustifolia, var. *radiosa*, Engelmann in King's Rep. v, 496.

Y. angustifolia, var. *elata*, Engelmann in Trans. St. Louis Acad. iii, 50; Wheeler's Rep. vi, 270.

SPANISH BAYONET.

Western Texas to southern Arizona and Utah; southward into Mexico.

A small tree, 3 to 5 meters in height, with a trunk 0.20 to 0.25 meter in diameter; dry, gravelly *mesas*.

Wood light, soft, spongy; color, light brown or yellow; specific gravity, 0.4470; ash, 9.28.

412.—Yucca baccata, Torrey,

Bot. Mex. Boundary Survey, 221; Ives' Rep. 29.—Coopor in Smithsonian Rep. 1858, 266.—Baker in London Gard. Chronicle, 1870, 923.—André in Ill. Hort. 3 ser. xx, 23, t. 115.—Gray, Hall's Pl. Texas, 23.—Engelmann in Trans. St. Louis Acad. iii, 44; King's Rep. v, 496; Wheeler's Rep. vi, 270.—Loew in Wheeler's Rep. iii, 609.—Rothrock in Wheeler's Rep. vi, 52.—Watson, Bot. California, ii, 164.

Y. filamentosa, ? Wood in Proc. Philadelphia Acad. 1868, 167 [not Torrey].

SPANISH BAYONET. MEXICAN BANANA.

Western Texas, south of latitude 32° N., west through New Mexico to southern Colorado and San Diego county, California; southward into northern Mexico.

A tree 7 to 12 meters in height, with a trunk 0.60 meter in diameter, or often much smaller, and toward the northern limits of its range stemless; forming upon the plains of Presidio county, Texas, extensive open forests (*Havard*).

Wood light, soft, spongy, difficult to work; color, light brown; specific gravity, 0.4470; ash, 9.28.

The large juicy fruit edible and an important article of food to Mexicans and Indians; a strong coarse fiber, prepared by macerating the leaves in water, is manufactured into rope by the Mexicans.

INDEX TO CATALOGUE.

[NOTE.—In this index the names of families are indicated by "SMALL CAPS", of species by "Roman" type, and of synonyms by "*Italics*".]

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PART II.

THE WOODS OF THE UNITED STATES.

THE WOODS OF THE UNITED STATES.

A critical examination of the wood produced by the indigenous trees of North America, exclusive of Mexico, has been made in connection with the investigation of the forest wealth of the United States.

Mr. S. P. Sharples, special agent in charge of this department of the investigation, has had general direction of such experiments, and suggested the methods adopted for their execution.

The object of this examination has been to determine, first, the fuel value of the woods of the United States; second, the value as material for construction of the wood of the principal timber trees of the country. The results thus obtained are highly suggestive; they must not, however, be considered conclusive, but rather valuable as indicating what lines of research should be followed in a more thorough study of this subject.

The fuel value has been obtained by a determination of the specific gravity and the ash of the absolutely dry wood, supplemented by a determination of the actual chemical composition of the wood of some of the most important trees; the value of our woods for construction has been obtained by experiments made with the United States testing-machine at the Watertown arsenal. Each specimen as received was at once numbered, and this number, designated in the following tables as "Office number", was carefully repeated on every fragment cut from the original tree, and always refers to the same specimen. In a few cases in the early part of the work a sub-number was used to designate a specimen from another tree of the same species received from the same collector. In most cases the specimens were taken from the butt-cut of the tree, and unless it is otherwise mentioned in the remarks, were free from sap and knots; they may be regarded as representing the best wood that could be obtained from the tree.

The specimens used in the different series of experiments are deposited in the National Museum at Washington and in the museum of the Arboretum of Harvard College. It was found necessary, in order to secure proper material upon which to carry out the various experiments, to obtain a much larger amount of wood of the different species than was actually consumed in the experiments. This surplus material has been worked into 12,961 museum specimens, of convenient size, showing as far as possible the bark, sap-, and heart-wood of each species. These have been made into sixty sets, more or less complete, and distributed to the following educational institutions in the United States and Europe:

Institute of Technology, Boston, Massachusetts.
United States Military Academy, West Point, New York.
Academy of Natural Science, Philadelphia, Pennsylvania.
United States Naval Academy, Annapolis, Maryland.
Sheffield Scientific School, New Haven, Connecticut.
School of Mines, Columbia College, New York, New York.
National School of Forestry, Nancy, France.
Museum of Science and Art, Edinburgh, Scotland.
Agricultural Museum, Rome, Italy.
Brown University, Providence, Rhode Island.
Rensselaer Polytechnic Institute, Troy, New York.
Lawrence Scientific School, Cambridge, Massachusetts.
Iowa Agricultural College, Ames, Iowa.
Administration of National Forests, Lisbon, Portugal.
National Forest Administration, Paris, France.
McGill University, Montreal, Canada.
Royal Botanic Gardens, Sydney, New South Wales.
State Agricultural College, Lansing, Michigan.

Peabody Academy of Science, Salem, Massachusetts.
Arkansas Industrial University, Fayetteville, Arkansas.
Imperial Botanic Gardens, St. Petersburg, Russia.
American Society of Civil Engineers, New York, New York.
Portland Society of Natural History, Portland, Maine.
New Jersey Agricultural College, New Brunswick, New Jersey.
State Agricultural College, Burlington, Vermont.
State Agricultural College, College Station, Maryland.
Union College Engineering School, Schenectady, New York.
Cornell University, Ithaca, New York.
Hampton Agricultural and Normal Institute, Hampton, Virginia.
Pennsylvania State College, State College, Pennsylvania.
Ohio State University, Columbus, Ohio.
Agricultural College of Missouri, Columbia, Missouri.
University of Wisconsin, Madison, Wisconsin.
State Agricultural and Mechanical College, Auburn, Alabama.
University of Minnesota, Minneapolis, Minnesota.
North Carolina Agricultural College, Chapel Hill, North Carolina.
West Virginia University, Morgantown, West Virginia.
State Agricultural College, Orono, Maine.
Georgia Agricultural College, Athens, Georgia.
Massachusetts Agricultural College, Amherst, Massachusetts.
Tennessee Agricultural College, Knoxville, Tennessee.
New Hampshire College of Agriculture, Hanover, New Hampshire.
Illinois Industrial University, Champaign, Illinois.
State Agricultural College, Corvallis, Oregon.
State Agricultural College, Manhattan, Kansas.
Agricultural College of Mississippi, Starkville, Mississippi.
Kentucky Agricultural College, Lexington, Kentucky.
Claflin University, Orangeville, South Carolina.
Purdue University, Lafayette, Indiana.
Botanic Garden, Königsberg, Germany.
Engineer's office, Water-works, Boston, Massachusetts.
Franklin Society, Providence, Rhode Island.
Madison University, Hamilton, New York.
Rochester University, Rochester, New York.
Colby Academy, New London, New Hampshire.

SPECIFIC GRAVITY AND ASH.

The specific gravity and the ash of every tree of the United States have been determined (Table I) by Mr. Sharples, with the exception of the following: *Clusia flava*, once detected upon the keys of southern Florida, but not rediscovered; *Gordonia pubescens*, a rare and local species discovered in the last century upon the banks of the Altamaha river of Georgia and never rediscovered; *Pistacia Mexicana* and *Acacia Berlandieri*, economically unimportant species of the valley of the lower Rio Grande; *Cratægus berberifolia*, a little known species of the Red River valley; *Cupressus Macnabiana*, a rare and local species of California of little economic importance, and *Larix Lyallii*, a rare and local species of the northern Rocky mountains.

At least two determinations of specific gravity have been made for each species studied, and, in the case of woods of commercial importance, specimens were taken from many trees growing in widely different parts of the country, and under different conditions of soil and climate.

The specimens used for specific gravity determinations were made 100 millimeters long and about 35 millimeters square, and were dried at 100° centigrade until they ceased to lose weight. The specific gravity was then obtained by measurement with micrometer calipers and calculation from the weights of the blocks.

Two determinations of ash were made from each specimen studied by burning small, dried blocks in a muffle furnace at a low temperature.

An average of the specific gravity and of the ash of all the specimens taken from the same tree was made, and the average of these averages is given as the final result for the species; equal weight is thus given to each tree in the calculations without regard to the number of specimens representing it.

In the following table the trees of the United States are arranged in the order of the weight of the dry wood:

Catalogue number.	Species.	Relative specific gravity.	Catalogue number.	Species.	Relative specific gravity.	Catalogue number.	Species.	Relative specific gravity.
43	Condalia ferrea	1.3020	163	Guettarda elliptica	0.8337	402	Larix occidentalis	0.7407
44	Condalia obovata	1.1999	159	Viburnum prunifolium	0.8332	273	Quercus coccinea	0.7405
140	Rhizophora Mangle	1.1617	26	Ptelia trifoliata	0.8319	87	Gleditschia monosperma	0.7342
20	Guaiacum sanctum	1.1432	119	Pyrus rivularis	0.8316	77	Robinia Pseudacacia	0.7333
114	Vauquelinia Torreyi	1.1374	257	Quercus lyrata	0.8313	276	Quercus nigra	0.7324
147	Eugenia longipes	1.1235	292	Ostrya Virginica	0.8284	158	Viburnum Lentago	0.7303
21	Purliera angustifolia	1.1101	270	Quercus agrifolia	0.8253	278	Quercus Catesbæi	0.7294
220	Sebastiania lucida	1.0905	244	Carya tomentosa	0.8218	178	Bumelia tenax	0.7293
183	Mimusops Sieberi	1.0838	245	Carya porcina	0.8217	130	Cratægus cordata	0.7293
115	Cercocarpus ledifolius	1.0731	49	Colubrina reclinata	0.8208	228	Celtis occidentalis	0.7287
42	Reynesia latifolia	1.0715	106	Prunus umbellata	0.8202	293	Carpinus Caroliniana	0.7286
80	Olneya Tesota	1.0602	151	Cornus florida	0.8153	31	Swietenia Mahogoni	0.7282
30	Amyris sylvatica	1.0459	54	Sapindus marginatus	0.8126	228	Celtis occidentalis, *var.* reticulata	0.7275
162	Genipa clusiæfolia	1.0316	201	Osmanthus Americanus	0.8111	35	Ilex Cassine	0.7270
176	Sideroxylon Mastichodendron	1.0109	243	Carya sulcata	0.8108	225	Ulmus racemosa	0.7263
264	Quercus grisea	1.0092	78	Robinia viscosa	0.8094	222	Ulmus crassifolia	0.7245
141	Conocarpus erecta	0.9900	204	Bourreria Havanensis	0.8073	280	Quercus aquatica	0.7244
12	Canella alba	0.9893	259	Quercus Michauxii	0.8039	103	Prunus Americana	0.7215
83	Sophora secundiflora	0.9842	79	Robinia Neo-Mexicana	0.8034	126	Cratægus Crus-galli	0.7194
213	Coccoloba Floridana	0.9835	247	Carya myristicæformis	0.8016	196	Fraxinus quadrangulata	0.7184
113	Prunus ilicifolia	0.9803	284	Quercus hypoleuca	0.8009	241	Carya olivæformis	0.7180
214	Coccoloba uvifera	0.9635	182	Bumelia cuneata	0.7959	407	Thrinax argentea	0.7172
56	Hypelate paniculata	0.9533	128	Cratægus subvillosa	0.7953	170	Kalmia latifolia	0.7160
266	Quercus Durandii	0.9507	372	Pinus serotina	0.7942	132	Cratægus spathulata	0.7159
267	Quercus virens	0.9501	73	Rhus Metopium	0.7917	16	Fremontia Californica	0.7142
265	Quercus reticulata	0.9479	184	Diospyros Virginiana	0.7908	142	Laguncularia racemosa	0.7137
148	Eugenia procera	0.9453	189	Fraxinus Greggii	0.7904	338	Juniperus occidentalis, *var.* monosperma	0.7118
263	Quercus oblongifolia	0.9441	109	Prunus Capuli	0.7879	194	Fraxinus viridis	0.7117
97	Acacia Wrightii	0.9392	271	Quercus Wislizeni	0.7855	202	Cordia Sebestena	0.7108
116	Cercocarpus parvifolius	0.9365	137	Amelanchier Canadensis	0.7838	167	Arbutus Xalapensis	0.7099
144	Eugenia buxifolia	0.9360	135	Cratægus flava	0.7809	166	Arbutus Menziesii	0.7052
175	Chrysophyllum oliviforme	0.9360	41	Schæfferia frutescens	0.7745	117	Pyrus coronaria	0.7048
219	Drypetes crocea, *var.* latifolia	0.9346	234	Maclura aurantiaca	0.7736	274	Quercus tinctoria	0.7045
136	Heteromeles arbutifolia	0.9326	233	Morus microphylla	0.7715	380	Pinus palustris	0.6999
177	Dipholis salicifolia	0.9316	102	Chrysobalanus Icaco	0.7709	11	Capparis Jamaicensis	0.6971
160	Exostemma Caribæum	0.9310	122	Cratægus rivularis	0.7703	223	Ulmus fulva	0.6956
269	Quercus Emoryi	0.9263	216	Nectandra Willdenoviana	0.7693	110	Prunus demissa	0.6951
95	Leucæna glauca	0.9235	135	Cratægus flava, *var.* pubescens	0.7683	123	Cratægus Douglasii	0.6950
219	Drypetes crocea	0.9209	281	Quercus laurifolia	0.7673	174	Jacquinia armillaris	0.6948
32	Ximenia Americana	0.9196	258	Quercus bicolor	0.7662	279	Quercus palustris	0.6938
146	Eugenia monticola	0.9156	93	Prosopis juliflora	0.7652	85	Gymnocladus Canadensis	0.6934
211	Avicennia nitida	0.9138	192	Fraxinus Americana, *var.* Texensis	0.7636	277	Quercus falcata	0.6928
57	Hypelate trifoliata	0.9102	129	Cratægus tomentosa	0.7633	64	Acer saccharinum, *var.* nigrum	0.6915
272	Quercus rubra, *var.* Texana	0.9080	299	Betula lenta	0.7617	64	Acer saccharinum	0.6912
101	Pithecolobium Unguis-cati	0.9049	164	Vaccinium arboreum	0.7610	338	Juniperus occidentalis, *var.* conjugens	0.6907
40	Myginda pallens	0.9048	94	Prosopis pubescens	0.7609	63	Acer grandidentatum	0.6902
24	Xanthoxylum Caribæum	0.9002	246	Carya amara	0.7552	118	Pyrus angustifolia	0.6895
112	Prunus sphærocarpa	0.8998	285	Quercus imbricaria	0.7529	27	Canotia holocantha	0.6885
143	Calyptranthes Chytraculia	0.8992	92	Cercis reniformis	0.7513	104	Prunus angustifolia	0.6884
145	Eugenia dichotoma	0.8983	381	Pinus Cubensis	0.7504	291	Fagus ferruginea	0.6883
262	Quercus Douglasii	0.8928	168	Arbutus Texana	0.7500	138	Hamamelis Virginica	0.6856
75	Eysenhardtia orthocarpa	0.8740	165	Andromeda ferruginea	0.7500	282	Quercus heterophylla	0.6834
81	Piscidia Erythrina	0.8734	260	Quercus Prinus	0.7499	287	Quercus densiflora	0.6827
210	Citharexylum villosum	0.8710	226	Ulmus alata	0.7491	191	Fraxinus pistaciæfolia	0.6810
111	Prunus Caroliniana	0.8688	152	Cornus Nuttallii	0.7481	124	Cratægus brachyacantha	0.6793
127	Cratægus coccinea	0.8618	286	Quercus Phellos	0.7472	203	Cordia Boissieri	0.6790
261	Quercus prinoides	0.8605	251	Quercus alba	0.7470	37	Cyrilla racemiflora	0.6784
173	Ardisia Pickeringia	0.8602	181	Bumelia lycioides	0.7467	397	Abies bracteata	0.6783
98	Acacia Greggii	0.8550	169	Oxydendrum arboreum	0.7458	86	Gleditschia triacanthos	0.6740
84	Sophora affinis	0.8509	131	Cratægus apiifolia	0.7453	96	Leucaena pulverulenta	0.6732
268	Quercus chrysolepis	0.8493	253	Quercus Garryana	0.7449	250	Myrica Californica	0.6703
185	Diospyros Texana	0.8460	256	Quercus macrocarpa	0.7453	150	Cornus alternifolia	0.6696
255	Quercus undulata, *var.* Gambelii	0.8407	89	Parkinsonia microphylla	0.7453	409	Yucca canaliculata	0.6677
242	Carya alba	0.8372	25	Xanthoxylum Pterota	0.7444	61	Acer circinatum	0.6660
55	Sapindus Saponaria	0.8367	36	Ilex decidua	0.7420	180	Bumelia spinosa	0.6603
254	Quercus obtusiloba	0.8367	252	Quercus lobata	0.7409	190	Fraxinus anomala	0.6597
172	Myrsine Rapanea	0.8341	248	Carya aquatica	0.7407	39	Euonymus atropurpureus	0.6592

Catalogue number.	Species.	Relative specific gravity.
134	Cratægus æstivalis	0.6564
240	Juglans rupestris	0.6554
297	Betula lutea	0.6553
179	Bumelia lanuginosa	0.6544
192	Fraxinus Americana	0.6543
272	Quercus rubra	0.6540
88	Parkinsonia Torreyana	0.6531
212	Pisonia obtusata	0.6529
218	Umbellularia Californica	0.6517
354	Pinus cembroides	0.6512
224	Ulmus Americana	0.6506
125	Cratægus arborescens	0.6491
205	Ehretia elliptica	0.6440
275	Quercus Kelloggii	0.6435
215	Persea Carolinensis	0.6429
69	Rhus cotinoides	0.6425
283	Quercus cinerea	0.6420
100	Lysiloma latisiliqua	0.6418
230	Ficus brevifolia	0.6398
215	Persea Carolinensis, *var.* palustris	0.6396
343	Taxus brevifolia	0.6391
355	Pinus edulis	0.6388
200	Chionanthus Virginica	0.6372
91	Cercis Canadensis	0.6363
1	Magnolia grandiflora	0.6360
154	Nyssa sylvatica	0.6356
199	Forestiera acuminata	0.6345
344	Taxus Floridana	0.6340
53	Ungnadia speciosa	0.6332
209	Crescentia cucurbitina	0.0319
198	Fraxinus sambucifolia	0.6318
171	Rhododendron maximum	0.6303
356	Juniperus Californica	0.6282
82	Cladrastis tinctoria	0.6278
332	Cupressus macrocarpa	0.6261
193	Fraxinus pubescens	0.6251
38	Cliftonia ligustrina	0.6249
401	Larix Americana	0.6236
66	Acer rubrum	0.6178
90	Parkinsonia aculeata	0.0116
239	Juglans nigra	0.6115
377	Pinus mitis	0.6104
315	Salix cordata, *var.* vestita	0.6069
408	Oreodoxa regia	0.6034
296	Betula occidentalis	0.6030
62	Acer glabrum	0.6028
46	Rhamnus Californica	0.6000
400	Thrinax parviflora	0.5991
23	Xanthoxylum Clava-Herculis, *var.* fruticosum.	0.5967
295	Betula papyrifera	0.5955
121	Pyrus sambucifolia	0.5928
139	Liquidambar Styraciflua	0.5909
208	Chilopsis saligna	0.5902
232	Morus rubra	0.5898
19	Byrsonima lucida	0.5888
289	Castanea pumila	0.5887
34	Ilex Dahoon, *var.* myrtifolia	0.5873
337	Juniperus pachyphlœa	0.5829
108	Prunus serotina	0.5822
33	Ilex opaca	0.5818
364	Pinus contorta	0.5815
194	Fraxinus viridis, *var.* Berlandieriana	0.5780
221	Hippomane Mancinella	0.5772
338	Juniperus occidentalis	0.5765
293	Betula nigra	0.5762
294	Betula alba, *var.* populifolia	0.5760
48	Ceanothus thyrsiflorus	0.5750
197	Fraxinus Oregana	0.5731

Catalogue number.	Species.	Relative specific gravity.
187	Halesia diptera	0.5705
235	Platanus occidentalis	0.5678
353	Pinus Parryana	0.5675
47	Rhamnus Purshiana	0.5672
356	Pinus monophylla	0.6058
22	Xanthoxylum Americanum	0.5654
249	Myrica cerifera	0.5637
188	Halesia tetraptera	0.5628
310	Salix lasiolepis	0.5587
374	Pinus clausa	0.5576
288	Castanopsis chrysophylla	0.5574
357	Pinus Balfouriana, *var.* aristata	0.5572
70	Dalea spinosa	0.5536
336	Juniperus Californica, *var.* Utahensis	0.5522
45	Rhamnus Caroliniana	0.5462
66	Acer rubrum, *var.* Drummondii	0.5459
363	Pinus Chihuahuana	0.5457
120	Pyrus Americana	0.5451
370	Pinus Tæda	0.5441
357	Pinus Balfouriana	0.5434
313	Salix flavescens, *var.* Scouleriana	0.5412
161	Pinckneya pubens	0.5350
314	Salix Hookeriana	0.5350
310	Salix longifolia, *var.* exigua	0.5342
59	Acer spicatum	0.5330
186	Symplocos tinctoria	0.5325
5	Magnolia macrophylla	0.5300
373	Pinus inops	0.5309
58	Acer Pennsylvanicum	0.5299
227	Planera aquatica	0.5294
71	Rhus copallina	0.5273
65	Acer dasycarpum	0.5269
302	Pinus Jeffreyi	0.5206
155	Nyssa uniflora	0.5194
71	Rhus copallina, *var.* lanceolata	0.5184
389	Tsuga Mertensiana	0.5182
405	Washingtonia filifera	0.5173
391	Pseudotsuga Douglasii	0.5157
371	Pinus rigida	0.5151
345	Torreya taxifolia	0.5145
156	Sambucus glauca	0.5087
317	Salix Sitchensis	0.5072
23	Xanthoxylum Clava-Herculis	0.5056
10	Anona laurifolia	0.5053
217	Sassafras officinale	0.5042
360	Pinus Arizonica	0.5038
2	Magnolia glauca	0.5035
105	Prunus Pennsylvanica	0.5023
7	Magnolia Fraseri	0.5003
300	Alnus maritima	0.4996
52	Æsculus Californica	0.4980
313	Salix flavescens	0.4969
376	Pinus muricata	0.4942
375	Pinus pungens	0.4935
310	Salix longifolia	0.4930
339	Juniperus Virginiana	0.4926
325	Populus Fremontii	0.4914
60	Acer macrophyllum	0.4909
236	Platanus racemosa	0.4880
359	Pinus Torreyana	0.4879
352	Pinus reflexa	0.4877
308	Salix lævigata	0.4872
358	Pinus resinosa	0.4854
335	Cupressus Guadalupensis	0.4843
366	Pinus Sabiniana	0.4840
68	Negundo Californicum	0.4821
301	Alnus rubra	0.4813
34	Ilex Dahoon	0.4806
330	Chamæcyparis Nutkaensis	0.4782

Catalogue number.	Species.	Relative specific gravity.
379	Pinus Banksiana	0.4701
346	Torreya Californica	0.4760
309	Salix lasiandra	0.4756
231	Ficus pedunculata	0.4739
237	Platanus Wrightii	0.4736
14	Gordonia Lasianthus	0.4728
361	Pinus ponderosa	0.4715
400	Abies magnifica	0.4701
3	Magnolia acuminata	0.4000
333	Cupressus Goveniana	0.4689
304	Alnus serrulata	0.4666
319	Populus grandidentata	0.4632
325	Populus Fremontii, *var.* Wislizenii	0.4621
331	Chamæcyparis Lawsoniana	0.4621
157	Sambucus Mexicana	0.4614
153	Nyssa capitata	0.4613
305	Alnus incana	0.4607
309	Salix lasiandra, *var.* Fendleriana	0.4598
382	Picea nigra	0.4584
368	Pinus insignis	0.4574
391	Pseudotsuga Douglasii, *var.* macrocarpa.	0.4563
399	Abies nobilis	0.4561
309	Salix lasiandra, *var.* lancifolia	0.4547
340	Taxodium distichum	0.4543
50	Æsculus glabra	0.4542
17	Tilia Americana	0.4525
200	Castanea vulgaris, *var.* Americana	0.4504
107	Prunus emarginata	0.4502
307	Salix amygdaloides	0.4502
6	Magnolia Umbrella	0.4487
206	Catalpa bignonioides	0.4474
411	Yucca elata	0.4470
306	Salix nigra	0.4456
390	Tsuga Pattoniana	0.4454
404	Sabal Palmetto	0.4404
311	Salix sessilifolia	0.4397
72	Rhus venenata	0.4382
350	Pinus flexilis	0.4358
70	Rhus typhina	0.4357
67	Negundo aceroides	0.4328
386	Picea Sitchensis	0.4287
388	Tsuga Caroliniana	0.4275
51	Æsculus flava	0.4274
312	Salix discolor	0.4261
18	Tilia heterophylla	0.4253
387	Tsuga Canadensis	0.4239
8	Liriodendron Tulipifera	0.4230
398	Abies amabilis	0.4228
342	Sequoia sempervirens	0.4208
207	Catalpa speciosa	0.4165
351	Pinus albicaulis	0.4165
321	Populus balsamifera, *var.* candicans	0.4161
4	Magnolia cordata	0.4139
28	Simaruba glauca	0.4136
367	Pinus Coulteri	0.4133
302	Alnus rhombifolia	0.4127
365	Pinus Murrayana	0.4096
320	Populus heterophylla	0.4089
238	Juglans cinerea	0.4086
17	Tilia Americana, *var.* pubescens	0.4074
383	Picea alba	0.4051
318	Populus tremuloides	0.4032
326	Libocedrus decurrens	0.4017
303	Alnus oblongifolia	0.3981
9	Asimina triloba	0.3969
378	Pinus glabra	0.3931
322	Populus angustifolia	0.3912
348	Pinus monticola	0.3908

Catalogue number.	Species.	Relative specific gravity.	Catalogue number.	Species.	Relative specific gravity.	Catalogue number.	Species.	Relative specific gravity.
324	Populus monilifera	0.3839	396	Abies concolor	0.3638	329	Chamæcyparis sphæroidea	0.3322
347	Pinus Strobus	0.3854	321	Populus balsamifera	0.3635	149	Cereus giganteus	0.3188
393	Abies balsamea	0.3819	392	Abies Fraseri	0.3565	327	Thuya occidentalis	0.3164
323	Populus trichocarpa	0.3814	395	Abies grandis	0.3545	29	Bursera gummifera	0.3003
328	Thuya gigantea	0.3796	195	Fraxinus platycarpa	0.3541	341	Sequoia gigantea	0.2882
385	Picea pungens	0.3740	369	Pinus tuberculata	0.3499	412	Yucca baccata	0.2724
410	Yucca brevifolia	0.3737	394	Abies subalpina	0.3476	229	Ficus aurea	0.2616
349	Pinus Lambertiana	0.3684	384	Picea Engelmanni	0.3449			

It will be noticed that all species in which the wood is heavier than water belong to the semi-tropical region of Florida or to the arid Mexican and interior Pacific regions. There seems to be a certain, but by no means constant relation, as shown in this table, between aridity of climate and the weight of the wood produced by closely allied species or by individuals of the same species. The wood of the form of *Quercus rubra* peculiar to western Texas is nearly 39 per cent. heavier than the average of all the specimens of the typical species grown in the northern states. Among the white oaks the wood of species belonging to regions of little rainfall, *Quercus grisea*, *oblongifolia*, *Durandii*, and *Douglasii*, is heavier than that of allied species peculiar to regions more favorable for the growth of trees. The average of two specimens of *Quercus prinoides* grown in western Texas is 19 per cent. heavier than the average of all the other specimens of this species grown in other parts of the country. In *Fraxinus*, the wood of *F. Greggii* of the Rio Grande valley is heavier than that of any other species; it only just surpasses in weight, however, the wood of the western Texas form of *F. Americana*, which is 20 per cent. heavier than the average of all specimens of the typical species grown north of Texas. On the other hand, the wood of Texas forms of *Fraxinus viridis* is constantly lighter than that of northern specimens, and the wood of *Celtis* grown in Arizona is lighter than that of the average of all the other specimens of this species. In *Juglans*, the heaviest wood is that of *J. rupestris*, a species belonging to a region of little rainfall, and a specimen of *J. nigra* from western Texas is 33 per cent. heavier than the average of all specimens grown in the Mississippi basin. In the case of *Platanus*, the heaviest wood is that of the Atlantic species, but wood of the species peculiar to the comparatively moist climate of southwestern Arizona is, however, considerably lighter than that of the drier climate of southern California.

FUEL VALUE.

The relative fuel values are obtained by deducting the percentage of ash from the specific gravity, and are based on the hypothesis that the real value of the combustible material in all woods is the same.

A number of analyses was also made of the wood of several of the principal trees of the United States (Table II) and their absolute fuel value calculated. Mr. Sharples describes the methods adopted by him to obtain these results, as follows:

The carbon and hydrogen determinations were made by the ordinary processes of organic analysis, by burning the wood in a current of oxygen. The moisture was determined by drying the wood at 100° centigrade until its weight became sensibly constant. The calculations were then made on the dry wood. The results contain a slight constant error, arising from the fact that the nitrogen in the wood was not determined. This error is, however, very slight, the nitrogen, which is included in the percentage of oxygen, rarely amounting, in any wood, to one per cent. The column headed "Hydrogen combined with oxygen", is found by dividing the amount in the column headed "Oxygen" by eight, and represents the hydrogen that may be considered as already combined with oxygen in the form of water, and is therefore useless for fuel. The fuel value per kilogram is found by multiplying the percentage of carbon by 8,080, and that of excess of hydrogen by 34,462 (these being the values obtained by *Favre* and *Silberman*), adding these together and deducting from the sum the product of the total hydrogen multiplied by 4,833, which represents the heat required to evaporate the water produced by burning the hydrogen. The constants used above represent the number of kilograms of water raised one degree centigrade, by burning one kilogram of carbon or hydrogen. The fuel value per cubic decimeter is found by multiplying the value per kilogram by the specific gravity. It need hardly be said that this fuel value is rarely attained in practice, and that it is never utilized. There are too many sources of loss; the calculation supposes that the combustion is perfect, that no smoke is given off, and that the heat of the products of combustion, with the exception of that necessary to convert the water into vapor, is all utilized.

It appears from Mr. Sharples' experiments that resinous woods give upward of 12 per cent. more heat from equal weights burned than non-resinous woods; the heat produced by burning a kilogram of dry non-resinous wood being about 4,000 units, while the heat produced by burning a kilogram of dry resinous wood is about 4,500 units, a unit being the quantity of heat required to raise 1 kilogram of water 1 degree centigrade.

Count Rumford first propounded the theory that the value of equal weights of wood for fuel was the same without reference to specific distinctions; that is, that a pound of wood, whatever the variety, would always produce the same amount of heat (*Count Rumford's Works*, Boston, 1873, vol. ii). Marcus Bull, experimenting in 1826 upon the fuel value of different woods (*Trans. Am. Phil. Soc.*, new ser., iii, 1), found a variation of only 11 per cent. between the different species tested. Rumford's theory must be regarded as nearly correct, if woods are separated into resinous and non-resinous classes. The specific gravity gives a direct means of comparing heat values of equal volumes of wood of different resinous and non-resinous species. In burning wood, however, various circumstances affect its value; few fire-places are constructed to fully utilize the fuel value of resinous wood, and carbon escapes unconsumed in the form of smoke. Pine, therefore, which, although capable of yielding more heat than oak or hickory, may in practice yield considerably less, the pine losing both carbon and hydrogen in the form of smoke, while hickory or oak, burning with a smokeless flame, is practically entirely consumed. The ash in a wood, being non-combustible, influences its fuel value in proportion to its amount. The state of dryness of wood also has much influence upon its fuel value, though to a less degree than is generally supposed. The water in green wood prevents its rapid combustion, evaporation reducing the temperature below the point of ignition. Green wood may often contain as much as 50 per cent. of water, and this water must evaporate during combustion; but as half a kilogram of ordinary wood will give 2,000 units of heat, while half a kilogram of water requires only 268.5 units to evaporate it, 1731.5 units remain available for generating heat in wood containing even a maximum amount of water. In cases where the pressure was perpendicular to the grain of the wood it was applied on the side of the specimen nearest to the heart of the tree.

A factor in the general value of wood as fuel is the ease with which it can be seasoned; beech, for example, a very dense wood of high fuel value when dried, is generally considered of little value as fuel, on account of the rapidity with which it decays when cut and the consequent loss of carbon by decomposition.

THE STRENGTH OF WOOD.

The specimens tested for the purpose of determining the strength of the wood produced by the different trees of the United States were cut, with few exceptions, before March, 1881, and were slowly and carefully seasoned.

Those used in determining the resistance to transverse strain were made 4 centimeters square and long enough to give the necessary bearing upon the supports. These were shod with flat iron plates, slightly rounded on the edges and were set exactly 1 meter apart; they remained perfectly rigid under the pressure applied. Each specimen was weighed, measured, and its specific gravity calculated before it was tested. The result thus obtained represents the specific gravity of the air-dried wood.

To eliminate the action of their weight the specimens were placed upright, and hydraulic pressure was applied by means of an iron rod 12 millimeters in radius, acting midway between the supports, the deflections being read at this point.

The direction of the grain of the wood is shown by diagrams in the table (Table III), the pressure acting upon it horizontally from the left.

The pressure was applied slowly and uniformly, a reading of the deflections being taken for every 50 kilograms. When a load of 200 kilograms had been applied it was removed and the set read. Pressure was again applied in the same way, and the readings of deflections were resumed when 200 kilograms was again reached.

The formula used in calculating the coefficient of elasticity was $E = \frac{P\,l^3}{4 \triangle b d^3}$; l, b, d, being taken in millimeters; that of the modulus of rupture, $R = \frac{3\,P\,l}{2\,b\,d^2}$, l, b, d being in centimeters, P, in both formulas, in kilograms.

A few experiments were also made in the same manner, for purposes of comparison, to determine the transverse strength of specimens 1 meter long between the bearings and 8 centimeters square (Table IV).

The specimens tested by longitudinal compression were 4 centimeters square and 32 centimeters (8 diameters) long. They were placed between the platforms of the machine, and pressure was gradually applied until they failed. The figures given represent the number of kilograms required to cause failure.

The specimens tested under pressure applied perpendicularly to the fibers were 4 centimeters square and 16 centimeters long. They were placed upon the platform of the machine and indented with an iron punch 4 centimeters square on its face, covering the entire width of the specimen and one-quarter of its length at the center. In this series of experiments the direction of the annual rings was noted, horizontal pressure being also applied from the left. Readings were taken of the pressure necessary to produce each successive indentation of 0.254 up to 2.54 millimeters, and in the case of specimens which did not fail with this pressure a further test was made of the weight required to produce indentations of 3.81 and 5.08. The remarks (Table V) upon the behavior of the wood of the different species under compression were furnished by Mr. James E. Howard, in charge of the testing machine.

COMPARATIVE VALUES.

In the following table the number standing opposite each species represents its relative value in the column in which it appears.

This table is purely an arbitrary one, since the introduction of one or more species would of course change the value of all species standing lower in value, or results based on an examination of a larger number of specimens of any species may change the relative numbers in regard to it very considerably. In other words, any twenty or thirty species bearing consecutive numbers may change places with each other. This arises partly from the want of uniformity of the wood of any species, and partly from the fact that where so many determinations fall between comparatively narrow limits the mere order of sequence must be largely accidental.

TABLE OF RELATIVE VALUES.

Catalogue number.	Species.	Approximate fuel value.	Elasticity.	Ultimate transverse strength.	Ultimate resistance to longitudinal crushing.	Resistance to indentation to 1.27 millimeters.
	MAGNOLIACEÆ.					
1	Magnolia grandiflora	145	133	135	115	124
2	Magnolia glauca	205	127	163	173	234
3	Magnolia acuminata	230	122	201	189	226
4	Magnolia cordata	265	119	236	191	248
5	Magnolia macrophylla	189	41	184	104	247
6	Magnolia Umbrella	249	207	245	234	257
7	Magnolia Fraseri	207	114	179	182	202
8	Liriodendron Tulipifera	259	124	208	229	262
	ANONACEÆ.					
9	Asimina triloba	277	281	293	298	285
10	Anona laurifolia	220	278	234	277	198
	CANELLACEÆ.					
12	Canella alba	11	56	50	6	5
	TERNSTRŒMIACEÆ.					
14	Gordonia Lasianthus	228	187	201	214	240
	TILIACEÆ.					
17	Tilia Americana	246	161	241	240	290
17	Tilia Americana, *var.* pubescens	272	183	256	195	298
18	Tilia heterophylla	257	158	248	202	263
	MALPIGHIACEÆ.					
19	Byrsonima lucida	169	272	288	206	100
	ZYGOPHYLLACEÆ.					
20	Guaiacum sanctum	3	147	137	10	1
	RUTACEÆ.					
23	Xanthoxylum Clava-Herculis	204	217	219	148	165
24	Xanthoxylum Caribæum	27	143	150	15	18
	SIMARUBEÆ.					
28	Simaruba glauca	268	121	252	171	251
	BURSERACEÆ.					
29	Bursera gummifera	298	292	300	300	300
30	Amyris sylvatica	5	65	2	9	6
	MELIACEÆ.					
31	Swietenia Mahogoni	96	71	56	20	36
	ILICINEÆ.					
33	Ilex opaca	167	244	188	180	149
34	Ilex Dahoon	224	246	250	252	214
	CYRILLACEÆ.					
38	Cliftonia ligustrina	152	191	262	231	177
	RHAMNACEÆ.					
42	Reynosia latifolia	6	74	116	3	4
43	Condalia ferrea	1	45	85	5	3
45	Rhamnus Caroliniana	184	208	251	154	187
47	Rhamnus Purshiana	175	129	152	28	131
	SAPINDACEÆ.					
50	Æsculus glabra	245	243	271	273	282
52	Æsculus Californica	208	232	222	246	220
54	Sapindus marginatus	47	165	112	122	58
60	Acer macrophyllum	213	194	190	223	159
61	Acer circinatum	126	221	147	136	119
64	Acer saccharinum	117	9	18	30	73
64	Acer saccharinum, *var.* nigrum	118	88	68	57	66
65	Acer dasycarpum	192	59	53	113	145
66	Acer rubrum	154	117	121	133	151
67	Negundo aceroides	256	260	263	270	215
68	Negundo Californicum	221	113	132	155	221

Catalogue number.	Species.	Approximate fuel value.	Elasticity.	Ultimate transverse strength.	Ultimate resistance to longitudinal crushing.	Resistance to indentation to 1.27 millimeters.
	ANACARDIACEÆ.					
71	Rhus copallina	193	210	205	227	216
73	Rhus Metopium	59	74	208	73	109
	LEGUMINOSÆ.					
77	Robinia Pseudacacia	87	19	3	12	71
79	Robinia Neo-Mexicana	51	43	81	16	52
80	Olneya Tesota	7	143	153	235	2
81	Piscidia Erythrina	35	154	151	34	24
82	Cladrastris tinctoria	150	95	88	71	141
84	Sophora affinis	34	102	121	48	27
85	Gymnocladus Canadensis	114	77	144	200	163
86	Gleditschia triacanthos	124	64	77	93	156
87	Gleditschia monosperma	88	40	49	41	53
88	Parkinsonia Torreyana	134	264	259	184	90
91	Cercis Canadensis	146	228	165	123	142
93	Prosopis juliflora	69	259	273	40	26
94	Prosopis pubescens	67	172	91	18	28
	ROSACEÆ.					
103	Prunus Americana	97	161	103	39	104
104	Prunus angustifolia	119	253	276	197	190
107	Prunus emarginata	248	149	194	124	266
108	Prunus serotina	164	153	115	61	114
110	Prunus demissa	112	199	186	84	76
111	Prunus Caroliniana	29	120	76	50	32
113	Prunus ilicifolia	10	212	138	63	39
117	Pyrus coronaria	109	245	273	181	74
121	Pyrus sambucifolia	165	248	284	220	225
125	Cratægus arborescens	135	189	228	95	140
126	Cratægus Crus-galli	100	240	210	169	107
128	Cratægus subvillosa	52	135	162	68	63
129	Cratægus tomentosa	65	213	177	153	80
132	Cratægus spathulata	102	237	268	139	99
134	Cratægus æstivalis	128	256	176	152	94
135	Cratægus flava	61	225	167	76	31
137	Amelanchier Canadensis	57	34	24	19	48
	HAMAMELACEÆ.					
139	Liquidambar Styraciflua	162	167	214	128	192
	RHIZOPHORACEÆ.					
140	Rhizophora Mangle	2	2	10	2	8
	COMBRETACEÆ.					
141	Conocarpus erecta	9	89	72	32	19
142	Laguncularia racemosa	108	219	264	147	174
	MYRTACEÆ.					
144	Eugenia buxifolia	18	0	38	1	20
146	Eugenia monticola	24	65	15	55	12
148	Eugenia procera	19	38	14	17	9
	CORNACEÆ.					
151	Cornus florida	44	176	85	09	40
152	Cornus Nuttallii	74	85	60	22	77
153	Nyssa capitata	235	234	194	167	169
154	Nyssa sylvatica	141	178	112	125	127
155	Nyssa uniflora	195	275	210	237	161
	CAPRIFOLIACEÆ.					
150	Sambucus glauca	206	299	295	287	184
159	Viburnum prunifolium	38	131	69	37	35
	RUBIACEÆ.					
160	Exostemma Caribæum	15	30	55	8	7
161	Pinckneya pubens	187	231	201	289	230

TABLE OF RELATIVE VALUES—Continued.

Catalogue number.	Species.	Approximate fuel value.	Elasticity.	Ultimate transverse strength.	Ultimate resistance to longitudinal crushing.	Resistance to indentation to 1.27 millimeters.
	ERICACEÆ.					
165	Andromeda ferruginea	72	179	194	107	92
166	Arbutus Menziesii	167	164	81	89	110
167	Arbutus Xalapensis	104	251	230	198	75
169	Oxydendrum arboreum	78	137	164	90	95
170	Kalmia latifolia	161	258	219	168	65
171	Rhododendron maximum	148	242	205	156	133
	SAPOTACEÆ.					
175	Chrysophyllum oliviforme	17	54	107	33	15
176	Sideroxylon Mastichodendron	12	61	67	23	25
177	Dipholis salicifolia	16	16	18	11	49
178	Bumelia tenax	60	204	200	143	146
179	Bumelia lanuginosa	133	286	294	239	162
181	Bumelia lycioides	81	193	254	106	97
182	Bumelia cuneata	56	252	265	117	47
183	Mimusops Sieberi	4	95	79	135	16
	EBENACEÆ.					
184	Diospyros Virginiana	55	162	98	88	29
	STYRACACEÆ.					
186	Symplocos tinctoria	190	256	230	218	139
187	Halesia diptera	172	229	107	166	123
	OLEACEÆ.					
191	Fraxinus pistaciæfolia	122	254	226	217	168
192	Fraxinus Americana	130	91	106	121	153
192	Fraxinus Americana, *var.* Texensis	66	69	27	65	121
193	Fraxinus pubescens	151	182	101	162	113
194	Fraxinus viridis	105	133	91	114	98
195	Fraxinus platycarpa	291	283	261	296	185
196	Fraxinus quadrangulata	73	196	121	94	111
197	Fraxinus Oregana	171	156	203	80	157
198	Fraxinus sambucifolia – nigra (Ch List)	149	142	125	175	130
199	Forestiera acuminata	147	227	175	193	154
201	Osmanthus Americanus	45	28	40	51	64
	BORRAGINACEÆ.					
204	Bourreria Havanensis	53	97	71	45	43
205	Ehretia elliptica	142	296	169	215	87
	BIGNONIACEÆ.					
206	Catalpa bignonioides	250	233	241	238	273
207	Catalpa speciosa	263	175	224	194	254
208	Chilopsis saligna	161	267	247	278	181
	VERBENACEÆ.					
210	Citharexylum villosum	28	26	73	13	37
	NYCTAGINACEÆ.					
212	Pisonia obtusata	157	284	290	274	218
	POLYGONACEÆ.					
213	Coccoloba Floridana	14	49	78	7	13
	LAURACEÆ.					
215	Persea Carolinensis	138	162	88	47	128
215	Persea Carolinensis, *var.* palustris	140	162	110	232	132
217	Sassafras officinale	202	273	235	221	188
218	Umbellularia Californica	131	70	127	49	126
	EUPHORBIACEÆ.					
210	Drypetes crocea	30	79	132	24	23
210	Drypetes crocea, *var.* latifolia	25	108	178	79	13
	URTICACEÆ.					
222	Ulmus crassifolia	99	226	142	142	68
223	Ulmus fulva	111	110	101	66	172
224	Ulmus Americana	136	205	110	146	138
225	Ulmus racemosa	93	62	36	38	112
226	Ulmus alata	86	273	167	158	67
227	Planera aquatica	191	266	228	203	179
228	Celtis occidentalis	94	229	135	178	161
228	Celtis occidentalis, *var.* reticulata	98	143	127	160	56
229	Ficus aurea	300	360	298	299	296
231	Ficus pedunculata	244	292	260	284	267
232	Morus rubra	163	173	141	179	148
234	Maclura aurantiaca	63	114	25	4	22
	PLATANACEÆ.					
235	Platanus occidentalis	173	146	222	144	158
236	Platanus racemosa	218	240	254	269	245
237	Platanus Wrightii	231	286	285	267	211
	JUGLANDACEÆ.					
238	Juglans cinerea	276	181	238	265	244
239	Juglans nigra	155	63	109	46	126
240	Juglans rupestris	132	218	236	159	143
241	Carya olivæformis Hicoria Pecan	163	239	246	164	84
242	Carya alba H. ovata	36	12	11	27	60
243	Carya sulcata H. laciniosa	46	78	33	52	45
244	Carya tomentosa H. alba	43	42	26	36	51
245	Carya porcina H. glabra	42	92	31	43	41
246	Carya amara H. minima	71	86	30	78	78
247	Carya myristicæformis H. myrist.	49	8	1	25	34
248	Carya aquatica H. aquatica	86	93	90	110	55
	MYRICACEÆ.					
249	Myrica cerifera	177	137	119	151	182
250	Myrica Californica	125	99	46	74	135
	CUPULIFERÆ.					
251	Quercus alba	76	104	85	82	105
252	Quercus lobata	85	222	163	172	136
253	Quercus Garryana	79	183	99	07	79
254	Quercus obtusiloba	37	169	106	108	54
255	Quercus undulata, *var.* Gambelii	32	262	194	186	69
256	Quercus macrocarpa	82	122	65	103	82
257	Quercus lyrata	30	17	50	160	72
258	Quercus bicolor	60	131	81	102	96
259	Quercus Michauxii	48	106	28	112	83
260	Quercus Prinus	75	27	48	67	86
261	Quercus prinoides	31	53	6	44	61
262	Quercus Douglasii	26	197	57	53	17
263	Quercus oblongifolia	20	156	175	165	10
264	Quercus grisea	8	269	73	116	21
266	Quercus Durandii	21	165	57	76	38
267	Quercus virens	13	49	54	59	30
268	Quercus chrysolepis	33	33	4	62	33
269	Quercus Emoryi	22	247	186	176	11
270	Quercus agrifolia	41	116	75	131	81
271	Quercus Wislizeni	58	148	118	72	57
272	Quercus rubra	129	48	63	83	150
272	Quercus rubra, *var.* Texana	23	83	52	42	44
273	Quercus coccinea	84	65	38	87	116
274	Quercus tinctoria	166	81	44	92	115
275	Quercus Kelloggii	137	206	145	149	152
276	Quercus nigra	89	102	43	98	46
277	Quercus falcata	113	11	12	35	117
278	Quercus Catesbæi	91	80	42	137	88
279	Quercus palustris	115	55	32	161	134
280	Quercus aquatica	95	29	40	91	122
281	Quercus laurifolia	62	25	13	77	70

TABLE OF RELATIVE VALUES—Continued.

Catalogue number.	Species.	Approximate fuel value.	Elasticity.	Ultimate transverse strength.	Ultimate resistance to longitudinal crushing.	Resistance to indentation to 1.27 millimeters.
282	Quercus heterophylla	121	30	35	190	144
283	Quercus cinerea	144	203	57	150	118
284	Quercus hypoleuca	54	114	29	279	59
285	Quercus imbricaria	68	37	8	56	89
286	Quercus Phellos	77	190	63	211	102
287	Quercus densiflora	123	106	70	119	93
288	Castanopsis chrysophylla	180	94	158	163	206
289	Castanea pumila	160	46	60	99	209
290	Castanea vulgaris, *var.* Americana	247	152	184	222	227
291	Fagus ferruginea	120	32	18	120	125
292	Ostrya Virginica	40	15	23	64	85
293	Carpinus Caroliniana	92	43	18	96	103
	BETULACEÆ.					
294	Betula alba, *var.* populifolia	168	214	140	254	196
295	Betula papyrifera	159	18	37	109	195
296	Betula occidentalis	158	126	127	207	171
297	Betula lutea	127	3	5	29	160
298	Betula nigra	170	58	66	157	103
299	Betula lenta	64	10	9	31	91
301	Alnus rubra	222	72	121	188	210
302	Alnus rhombifolia	267	158	190	244	268
303	Alnus oblongifolia	276	199	189	285	279
	SALICACEÆ.					
307	Salix amygdaloides	251	277	257	291	264
308	Salix lævigata	216	280	217	272	208
309	Salix lasiandra, *var.* lancifolia	243	141	199	257	249
309	Salix lasiandra, *var.* Fendleriana	236	298	276	281	261
313	Salix flavescens	209	65	125	192	241
313	Salix flavescens, *var.* Scouleriana	186	22	81	120	199
316	Salix lasiolepis	181	137	120	216	183
318	Populus tremuloides	275	180	198	266	265
319	Populus grandidentata	234	108	169	243	295
320	Populus heterophylla	271	220	218	283	250
321	Populus balsamifera	268	150	257	271	276
321	Populus balsamifera, *var.* candicans	264	215	232	286	291
322	Populus angustifolia	280	284	292	296	274
323	Populus trichocarpa	285	57	204	209	293
324	Populus monilifera	281	98	145	249	258
325	Populus Fremontii	214	73	183	225	252
325	Populus Fremontii, *var.* Wislizeni	238	160	186	230	239
	CONIFERÆ.					
326	Libocedrus decurrens	274	157	190	130	242
327	Thuya occidentalis	297	271	267	275	297
328	Thuya gigantea	284	81	154	145	264
329	Chamæcyparis sphæroidea	296	291	281	294	287
330	Chamæcyparis Nutkaensis	223	87	130	138	236
331	Chamæcyparis Lawsoniana	233	31	93	129	259
333	Cupressus Goveniana	232	279	260	242	147
338	Juniperus occidentalis, *var.* conjugens	116	211	276	75	50
339	Juniperus Virginiana	212	238	158	177	176
340	Taxodium distichum	242	84	190	174	280
341	Sequoia gigantea	299	287	280	213	286
342	Sequoia sempervirens	261	236	238	187	271
343	Taxus brevifolia	130	202	34	111	62
345	Torreya taxifolia	198	170	94	134	166
346	Torreya Californica	227	294	243	250	203
347	Pinus Strobus	282	154	225	212	278
348	Pinus monticola	279	112	232	263	288
349	Pinus Lambertiana	287	187	238	262	270
350	Pinus flexilis	253	235	227	251	219
351	Pinus albicaulis	262	276	244	265	224
352	Pinus reflexa	215	127	143	165	260
353	Pinus Parryana	174	297	287	258	129
355	Pinus edulis	143	291	283	253	100
356	Pinus monophylla	176	289	297	288	155
357	Pinus Balfouriana	185	255	288	260	178
357	Pinus Balfouriana, *var.* aristata	179	223	210	268	189
358	Pinus resinosa	217	51	131	140	256
359	Pinus Torreyana	200	270	149	272	180
360	Pinus Arizonica	203	174	210	204	217
361	Pinus ponderosa	226	140	171	226	222
362	Pinus Jeffreyi	201	125	156	185	212
363	Pinus Chihuahuana	182	216	114	259	170
364	Pinus contorta	166	4	60	54	175
365	Pinus Murrayana	269	198	253	264	253
366	Pinus Sabiniana	219	257	139	261	186
367	Pinus Coulteri	266	46	148	233	246
368	Pinus insignis	239	101	158	183	229
369	Pinus tuberculata	293	200	290	293	255
370	Pinus Tæda	183	52	95	170	223
371	Pinus rigida	197	261	158	245	191
372	Pinus serotina	50	39	17	86	42
373	Pinus inops	188	269	207	241	168
374	Pinus clausa	178	268	260	228	194
375	Pinus pungens	211	186	166	247	213
376	Pinus muricata	210	35	47	85	204
377	Pinus mitis	156	13	45	118	197
378	Pinus glabra	278	288	270	280	228
379	Pinus Banksiana	225	118	214	201	237
380	Pinus palustris	110	7	18	26	167
381	Pinus Cubensis	70	5	15	21	137
382	Picea nigra	237	60	156	193	272
383	Picea alba	273	90	155	256	283
384	Picea Engelmanni	295	185	249	292	275
385	Picea pungens	286	265	281	295	267
386	Picea Sitchensis	254	100	210	248	281
387	Tsuga Canadensis	258	135	171	219	260
388	Tsuga Caroliniana	255	224	270	196	211
389	Tsuga Mertensiana	194	13	80	60	235
390	Tsuga Pattoniana	252	195	171	224	232
391	Pseudotsuga Douglasii	196	20	96	81	238
391	Pseudotsuga Douglasii, *var.* macrocarpa	240	74	111	132	233
392	Abies Fraseri	290	104	219	255	289
393	Abies balsamea	283	177	265	236	277
394	Abies subalpina	294	201	275	276	204
395	Abies grandis	292	109	271	208	299
396	Abies concolor	289	130	180	210	269
398	Abies amabilis	260	24	134	127	292
399	Abies nobilis	241	21	105	141	205
400	Abies magnifica	229	241	182	161	243
401	Larix Americana	153	23	90	58	231
402	Larix occidentalis	83	1	7	14	173
	PALMACEÆ.					
405	Washingtonia filifera	199	263	285	297	164

The following table gives the figures from which the table of relative values was computed, and includes all species upon which complete tests have been made.

The coefficient of elasticity is derived from the second deflection, the measurements being taken in millimeters and the weight in kilograms.

The ultimate transverse strength is the force, applied at the middle of the stick, required to break a stick 4 centimeters square and 1 meter between the supports.

In the compression tests the surface exposed to pressure was 4 centimeters square. To give the pressure on a square centimeter these results must be divided by 16.

The indentation to 1.27 millimeters, or the fifth in the series, is the one selected for comparison.

TABLE OF AVERAGES.

Catalogue number.	Species.	Approximate relative fuel value.	Coefficient of elasticity, kilograms on millimeters.	Ultimate transverse strength, in kilograms.	Ultimate resistance to longitudinal crushing, in kilograms.	Resistance to indentation to 1.27 millimeters, in kilograms.
	MAGNOLIACEÆ.					
1	Magnolia grandiflora	63.20	903	338	7,705	3,156
2	Magnolia glauca	50.11	914	313	0,790	1,027
3	Magnolia acuminata	46.76	929	286	6,633	1,709
4	Magnolia cordata	41.20	941	250	6,552	1,427
5	Magnolia macrophylla	52.90	1,169	297	7,829	1,427
6	Magnolia Umbrella	44.78	744	249	5,861	1,343
7	Magnolia Fraseri	49.89	944	302	0,691	1,966
8	Liriodendron Tulipifera	42.20	926	280	5,955	1,206
	ANONACEÆ.					
9	Asimina triloba	39.61	482	167	3,395	1,098
10	Anona laurifolia	48.11	501	259	4,829	2,037
	CANELLACEÆ.					
12	Canella alba	97.20	1,117	438	12,519	9,163
	TERNSTRŒMIACEÆ.					
14	Gordonia Lasianthus	46.92	794	286	6,195	1,591
	TILIACEÆ.					
17	Tilia Americana	45.00	840	252	5,768	1,044
17	Tilia Americana, *var.* pubescens	40.47	811	239	6,487	950
18	Tilia heterophylla	42.27	846	246	6,307	1,296
	MALPIGHIACEÆ.					
19	Byrsonima lucida	57.43	525	181	6,260	3,475
	ZYGOPHYLLACEÆ.					
20	Guaiacum sanctum	113.38	863	336	11,780	12,689
	RUTACEÆ.					
23	Xanthoxylum Clava-Herculis	50.15	726	273	7,189	2,548
24	Xanthoxylum Caribæum	88.20	868	322	10,955	5,964
	SIMARUBEÆ.					
28	Simaruba glauca	40.08	932	241	6,816	1,383
	BURSERACEÆ.					
29	Bursera gummifera	29.41	417	63	2,473	749
30	Amyris sylvatica	103.97	1,085	557	11,075	8,795
	MELIACEÆ.					
31	Swietenia Mahogoni	72.03	1062	428	10,660	4,951
	ILICINEÆ.					
33	Ilex opaca	57.74	643	293	0,709	2,826
34	Ilex Dahoon	47.62	642	244	5,562	1,808
	CYRILLACEÆ.					
38	Cliftonia ligustrina	62.23	783	225	5,038	2,350
	RHAMNACEÆ.					
42	Reynosia latifolia	103.72	1,050	350	13,420	9,753
43	Condalia ferrea	119.38	1,143	386	12,848	10,388
45	Rhamnus Caroliniana	54.27	741	242	7,112	2,195
47	Rhamnus Purshiana	56.34	913	320	9,984	3,075
	SAPINDACEÆ.					
50	Æsculus glabra	45.03	644	211	5,017	1,132
52	Æsculus Californica	49.45	683	271	5,686	1,722
54	Sapindus marginatus	80.05	837	360	7,523	4,350
60	Acer macrophyllum	48.83	789	292	0,100	2,597
61	Acer circinatum	66.34	718	327	7,349	3,205
64	Acer saccharinum	68.75	1,465	490	9,907	4,019
64	Acer saccharinum, *var.* nigrum	68.66	1,027	410	8,808	4,149
65	Acer dasycarpum	52.52	1,110	435	7,711	2,899
66	Acer rubrum	61.65	943	346	7,402	2,795
67	Negundo aceroides	42.82	582	226	5,151	1,781
68	Negundo Californicum	47.95	945	340	7,072	1,719
	ANACARDIACEÆ.					
71	Rhus copallina	52.42	730	283	0,033	1,744
73	Rhus Metopium	77.28	1,050	280	8,523	3,348
	LEGUMINOSÆ.					
77	Robinia Pseudacacia	72.96	1,301	543	11,272	4,038
79	Robinia Neo-Mexicana	79.86	1,149	388	10,931	4,427
80	Olneya Tesota	103.59	868	320	5,851	10,478
81	Piscidia Erythrina	84.39	851	321	0,548	5,698
82	Cladrastis tinctoria	62.61	1,002	385	8,550	2,037
84	Sophora affinis	84.46	977	346	0,129	5,348
85	Gymnocladus Canadensis	68.88	1,048	329	6,406	2,560
86	Gleditschia triacanthos	66.86	1,086	394	8,001	2,697
87	Gleditschia monosperma	72.89	1,170	439	9,344	4,420
88	Parkinsonia Torreyana	64.58	558	233	6,679	3,820
91	Cercis Canadensis	63.16	688	310	7,510	2,917
93	Prosopis juliflora	74.86	583	207	9,412	5,484
94	Prosopis pubescens	75.37	824	382	10,732	5,267
	ROSACEÆ.					
103	Prunus Americana	72.02	827	369	9,419	3,405
104	Prunus angustifolia	68.65	603	260	8,441	2,132
107	Prunus emarginata, *var.* mollis	44.93	801	200	7,507	1,280
108	Prunus serotina	58.14	852	354	8,746	3,269
110	Prunus demissa	60.16	769	295	8,165	3,937
111	Prunus Caroliniana	86.52	937	396	8,989	5,090
113	Prunus ilicifolia	97.27	732	334	8,709	4,888
117	Pyrus coronaria	70.11	642	207	6,706	3,999
121	Pyrus sambucifolia	58.08	626	190	6,123	1,715
125	Cratægus arborescens	64.55	788	265	7,969	2,951
126	Cratægus Crus-galli	71.54	664	279	6,884	3,368
128	Cratægus subvillosa	78.98	901	315	8,612	4,207
129	Cratægus tomentosa	75.96	732	303	7,117	3,844
132	Cratægus spathulata	71.12	673	216	7,280	3,484
134	Cratægus æstivalis	65.27	592	304	7,122	3,583
135	Cratægus flava, *var.* pubescens	76.13	708	309	8,437	5,103
137	Amelanchier Canadensis	77.95	1,197	483	10,712	4,483
	HAMAMELACEÆ.					
139	Liquidambar Styraciflua	58.73	837	278	7,462	2,122

TABLE OF AVERAGES—Continued.

Catalogue number.	Species.	Approximate relative fuel value.	Coefficient of elasticity, kilograms on millimeters.	Ultimate transverse strength, in kilograms.	Ultimate resistance to longitudinal crushing, in kilograms.	Resistance to indentation to 1.27 millimeters, in kilograms.
	RHIZOPHORACEÆ.					
140	Rhizophora Mangle	114. 06	1, 656	515	13, 767	7, 394
	COMBRETACEÆ.					
141	Conocarpus erecta	98. 68	1, 025	402	9, 593	5, 926
142	Laguncularia racemosa	70. 21	724	221	7, 190	2, 386
	MYRTACEÆ.					
144	Eugenia buxifolia	92. 20	1, 575	450	14, 198	5, 851
146	Eugenia monticola	89. 83	1, 095	500	8, 845	6, 532
148	Eugenia procera	92. 05	1, 191	502	10, 750	7, 099
	CORNACEÆ.					
151	Cornus florida	80. 98	821	386	8, 553	4, 875
152	Cornus Nuttallii	74. 44	1, 031	423	10, 603	3, 883
153	Nyssa capitata	45. 97	681	290	6, 895	2, 484
154	Nyssa sylvatica	63. 66	818	360	7, 497	3, 131
155	Nyssa uniflora	51. 58	518	279	5, 848	2, 575
	CAPRIFOLIACEÆ.					
158	Sambucus glauca	50. 07	305	158	4, 400	2, 218
159	Viburnum prunifolium	82. 89	907	406	9, 474	5, 009
	RUBIACEÆ.					
160	Exostemma Caribæum	92. 89	1, 194	429	12, 020	7, 707
161	Pinckneya pubens	53. 28	683	173	4, 355	1, 678
	ERICACEÆ.					
165	Andromeda ferruginea	74. 66	814	290	7, 802	3, 611
166	Arbutus Menziesii	70. 24	838	387	8, 034	3, 322
167	Arbutus Xalapensis	70. 81	610	264	6, 419	3, 947
169	Oxydendrum arboreum	74. 30	889	311	8, 025	3, 550
170	Kalmia latifolia	71. 81	585	273	6, 890	4, 196
171	Rhododendron maximum	62. 80	646	283	7, 020	3, 066
	SAPOTACEÆ.					
175	Chrysophyllum oliviforme	92. 44	1, 124	366	9, 571	6, 108
176	Sideroxylon Mastichodendron	95. 89	1, 099	414	10, 410	5, 682
177	Dipholis salicifolia	92. 86	1, 336	490	11, 680	4, 480
178	Bumelia tenax	72. 89	751	287	7, 235	2, 894
179	Bumelia lanuginosa	64. 64	483	165	5, 798	2, 564
181	Bumelia lycioides	74. 07	781	240	7, 825	3, 529
182	Bumelia cuneata	78. 08	603	220	7, 643	4, 581
183	Mimusops Sieberi	105. 55	1, 002	390	7, 360	6, 091
	EBENACEÆ.					
184	Diospyros Virginiana	76. 32	782	375	8, 045	5, 192
	STYRACEÆ.					
186	Symplocos tinctoria	52. 88	622	264	6, 146	2, 967
187	Halesia diptera	56. 81	683	366	6, 940	3, 153
	OLEACEÆ.					
191	Fraxinus pistaciæfolia	67. 68	601	266	6, 158	3, 368
192	Fraxinus Americana	85. 16	1, 015	367	7, 535	2, 745
192	Fraxinus Americana, *var.* Texensis	75. 83	1, 062	480	8, 664	3, 177
193	Fraxinus pubescens	62. 35	812	371	6, 960	3, 272
194	Fraxinus viridis	70. 71	903	382	7, 711	3, 521
195	Fraxinus platycarpa	35. 16	476	229	4, 014	2, 209
196	Fraxinus quadrangulata	74. 50	774	346	7, 980	3, 322
197	Fraxinus Oregana	57. 12	848	284	8, 320	2, 653
198	Fraxinus sambucifolia	62. 72	872	345	6, 766	3, 106
199	Forestiera acuminata	63. 00	703	306	6, 416	2, 717
201	Osmanthus Americanus	80. 74	1, 231	449	8, 966	4, 206
	BORRAGINACEÆ.					
204	Bourreria Havanensis	78. 48	996	403	9, 107	4, 702
205	Ehretia elliptica	63. 56	397	308	6, 192	3, 063

Catalogue number.	Species.	Approximate relative fuel value.	Coefficient of elasticity, kilograms on millimeters.	Ultimate transverse strength, in kilograms.	Ultimate resistance to longitudinal crushing, in kilograms.	Resistance to indentation to 1.27 millimeters, in kilograms.
	BIGNONIACEÆ.					
206	Catalpa bignonioides	44. 57	682	252	5, 821	1, 230
207	Catalpa speciosa	41. 48	822	270	6, 521	1, 377
208	Chilopsis saligna	58. 79	544	247	4, 753	2, 304
	VERBENACEÆ.					
210	Citharexylum villosum	86. 75	1, 257	400	11, 034	4, 927
	NYCTAGINACEÆ.					
212	Pisonia obtusata	60. 31	465	127	4, 962	1, 737
	POLYGONACEÆ.					
213	Coccoloba Floridana	93. 40	1, 136	392	12, 337	6, 310
	LAURACEÆ.					
215	Persea Carolinensis	63. 81	839	385	9, 173	3, 128
215	Persea Carolinensis, *var.* palustris	63. 73	849	350	5, 874	3, 073
217	Sassafras officinale	50. 38	519	257	6, 110	2, 144
218	Umbellularia Californica	64. 82	1, 068	344	9, 095	3, 196
	EUPHORBIACEÆ.					
219	Drypetes crocea	86. 44	1, 039	340	10, 410	5, 797
219	Drypetes crocea, *var.* latifolia	88.65	836	302	8, 324	6, 510
	URTICACEÆ.					
222	Ulmus crassifolia	71. 59	704	330	7, 248	4, 080
223	Ulmus fulva	69. 77	953	371	6, 628	2, 399
224	Ulmus Americana	64. 54	747	364	7, 191	2, 970
225	Ulmus racemosa	72. 20	1, 096	455	9, 474	3, 281
226	Ulmus alata	74. 17	523	309	7, 001	4, 095
227	Planera aquatica	52. 71	552	265	6, 305	2, 334
228	Celtis occidentalis	72. 08	685	337	6, 739	3, 472
228	Celtis occidentalis, *var.* reticulata	71. 86	868	344	6, 985	4, 373
229	Ficus aurea	24. 84	257	102	2, 597	980
231	Ficus pedunculata	45. 07	407	98	4, 491	1, 905
232	Morus rubra	58. 56	824	331	6, 721	2, 805
234	Maclura aurantiaca	76. 01	944	483	12, 939	5, 806
	PLATANACEÆ.					
235	Platanus occidentalis	56. 52	864	271	7, 207	2, 645
236	Platanus racemosa	48. 26	624	240	5, 190	1, 486
237	Platanus Wrightii	46. 72	457	183	5, 228	1, 867
	JUGLANDACEÆ.					
238	Juglans cinerea	40. 66	812	255	6, 270	1, 488
239	Juglans nigra	60. 91	1, 092	365	9, 178	3, 140
240	Juglans rupestris	64. 89	727	256	6, 997	2, 909
241	Carya olivæformis	70. 99	666	247	6, 951	3, 714
242	Carya alba	83. 11	1, 390	512	10, 007	4, 344
243	Carya sulcata	80. 35	1, 039	464	8, 939	4, 609
244	Carya tomentosa	81. 29	1, 150	482	9, 485	4, 429
245	Carya porcina	81. 36	1, 014	466	9, 232	4, 822
246	Carya amara	74. 74	1, 030	470	8, 357	3, 878
247	Carya myristicæformis	79. 31	1, 465	595	10, 206	5, 042
248	Carya aquatica	73. 13	1, 013	376	7, 776	4, 397
	MYRICACEÆ.					
249	Myrica cerifera	56. 08	888	348	7, 122	2, 804
250	Myrica Californica	66. 81	992	442	8, 516	3, 017
	CUPULIFERÆ.					
251	Quercus alba	74. 39	971	386	8, 183	3, 388
252	Quercus lobata	73. 87	717	309	6, 793	3, 014
253	Quercus Garryana	74. 24	811	375	7, 957	3, 846
254	Quercus obtusiloba	83. 01	833	372	7, 790	4, 415
255	Quercus undulata, *var.* Gambelii	85. 38	571	200	6, 668	4, 072
256	Quercus macrocarpa	74. 06	929	419	7, 843	3, 730
257	Quercus lyrata	82. 59	1, 334	436	7, 864	4, 033
258	Quercus bicolor	76. 18	906	388	7, 850	3, 534

TABLE OF AVERAGES—Continued.

Catalogue number.	Species.	Approximate relative fuel value.	Coefficient of elasticity, kilograms on millimeters.	Ultimate transverse strength, in kilograms.	Ultimate resistance to longitudinal crushing, in kilograms.	Resistance to indentation to 1.27 millimeters, in kilograms.
259	Quercus Michauxii	80.03	964	477	7,715	3,725
260	Quercus Prinus	74.42	1,255	440	8,615	3,686
261	Quercus prinoides	86.09	1,125	528	9,204	4,224
262	Quercus Douglasii	88.53	771	424	8,013	5,988
263	Quercus oblongifolia	97.60	857	307	6,941	7,031
264	Quercus grisea	99.10	740	400	7,666	5,829
266	Quercus Durandii	91.00	837	424	8,550	4,922
267	Quercus virens	93.93	1,136	434	8,748	5,185
268	Quercus chrysolepis	84.43	1,198	541	8,721	5,070
269	Quercus Emoryi	90.44	638	300	6,759	6,646
270	Quercus agrifolia	81.47	953	399	7,416	3,770
271	Quercus Wislizeni	77.75	861	349	8,527	4,362
272	Quercus rubra	65.28	1,137	422	8,172	2,825
272	Quercus rubra, *var.* Texana	90.03	1,033	437	9,310	4,665
273	Quercus coccinea	73.91	1,065	450	8,074	3,224
274	Quercus tinctoria	70.10	1,034	444	8,012	3,243
275	Quercus Kelloggii	64.18	745	328	7,184	2,783
276	Quercus nigra	72.39	977	445	7,954	4,582
277	Quercus falcata	69.11	1,402	509	9,532	3,223
278	Quercus Catesbæi	72.31	1,035	447	7,316	3,646
279	Quercus palustris	68.82	1,123	465	7,862	3,040
280	Quercus aquatica	72.07	1,227	440	8,023	3,169
281	Quercus laurifolia	76.10	1,259	564	8,424	4,056
282	Quercus heterophylla	68.22	1,225	458	6,600	2,908
283	Quercus cinerea	63.47	751	424	7,167	3,221
284	Quercus hypoleuca	78.41	944	475	4,095	4,348
285	Quercus imbricaria	74.97	1,193	520	8,839	3,623
286	Quercus Phellos	74.35	784	422	6,230	3,452
287	Quercus densiflora	67.25	964	404	7,609	3,593
288	Castanopsis chrysophylla	55.55	1,012	316	6,959	1,912
289	Castanea pumila	58.80	1,141	423	7,923	1,887
290	Castanea vulgaris, *var.* Americana	44.95	856	297	6,106	1,698
291	Fagus ferruginea	68.48	1,210	490	7,550	3,145
292	Ostrya Virginica	82.42	1,373	484	8,669	3,696
293	Carpinus Caroliniana	72.26	1,149	490	7,969	3,405
	BETULACEÆ.					
294	Betula alba, *var.* populifolia	57.43	730	332	5,564	2,073
295	Betula papyrifera	59.40	1,306	454	7,781	2,083
296	Betula occidentalis	60.12	924	344	6,200	2,459
297	Betula lutea	65.34	1,618	533	9,907	2,581
298	Betula nigra	57.42	1,113	415	7,007	2,117
299	Betula lenta	75.97	1,432	519	9,907	3,615
301	Alnus rubra	47.93	1,060	346	6,644	1,870
302	Alnus rhombifolia	41.14	846	291	5,696	1,257
303	Alnus oblongifolia	39.65	769	293	4,452	1,189
	SALICACEÆ.					
307	Salix amygdaloides	44.68	501	235	4,224	1,294
308	Salix lævigata	48.44	488	275	5,114	1,894
309	Salix lasiandra, *var.* lancifolia	45.73	305	200	4,681	1,311
309	Salix lasiandra, *var.* Fendleriana	45.12	879	288	5,457	1,400
313	Salix flavescens	53.91	1,262	388	7,484	2,019
313	Salix flavescens, *var.* Scouleriana	40.39	1,085	345	6,532	1,581
316	Salix lasiolepis	55.32	888	347	6,169	2,241
318	Populus tremuloides	40.10	814	289	5,285	1,281
319	Populus grandidentata	46.11	963	308	5,727	994
320	Populus heterophylla	40.57	723	274	4,627	1,384
321	Populus balsamifera	36.11	867	235	5,126	1,202
321	Populus balsamifera, *var.* candicans.	41.42	730	260	4,418	1,030
322	Populus angustifolia	38.81	458	171	4,332	1 225
323	Populus trichocarpa	37.66	1,117	284	6,243	1,018
324	Populus monilifera	38.53	994	328	5,651	1,327
325	Populus Fremontii	46.77	1,051	298	6,055	1,382
325	Populus Fremontii, *var.* Wislizeni	45.60	843	295	5,950	1,607
	CONIFERÆ.					
326	Libocedrus decurrens	40.14	847	291	7,446	1,561
327	Thuya occidentalis	31.53	533	219	4,903	957
328	Thuya gigantea	37.90	1,034	319	7,197	1,114
329	Chamæcyparis sphæroidea	33.12	404	194	4,149	1,074
330	Chamæcyparis Nutkaensis	47.60	1,029	342	7,281	1,618
331	Chamæcyparis Lawsoniana	46.16	1,217	379	7,454	1,317
333	Cupressus Goveniana	46.68	499	230	5,742	2,852
338	Juniperus occidentalis, *var.* conjugens.	68.75	734	200	8,505	4,464
339	Juniperus Virginiana	49.11	670	316	6,750	2,376
340	Taxodium distichum	45.24	1,032	291	6,771	1,166
341	Sequoia gigantea	28.67	451	196	6,210	1,091
342	Sequoia sempervirens	42.02	676	255	6,656	1,242
343	Taxus brevifolia	63.78	761	460	7,734	4,223
345	Torreya taxifolia	51.08	821	378	7,364	2,523
346	Torreya Californica	46.96	401	249	5,625	1,962
347	Pinus Strobus	38.47	851	207	6,219	1,194
348	Pinus monticola	38.99	950	260	5,349	1,071
349	Pinus Lambertiana	36.76	794	255	5,382	1,244
350	Pinus flexilis	43.42	676	266	5,591	1,727
351	Pinus albicaulis	41.54	512	249	5,296	1,716
352	Pinus reflexa	48.05	913	329	7,825	2,002
353	Pinus Parryana	56.44	378	182	6,420	3,126
355	Pinus edulis	63.49	421	191	5,579	3,388
356	Pinus monophylla	56.20	435	123	4,389	2,713
357	Pinus Balfouriana	54.17	594	181	5,898	2,350
357	Pinus Balfouriana, *var.* aristata	55.60	715	270	5,209	2,140
358	Pinus resinosa	48.41	1,132	341	7,274	1,353
359	Pinus Torreyana	60.62	542	323	4,548	2,309
360	Pinus Arizonica	50.28	824	279	6,292	1,740
361	Pinus ponderosa	46.90	887	307	6,037	1,719
362	Pinus Jeffreyi	50.53	925	318	6,679	1,850
363	Pinus Chihuahuana	54.37	726	355	5,398	2,470
364	Pinus contorta	58.04	1,585	423	8,868	2,882
365	Pinus Murrayana	40.83	771	241	5,328	1,379
366	Pinus Sabiniana	48.18	585	333	6,387	2,202
367	Pinus Coulteri	41.18	1,141	325	5,874	1,475
368	Pinus insignis	45.60	979	316	6,680	1,087
369	Pinus tuberculata	84.88	429	175	4,207	1,372
370	Pinus Tæda	54.27	1,128	377	6,834	1,719
371	Pinus rigida	51.39	581	316	5,687	2,123
372	Pinus serotina	79.29	1,170	497	8,079	4,740
373	Pinus inops	52.93	543	281	5,765	2,496
374	Pinus clausa	55.09	543	214	6,028	2,100
375	Pinus pungens	49.22	803	310	5,670	1,842
376	Pinus muricata	49.29	1,194	441	8,142	1,950
377	Pinus mitis	60.86	1,375	443	7,628	2,064
378	Pinus glabra	39.13	448	212	4,604	1,694
379	Pinus Banksiana	47.60	942	278	6,329	1,609
380	Pinus palustris	69.82	1,488	490	10,074	2,508
381	Pinus Cubensis	74.83	1,577	500	10,626	2,985
382	Picea nigra	45.71	1,100	318	6,520	1,240
383	Picea alba	40.38	1,023	319	5,489	1,117
384	Picea Engelmanni	33.38	808	245	4,271	1,217
385	Picea pungens	37.26	553	194	4,128	1,267
386	Picea Sitchensis	42.80	990	277	5,653	1,160
387	Tsuga Canadensis	42.20	900	307	6,142	1,314
388	Tsuga Caroliniana	42.58	713	197	6,450	1,996
389	Tsuga Mertensiana	51.61	1,375	388	8,747	1,622

TABLE OF AVERAGES—Continued.

Catalogue number.	Species.	Approximate relative fuel value.	Coefficient of elasticity, kilograms on millimeters.	Ultimate transverse strength in kilograms.	Ultimate resistance to longitudinal crushing, in kilograms.	Resistance to indentation to 1.27 millimeters in kilograms.	Catalogue number.	Species.	Approximate relative fuel value.	Coefficient of elasticity, kilograms on millimeters.	Ultimate transverse strength in kilograms.	Ultimate resistance to longitudinal crushing in kilograms.	Resistance to indentation to 1.27 millimeters in kilograms.
390	Tsuga Pattoniana	44. 35	775	307	6, 074	1, 664	398	Abies amabilis	42. 18	1260	338	7, 480	1, 029
391	Pseudotsuga Douglasii	51. 53	1283	376	8, 280	1, 608	399	Abies nobilis	45. 46	1277	368	7, 256	1, 917
391	Pseudotsuga Douglasii, *var.* macrocarpa.	45. 59	1050	361	7, 405	1, 642	400	Abies magnifica	46. 87	662	299	6, 963	1, 545
							401	Larix Americana	62. 16	1261	384	8, 763	1, 675
392	Abies Fraseri	35. 46	972	273	5, 557	1, 048	402	Larix occidentalis	74. 00	1658	524	11, 023	2, 385
393	Abies balsamea	38. 02	819	220	5, 851	1, 202							
394	Abies subalpina	34. 61	762	202	4, 820	1, 015		PALMACEÆ.					
395	Abies grandis	35. 08	958	211	6, 255	810							
396	Abies concolor	36. 07	909	300	6, 237	1, 248	405	Washingtonia filifera	50. 75	563	183	3, 633	2, 550

The following table illustrates the relation between the specific gravity and the transverse strength of the wood of species upon which a sufficient number of tests has been made to render such a comparison valuable. The determinations of the specific gravity and transverse strength were, in every case, made upon the same specimen, at the same time. The table is arranged according to the specific gravity of the specimens.

It will be noticed that the strength of the different specimens closely but not invariably follows their specific gravity. An examination of Table III will show, however, that in nearly every case where any wide difference occurs it is due to imperfections in the stick disproportionately affecting its strength. Moreover, in the case of species where the specific gravity and strength of different specimens are nearly identical, their order of arrangement becomes largely accidental. A slight difference in the time occupied in the strength tests, or slight variations in the direction of the grain of the wood, may considerably affect the sequence in such a table:

TABLE ILLUSTRATING THE RELATION BETWEEN TRANSVERSE STRENGTH AND SPECIFIC GRAVITY IN THE WOOD OF CERTAIN SPECIES.

Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.	Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.
3	Magnolia acuminata	534	1	1	66	Acer rubrum	20	1	8
		534	2	2			878	2	3
		246	3	3			878	3	1
		261	4	5			1048	4	2
		246	5	4			1048	5	4
		261	6	6			530	6	5
8	Liriodendron Tulipfera	818	1	1			530	7	6
		818	2	5			743	8	9
		1231	3	2			743	9	7
		1236	4	6	77	Robinia Pseudacacia	1248	1	1
		1236	5	4			405	2	2
		1232	6	3			1248	3	5
		1232	7	8			1247	4	3
		395	8	7			1247	5	4
60	Acer macrophyllum	982	1	1			815	6	6
		982	2	2			815	7	7
		1023	3	4	108	Prunus serotina	15	1	1
		1023	4	3			15	2	2
64	Acer saccharinum	299	1	2			127	8	4
		1233	2	1			1053	4	5
		1235	3	7			1053	5	6
		1234	4	6			127	6	3
		1235	5	5			763	7	8
		1234	6	4			763	8	7
		1233	7	3			368	9	9
		376	8	8			317	10	10
		403	9	9			317	11	11
64	Acer saccharinum, *var.* nigrum	274	1	1			115[1]	12	13
		213	2	2			406	13	12
		757	3	3	117	Pyrus coronaria	1086	1	1
		757	4	4			7108	2	3

RELATION BETWEEN TRANSVERSE STRENGTH AND SPECIFIC GRAVITY, ETC.—Continued.

Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.
117	Pyrus coronaria—continued	1088	3	2
		1087	4	4
139	Liquidambar Styraciflua	1173	1	2
		1182	2	9
		1182	3	5
		1183	4	8
		1173	5	1
		1095	6	3
		1161	7	11
		1181	8	10
		546	9	6
		1095	10	4
		546	11	12
		1183	12	7
151	Cornus florida	1077	3	1
		1077	4	3
		1092	5	8
		812	6	4
		812	7	5
		761	8	7
		67	9	6
		67	10	4
154	Nyssa sylvatica	750	1	2
		835	2	9
		750	3	1
		833	4	6
		833	5	4
		834	6	7
		834	7	3
		813	8	5
		813	9	8
155	Nyssa uniflora	128	1	2
		128	2	1
		604	3	6
		604	4	4
		550	5	5
		550	6	3
184	Diospyros Virginiana	425	1	1
		1084	2	6
		1162	3	4
		811	4	3
		1084	5	2
		811	6	5
		61	7	8
		61	8	7
192	Fraxinus Americana	1045	1	1
		1045	2	4
		114[3]	3	3
		937	4	19
		227[2]	5	2
		130	6	7
		431	7	6
		114[4]	8	5
		227[1]	9	10
		39[2]	10	8
		212	11	11
		212	12	9
		747	13	21
		551	14	14
		227	15	13
		267	16	12
		747	17	17
		551	18	15
		114[5]	19	16
		114	20	18
		114	21	20
194	Fraxinus viridis	949	1	2
194	Fraxinus viridis—continued	948	2	4
		957	3	1
		438	4	3
		57	5	7
		957	6	5
		308	7	6
		308	8	8
196	Fraxinus quadrangulata	66	1	3
		66	2	2
		286[1]	3	1
		518	4	5
		286[2]	5	6
		291	6	4
		125	7	8
		125	8	7
217	Sassafras officinale	814	1	6
		814	2	4
		71	3	1
		854	4	7
		854	5	8
		446	6	5
		387	7	3
		71	8	2
		387	9	9
223	Ulmus fulva	134	1	1
		134	2	2
224	Ulmus Americana	533	1	6
		533	2	4
		1049	3	2
		19	4	1
		19	5	3
		1036	6	11
		1036	7	10
		958	8	7
		281	9	8
		281	10	9
		958	11	5
225	Ulmus racemosa	116	1	1
		314	2	2
		314	3	5
		116[5]	4	3
		428	5	7
		116[3]	6	4
		116	7	6
228	Celtis occidentalis	873	1	5
		873	2	4
		1111	3	1
		306	4	6
		306	5	7
		1111	6	2
		75	7	3
		75	8	8
232	Morus rubra	132	1	1
		1255	2	4
		132	3	2
		1255	4	6
		1244	5	3
		1245	6	5
		1246	7	7
238	Juglans cinerea	1057	1	1
		76[2]	2	2
		16	3	7
		16	4	4
		76	5	5
		76	6	3
		123	7	6
		893	8	8

RELATION BETWEEN TRANSVERSE STRENGTH AND SPECIFIC GRAVITY, ETC.—Continued.

Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.
239	Juglans nigra	951	1	4
		951	2	3
		766	3	1
		766	4	6
		318	5	9
		325	6	8
		407	7	5
		117	8	2
		117	9	7
242	Carya alba	29[2]	1	4
		539	2	7
		531	3	2
		531	4	3
		1056	5	12
		1056	6	13
		3	7	6
		1097	8	1
		249	9	11
		118	10	14
		249	11	10
		118	12	16
		3	13	5
		816	14	9
		539	15	8
		816	16	15
243	Carya sulcata	383	1	3
		1082	2	5
		391	3	1
		1166	4	6
		391	5	4
		1082	6	7
		1164	7	2
		1170	8	8
		1165	9	9
245	Carya porcina	88	1	1
		88	2	2
		1168	3	7
		1168	4	4
		442	5	9
		538	6	3
		6	7	5
		6	8	6
		121	9	8
248	Carya aquatica	740	1	1
		740	2	5
		362	3	3
		362	4	4
		129	5	2
		917	6	6
251	Quercus alba	1257	1	18
		749	2	27
		547	3	1
		547	4	11
		1257	5	14
		8	6	19
		1050	7	10
		740	8	8
		250	9	9
		238	10	5
		748	11	3
		32	12	12
		1050	13	2
		49	14	13
		250	15	7
		895	16	29
		238	17	6
		250	18	10

Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.
251	Quercus alba—continued	49[1]	19	15
		259[3]	20	21
		49[3]	21	17
		49[2]	22	24
		8	23	25
		403	24	28
		895	25	29
		251	26	4
		113[2]	27	31
		403	28	33
		251	29	26
		32[2]	30	20
		113[2]	31	34
		49	32	22
		443	33	35
		32[3]	34	22
		113	35	31
253	Quercus Garryana	985	1	1
		1027	2	6
		985	3	3
		988	4	2
		1027	5	7
		1029	6	4
		988	7	5
		1029	8	8
254	Quercus obtusiloba	771	1	5
		771	2	7
		256	3	3
		151	4	1
		151	5	2
		351	6	4
		351	7	4
256	Quercus macrocarpa	137	1	1
		310	2	8
		1071	3	5
		310	4	10
		143	5	13
		933	6	12
		1073	7	6
		1072	8	7
		933	9	11
		70	10	3
		432	11	9
		831	12	4
		70	13	3
257	Quercus lyrata	545	1	1
		762	2	2
		762	3	3
		545	4	4
258	Quercus bicolor	54	1	1
		846	2	5
		846	3	4
		54[2]	4	2
		54	5	3
259	Quercus Michauxii	755	1	3
		755	2	1
		240	3	5
		240	4	6
		524	5	4
		524	6	2
260	Quercus Prinus	35	1	1
		925	2	3
		31	3	5
		925	4	4
		31	5	2
		434	6	6
261	Quercus prinoides	273	1	2
		287	2	4

RELATION BETWEEN TRANSVERSE STRENGTH AND SPECIFIC GRAVITY, ETC.—Continued.

Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.
261	Quercus prinoides—continued	514	3	3
		34[2]	4	1
		514	5	6
		34	6	5
267	Quercus virens	464	1	3
		954	2	7
		954	3	6
		799	4	2
		919	5	4
		799	6	1
		919	7	5
272	Quercus rubra	1043	1	1
		146	2	10
		1043	3	4
		217	4	6
		215	5	7
		218	6	3
		7	7	2
		7	8	5
		140	9	8
		215	10	11
		92	11	13
		45[2]	12	9
		141	13	15
		920	14	6
		920	15	7
		45[1]	16	12
		45[2]	17	14
274	Quercus tinctoria	74	1	4
		36[3]	2	9
		36[2]	3	2
		86	4	6
		36	5	8
		247	6	1
		17	7	5
		247	8	3
		437	9	10
		17	10	7
		244	11	11
		444	12	12
277	Quercus falcata	548	1	3
		265	2	1
		548	3	2
		131	4	5
		131	5	7
		265	6	4
		245	7	6
		245	8	8
280	Quercus aquatica	742	1	1
		511	2	8
		742	3	9
		511	4	2
		349	5	4
		349	6	3
		264[1]	7	6
		264[2]	8	5
		264[3]	0	7
290	Castanea vulgaris, *var.* Americana	18	1	2
		258	2	1
		516	3	3
		18	4	4
291	Fagus ferruginea	119	1	2
		9	2	1
		853	3	4
		9	4	3
		853	5	6
		119	6	5
291	Fagus ferruginea—continued	765	7	9
		765	8	7
		443	9	10
		44[2]	10	8
295	Betula papyrifera	836	1	1
		1065	2	2
		1065	3	4
		1067	4	3
		722	5	5
		990	6	9
		1066	7	6
		1066	8	7
		990	9	11
		1067	10	10
		722	11	8
297	Betula lutea	843	1	2
		843	2	8
		1068	4	7
		1069	5	6
		1070	8	4
		1068	6	5
		1069	7	1
		1070	8	3
298	Betula nigra	842	1	5
		841	2	4
		841	3	2
		842	4	6
		136	5	1
		136	6	3
301	Alnus rubra	991	1	4
		991	2	3
		1025	3	1
		967	4	5
		967	5	6
		1025	6	2
324	Populus monilifera	309	1	3
		754	2	2
		754	3	1
		309	1	3
		304	5	5
		304	6	6
325	Populus Fremontii, *var.* Wislizeni	912	1	5
		646	2	2
		646	3	4
		909	4	1
		912	5	6
		909	6	8
327	Thuya occidentalis	1099	1	2
		874	2	1
		874	3	5
		782	4	7
		1099	5	8
		783	6	8
		783	7	10
		790	8	4
		790	9	6
		379	10	9
		879	11	11
		792	12	12
		793	13	13
329	Chamæcyparis sphæroidea	350	1	7
		850	2	3
		850	3	1
		851	4	4
		851	5	2
		852	6	5
		350	7	6

RELATION BETWEEN TRANSVERSE STRENGTH AND SPECIFIC GRAVITY, ETC.—Continued.

Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.	Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.
330	Chamæcyparis Nutkaensis	969	1	5	378	Pinus glabra—continued	704	2	2
		983	2	1			142	3	4
		1000	3	8			142	4	2
		983	4	3			544	5	6
		1000	5	6			544	0	5
		994	6	4	379	Pinus Banksiana	780	1	1
		994	7	2			879	2	2
		969	8	7			394	3	8
339	Juniperus Virginiana	1249	1	5			394	4	4
		1250	2	7			879	5	6
		734	3	1			780	6	5
		800	4	4	380	Pinus palustris	81	1	1
		800	5	3			358	2	7
		327	6	2			559	3	2
		327	7	6			358	4	8
342	Sequoia sempervirens	711	1	5			357	5	1
		710	2	1			81	6	10
		711	3	3			859	7	11
		713	4	6			360	8	4
		713	5	2			361	9	8
		712	6	4			361	10	5
		712	7	7			360	11	13
347	Pinus Strobus	222	1	2			243	12	9
		1044	2	7			243	13	6
		797	3	1			385	14	18
		1	4	4			390	15	15
		788	5	3			357	16	12
		788	6	5			85	17	19
		797	7	6			384	18	16
		1044	8	11			390	19	17
		789	9	8			85	20	20
		789	10	9			384	21	21
		777	11	10	381	Pinus Cubensis	493	1	6
358	Pinus resinosa	315	1	1			493	2	4
		315	2	2			356	3	2
		1076	3	3			356	4	1
		1076	4	5			84	5	3
		785	5	4			84	6	5
		1074	6	6	382	Picea nigra	231	1	1
		1075	7	7			231	2	2
		785	8	8			776	3	3
361	Pinus ponderosa	632	1	3			880	4	4
		910	2	10			776	5	9
		907	3	11			373	6	7
		689	4	1			880	7	8
		619	5	4			794	8	5
		630	6	9			794	9	6
		731	7	6	383	Picea alba	513	1	6
		626	8	2			773	2	3
		718	9	5			773	3	1
		630	10	12			784	4	6
		718	11	8			513	5	4
		636	12	7			784	6	8
370	Pinus Tæda	82	1	1			791	7	2
		355	2	4	386	Picea Sitchensis	970	1	3
		355	3	6			970	2	2
		388	4	2			1015	3	1
		389	5	3			977	4	4
		388	6	7			1026	5	8
		389	7	5			977	6	5
373	Pinus inops	1172	1	4			1026	7	9
		1172	2	2			1010	8	6
		1169	3	6			1010	9	7
		1169	4	1	387	Tsuga Canadensis	793	1	6
		622	5	6			793	2	2
		621	0	3			772	3	1
378	Pinus glabra	764	1	1			772	4	3

RELATION BETWEEN TRANSVERSE STRENGTH AND SPECIFIC GRAVITY, ETC.—Continued.

Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.	Catalogue number.	Species.	Office number.	Relative specific gravity.	Relative transverse strength.
387	Tsuga Canadensis—continued	1040	5	4	391	Pseudotsuga Douglasii—continued	1022	25	26
		1040	6	5			1008	26	28
		775	7	13			271^2	27	24
		787	8	9			1020	28	21
		787	9	8			1022	29	6
		5	10	10			986	30	23
		219	11	7			1020	31	4
		775	12	15			702	32	34
		1042	13	11			709	33	22
		1042	14	12			709	34	27
		5	15	17	394	Abies subalpina	449	1	2
		817	16	14			449^2	2	6
		219	17	16			449^1	3	5
		817	18	18			449^1	4	1
		778	19	20			820	5	3
		778	20	19			820	6	4
391	Pseudotsuga Douglasii	708	1	1	396	Abies concolor	783	1	1
		708	2	2			639	2	3
		704	3	3			733	3	2
		1018	4	8			639	4	4
		1018	5	10			529	5	6
		1016	6	33			529	6	5
		989	7	7	401	Larix Americana	226^2	1	1
		1016	8	18			226	2	3
		705	9	14			774	3	10
		627	10	5			840	4	8
		881	11	9			786	5	2
		881	12	13			795	6	4
		1008	13	19			774	7	5
		706	14	11			795	8	7
		720	15	15			840	9	9
		1011	16	17			781	10	12
		627	17	12			786	11	6
		720	18	30			781	12	11
		1011	19	32	402	Larix occidentalis	1006	1	3
		974	20	16			1006	2	4
		732	21	21			984	3	1
		732	22	29			984	4	2
		973	23	25			719	5	5
		973	24	20			719	6	6

GENERAL REMARKS.

An examination of the results obtained from the various tests made upon the woods of North America indicate at least the important fact that within the limits of any species the weight and strength of any specimen of wood depends upon the actual proportion of the space occupied in the layers of annual growth with open ducts to the space occupied with compact, woody tissue, and to the size of these ducts; or in the case of the wood of Coniferæ, the proportion of space occupied with cells formed early in the season to that occupied with the smaller cells of the summer growth. The proportion between these two kinds of growth varies not only in every individual tree, but in different parts of the same tree. The causes which thus affect the growth of wood are not very apparent. It is not soil, nor age, nor general climatic conditions, it appears, which produce the different proportion between the solid and the light portions of the annual growth in any species, because in the same individual this proportion is found to vary from year to year. It varies very irregularly; nor does the rapidity of growth, as has been supposed, greatly affect the strength of wood, because the proportion of open to compact growth is little affected by rapid or slow increase of the tree's diameter. How far annual climatic variations affect the nature of the annual layers of growth has not been demonstrated, although it is not impossible that in years in which conditions favorable to rapid growth are extended late into the season, the proportion of the annual layer occupied by open, weak growth to the growth of the whole year would be greater than that formed in a year during which the season favorable for rapid growth was less extended.

It follows that while such experiments as those conducted by Mr. Sharples are necessary to establish maximum and relative values for any species, these being established, actual values of any given specimen of wood may be determined by microscopic examination of its structure; that is, two specimens of the wood of any species to which the census tests have been applied being given, their relative values can be determined by an examination of their structure as well as or better than by any elaborate experiments.

TANNIN VALUES.

The amount of tannin contained in the bark of various trees of the United States has been determined.

These determinations give the proportion of tannin. They do not indicate the real value of the bark of the species for tanning, which can only be obtained by actual experiments made on a large scale, other properties in the bark, beside the percentage of tannin, affecting the value of the leather prepared with it.

These determinations must therefore be regarded as approximations, which will serve, in some cases, to indicate species not now in general use for this purpose, which may be looked to as possible sources of tannin supply.

The methods adopted by Mr. Sharples in making these determinations are described by him as follows:

The tannin in each case was determined in the rossed bark; that is, bark deprived of the main part of the outside coating. The method employed was that devised by Lowenthal, which may be thus briefly described: A standard decoction of the bark is titrated with permanganate of potash, a quantity of indigo being first added to it. In a second portion the tannin is precipitated by means of gelatine, and the gallic acid in the liquid again determined by permanganate and indigo. The difference between these two readings gives the amount of tannin in the bark, the value of the permanganate having previously been determined by pure tannic acid, or by oxalic acid and calculation.

The bark of the following species has been examined:

Catalogue number.	Botanical name.	Common name.	Per cent. of tannin.	Per cent. of ash.	Catalogue number.	Botanical name.	Common name.	Per cent. of tannin.	Per cent. of ash.
14	Gordonia Lasianthus	Loblolly Bay. Tan Bay	13.14	2.35	275	Quercus Kelloggii	Black Oak	6.76	8.64
93	Prosopis juliflora	Mesquit. Algaroba. Honey Locust. Honey Pod.	4.04	8.71	276	Quercus nigra	Black Jack. Jack Oak	4.36	6.28
					277	Quercus falcata	Spanish Oak. Red Oak	8.59	4.32
140	Rhizophora Mangle	Mangrove	31.04	6.70	287	Quercus densiflora	Tanbark Oak. Chestnut Oak. Peach Oak.	16.46	8.84
160	Exostemma Caribæum		5.81	7.16					
251	Quercus alba	White Oak	5.99	6.11	290	Castanea vulgaris, *var.* Americana.	Chestnut	6.25	2.00
256	Quercus macrocarpa	Burr Oak. Mossy-cup Oak. Over-cup Oak.	4.59	8.05	382	Picea nigra	Black Spruce	7.20	2.84
260	Quercus Prinus	Chestnut Oak. Rock Chestnut Oak.	6.25	3.83	384	Picea Engelmanni	White Spruce	20.56	2.75
					384	Picea Engelmanni	do	17.01	2.32
261	Quercus prinoides (old tree)	Yellow Oak. Chestnut Oak. Chinquapin Oak.	4.33	8.38	384	Picea Engelmanni	do	12.60	0.75
					387	Tsuga Canadensis	Hemlock	13.11	1.31
261	Quercus prinoides (young tree)	do	10.33	6.23	389	Tsuga Mertensiana	do	14.42	1.44
267	Quercus virens	Live Oak	10.46	8.89	389	Tsuga Mertensiana	do	15.87	1.49
269	Quercus Emoryi	Black Oak	0.76	15.00	390	Tsuga Pattoniana		15.72	2.48
272	Quercus rubra	Red Oak. Black Oak	4.56	4.43	391	Pseudotsuga Douglasii	Red Fir. Yellow Fir. Oregon Pine. Douglas Fir.	13.79	1.56
274	Quercus tinctoria	Black Oak. Yellow-bark Oak. Quercitron Oak. Yellow Oak.	5.90	5.73					

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
MAGNOLIACEÆ.								
1. Magnolia grandiflora *Big Laurel. Bull Bay.*	346	Alabama	Cottage Hill	C. Mohr	Rich loam	0.372	116	
2. Magnolia glauca *Sweet Bay. White Bay. Beaver Tree. White Laurel. Swamp Laurel.*	354	...do	...do	...do	Swampy	0.268	91	20
3. Magnolia acuminata *Cucumber Tree. Mountain Magnolia.*	246	Virginia	Wytheville	H. Shriver	Clay limestone			
	261[1]	...do	Fancy Gap	...do	Rich, light			
	261[2]	...do	...do	...do	...do			
	261[3]	...do	...do	...do	...do			
	534	Mississippi	Selvers' mill	C. Mohr	...do	0.198	26	14
4. Magnolia cordata *Cucumber Tree.*	1178	Alabama	Winston county	C. Mohr				
5. Magnolia macrophylla *Large-leaved Cucumber Tree.*	22	North Carolina	Statesville	M. E. Hyams	Rich	0.050	18	
	532	Mississippi	Quitman	C. Mohr	Rich, low			
6. Magnolia Umbrella *Umbrella Tree. Elk Wood.*	266[1]	Virginia	Wytheville	H. Shriver		0.072	15	8
	266[2]	...do	...do	...do				
	266[3]	...do	...do	...do				
7. Magnolia Fraseri *Long-leaved Cucumber Tree.*	260[1]	...do	Fancy Gap	...do	Damp	0.085	20	
	260[2]	...do	...do	...do	...do			
	260[3]	...do	...do	...do	...do			
8. Liriodendron Tulipifera *Tulip Tree. Yellow Poplar. White Wood.*	138	Michigan	Dansville	W. J. Beal	Sandy			
	165	Ohio	D. E. McSherry & Co.	E. E. Barney				
	174	Tennessee	Woodsum Machine Company.	...do				
	177	Ohio	Barney & Smith Manufacturing Co.	...do				
	178	...do	D. E. McSherry & Co.	...do				
	187	...do	J. W. Stoddard & Co.	...do				
	188	...do	Barney & Smith Manufacturing Co.	...do				
	395	Michigan	Lansing	W. J. Beal				
	818	West Virginia	Grafton	C. G. Pringle				
	1231	Pennsylvania	Chester county	P. P. Sharples				
	1232	...do	...do	...do				
ANONACEÆ.								
9. Asimina triloba *Papaw. Custard Apple.*	211	Missouri	Meramec river, Jefferson county.	G. W. Letterman	Alluvial	0.169		
	332	Tennessee	Cumberland river	A. Gattinger	...do	0.086		
10. Anona laurifolia *Pond Apple.*	470	Florida	Bay Biscayne	A. H. Curtiss	Swampy	0.240	47	

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.6040	0.6680	...	0.6360	0.40	0.65	0.53	39.63	Second sp. gr. determination made on sap-wood	346
0.5034	0.5037	...	0.5035	0.42	0.53	0.47	31.38	...	854
0.5012	0.5413	...	0.5213	0.29	0.26	0.27	...	...	246
0.4399	...	...	0.4399	0.25	...	0.25	...	...	261[1]
0.4562	...	...	0.4562	0.30	...	0.30	...	...	261[2]
0.4215	...	...	0.4215	0.30	...	0.30	...	...	261[3]
0.5065	0.5058	...	0.5061	0.34	0.33	0.34	...	...	534
			0.4690			0.29	29.23		
0.4095	0.4184	0.4101	0.4139	0.25	0.39	0.32	25.79	Third sp. gr. determination made on sap-wood; fourth sp. gr. determination, 0.4175.	1178
0.5375	0.4859	...	0.5117	0.32	...	0.32	...	All sap-wood	22
0.5468	0.5534	...	0.5501	0.45	0.34	0.39	...	...	532
			0.5309			0.35	33.09		
0.3787	...	...	0.3787	0.19	...	0.19	...	Growth rapid	266[1]
0.5067	...	...	0.5067	0.18	...	0.18	...	Growth rapid; 0.5 sap-wood	266[2]
0.4606	...	...	0.4606	0.24	...	0.24	...	Growth rapid; all sap-wood	266[3]
			0.4487			0.20	27.96		
0.5430	...	...	0.5430	0.25	...	0.25	...	All sap-wood	260[1]
0.4976	...	...	0.4976	0.27	...	0.27	...	...	260[2]
0.4602	...	...	0.4602	0.33	...	0.33	...	All sap-wood	260[3]
			0.5003			0.28	31.18		
0.3843	...	...	0.3843	0.25	...	0.25	...	...	138
0.3831	0.3783	...	0.3807	0.27	0.27	0.27	...	Yellow poplar	165
0.3798	0.3787	...	0.3792	0.20	0.22	0.21	...	Yellow poplar (soft)	174
0.4475	0.4361	...	0.4418	0.17	0.15	0.16	...	Hard poplar	177
0.4512	0.4442	...	0.4477	0.19	0.19	0.19	...	Hard poplar	178
0.4362	0.4150	...	0.4256	0.18	0.21	0.19	...	Yellow poplar	187
0.4436	0.4551	...	0.4493	0.25	0.30	0.27	...	...	188
0.3774	...	...	0.3774	0.33	0.31	0.32	...	...	305
0.4763	0.4822	...	0.4793	0.26	0.29	0.28	...	...	818
0.4444	0.4409	...	0.4427	0.20	0.22	0.21	...	White poplar	1231
0.4199	0.4712	...	0.4455	0.19	0.16	0.18	...	Yellow poplar	1232
			0.4230			0.23	26.36		
0.3549	0.3810	...	0.3679	0.16	0.14	0.15	...	...	211
0.4259	...	...	0.4259	0.24	0.30	0.27	...	...	332
			0.3969			0.21	24.74		
0.4912	0.5190	0.5048	0.5053	4.94	4.79	4.86	31.49	...	479

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth. Sap-wood.	Layers of growth. Heart-wood.
CAPPARIDACEÆ.								
11. Capparis Jamaicensis	477	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	0.098	84	
	1186	....do	....do	....do	....do			
CANELLACEÆ.								
12. Canella alba *White Wood. Cinnamon Bark. Wild Cinnamon.*	499	....do	Umbrella Key	....do	....do	0.620	17	
	1181	....do	Elliott's Key	....do	....do	0.120	5	14
TERNSTRŒMIACEÆ.								
14. Gordonia Lasianthus *Loblolly Bay. Tan Bay.*	238	South Carolina	Bonneau's Depot	H. W. Ravenel	Wet pine-barren			
	414	....do	Aiken	....do	Swampy	0.330	22	25
STERCULIACEÆ.								
16. Fremontia Californica *Slippery Elm.*	1230	California	San Bernardino mountains.	C. G. Pringle				
TILIACEÆ.								
17. Tilia Americana *Lime Tree. Bass Wood. American Linden. Lin. Bee Tree.*	2	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.470	9	26
	124	Michigan	Big Rapids	W. J. Beal	Gravelly			
	252	Missouri	Allenton	G. W. Letterman	Alluvial	0.270	8	73
	316	Michigan	Hersey	W. J. Beal	Rich loam			
	1038	Massachusetts	Danvers	J. Robinson	Moist gravel	0.330	2	35
17. Tilia Americana, *var.* pubescens	745	Georgia	Bainbridge	A. H. Curtiss	Low	0.300	23	
18. Tilia heterophylla *White Bass Wood. Wahoo.*	285[1]	Kentucky	Cliffs Kentucky river	W. M. Linney	Limestone			
	285[2]	....do	Mercer county	....do	....do			
	285[3]	....do	....do	....do	....do			
	320	Tennessee	Cumberland river	A. Gattinger	Alluvial			
MALPIGHIACEÆ.								
19. Byrsonima lucida *Tallowberry. Glamberry.*	510	Florida	Boca Chica Key	A. H. Curtiss	Coral	0.080	21	
	1113	....do	No-Name Key	....do	....do			
	1117	....do	Boca Chica Key	....do	....do	0.074	19	12
	1190	....do	No-Name Key	....do	....do			
ZYGOPHYLLACEÆ.								
20. Guaiacum sanctum *Lignum-vitæ.*	476	....do	Upper Metacombe Key.	....do	....do	0.178	18	55
	898	....do		Department of Agriculture.				
	1133	....do	Elliott's Key	A. H. Curtiss	Coral			
21. Porliera angustifolia	947	Texas	San Antonio	C. Mohr	Limestone	0.056	31	
RUTACEÆ.								
22. Xanthoxylum Americanum *Prickly Ash. Toothache Tree.*	80	Missouri	Allenton	G. W. Letterman	Alluvial	0.087	5	9
	392	Michigan	Lansing	W. J. Beal	....do	0.066	4	28

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.6690	0.6609	....	0.6649	5.60	5.77	6.68	....	....	477
0.7272	0.7315	....	0.7293	3.82	3.88	3.85	....	....	1186
			0.0971			4.76	43.44		
0.9570	0.9593	....	0.9582	0.75	0.95	0.85	....	All sap-wood	499
1.0390	1.0017	....	1.0203	2.66	2.65	2.66	....	0.5 sap-wood	1131
			0.9893			1.75	01.65		
0.3852	0.4659	....	9.4255	9.49	0.44	0.47	....	....	236
0.5146	0.5255	....	0.5201	1.02	1.08	1.05	....	....	414
			0.4728			0.76	29.47		
0.6995	0.7288	....	0.7142	1.51	1.86	1.69	44.51	....	1280
0.4626	0.4722	....	0.4674	0.30	0.33	0.31	....	....	2
0.3815	....	....	0.3815	0.32	0.38	0.35	....	....	124
0.5035	0.4378	....	0.4706	0.97	1.08	1.02	....	....	252
0.5186	....	....	0.5166	0.55	0.64	0.60	....	All sap-wood	316
0.4272	0.4163	0.4362	0.4266	0.42	0.48	0.45	....	....	1039
			0.4525			0.55	28.20		
{ 0.4103 0.4087 }	{ 0.3885 0.4220 }	....	0.4074	{ 0.68 0.62 }	{ 0.67 0.64 }	0.65	25.39	Growth very rapid	745
0.4927	....	....	0.4927	0.45	....	0.45	....	Second growth	285^{1}
0.3791	....	....	0.3791	0.67	....	0.67	....	....	285^{1}
0.3674	....	....	0.3674	0.86	....	0.86	....	....	285^{1}
0.4695	0.4545	....	0.4620	0.48	0.53	0.50	....	....	320
			0.4253			0.62	26.51		
0.5257	0.5360	....	0.5308	2.84	2.85	2.85	....	....	510
0.5909	0.6783	0.6743	0.6478	2.40	1.94	2.17	....	....	1113
0.5681	0.5791	0.5875	0.5782	2.76	2.56	2.65	....	....	1119
0.6009	0.5964	....	0.5987	1.94	2.40	2.17	....	....	1190
			0.5888			2.46	36.69		
1.1845	1.2180	0.9563	1.1190	0.87	0.92	0.90	....	0.5 sap-wood	476
1.2736	1.1700	....	1.2218	0.51	0.81	0.66	....	Second sp. gr. determination made on 0.5 sap-wood	898
1.0997	1.0998	1.0652	1.0882	0.86	0.94	0.90	....	0.66 sap-wood	1138
			1.1432			0.82	71.24		
1.1230	1.0843	1.1230	1.1101	0.53	0.49	0.51	69.18	Sap-wood	947
0.6122	0.5969	....	0.6045	0.60	0.68	0.59	....	....	80
0.5235	0.5290	....	0.5262	0.54	0.65	0.54	....	....	392
			0.5654			0.57	35.23		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
23. Xanthoxylum Clava-Herculis *Toothache Tree. Prickly Ash. Sea Ash. Pepper Wood. Wild Orange.*	735	Florida	Chattahoochee	A. H. Curtiss	Dry, sandy			
	807	Georgia	Cumberland Island	...do				
	1086	Texas	Palestine	C. Mohr	Damp, sandy	0.352	20	10
23. Xanthoxylum Clava-Herculis, *var.* fruticosum	938	...do	Austin	...do	Dry, calcareous	0.098	33	
24. Xanthoxylum Caribæum *Satin Wood.*	1109	Florida	Bahia Honda Key	A. H. Curtiss	Coral			
	1140	...do	...do	...do	...do	0.136	4	54
25. Xanthoxylum Pterota *Wild Lime.*	481	...do	Bay Biscayne	A. H. Curtiss	Coral			
	950	Texas	Matagorda bay	C. Mohr	Calcareous			
	1128	Florida	Bay Biscayne	A. H. Curtiss	Coral	0.84	13	31
26. Ptelia trifoliata *Hop Tree. Shrubby Trefoil. Wafer Ash.*	768	...do	Aspalaga	...do	Calcareous	0.94	23	
27. Canotia holocantha	1228	Arizona	Wickenburg	C. G. Pringle				
SIMARUBEÆ.								
28. Simaruba glauca *Paradise Tree.*	487	Florida	Bay Biscayne	A. H. Curtiss	Coral			
BURSERACEÆ.								
29. Bursera gummifera *Gum Elemi. Gumbo Limbo. West Indian Birch.*	462	...do	Upper Metacombe Key.	...do	...do			
	903	...do		Department of Agriculture.				
30. Amyris sylvatica *Torch Wood.*	475	...do	Upper Metacombe Key.	A. H. Curtiss	Coral	0.128	61	
MELIACEÆ.								
31. Swietenia Mahogoni *Mahogany. Madeira.*	452	...do	...do	...do	...do	0.228	16	81
OLACINEÆ.								
32. Ximenia Americana *Wild Lime. Tallow Nut. Hog Plum. Mountain Plum.*	472	...do	...do	...do	...do	0.112	3	43
	1134	...do	Umbrella Key	...do	...do			
ILICINEÆ.								
33. Ilex opaca *American Holly.*	280	South Carolina	Waverly Mills	W. St. J. Mazyck	Sandy loam	0.144	35	
	902	...do.		Department of Agriculture.				
34. Ilex Dahoon *Dahoon. Dahoon Holly.*	484	Florida	Bay Biscayne	A. H. Curtiss	Low, damp	0.128	29	
34. Ilex Dahoon, *var.* myrtifolia	802	...do	Jacksonville	...do	...do	0.148	28	

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.5139	0.5002	....	0.5070	0.92	0.91	0.91	....	....	735
0.4880	0.4772	....	0.4826	0.68	0.65	0.67	....	....	807
0.5392	0.5153	....	0.5272	0.90	0.84	0.87	....	....	1086
			0.5056			0.82	31.51		
0.6130	0.5733	0.6030	0.5967	0.76	0.76	0.76	37.19	....	938
0.8598	0.8965	....	0.8782	1.59	2.01	1.80	....	....	1109
0.9090	0.9275	0.9302	0.9222	2.34	2.15	2.25	....	....	1140
			0.9002			2.02	50.10		
0.7480	0.7666	....	0.7573	0.90	1.00	0.95	....	....	481
0.5807	0.5775	....	0.5791	0.63	0.59	0.61	....	....	950
0.9000	0.8949	0.8955	0.8968	0.69	0.89	0.79	....	....	1128
			0.7444			0.78	46.39		
0.8238	0.8400	....	0.8319	0.34	0.27	0.30	51.84	....	768
0.6464	0.7305	....	0.6885	6.13	4.54	5.33	42.91	....	1228
0.4100	0.4172	....	0.4136	0.93	0.92	0.93	25.78	....	487
0.2677	0.2488	0.2587	0.2584	2.05	1.91	1.98	....	....	462
0.2823	0.4022	....	0.3423	2.10	2.07	2.09	....	....	903
			0.3003			2.04	18.71		
1.0469	1.0450	....	1.0459	0.66	0.51	0.59	65.18	....	475
0.7335	0.7464	0.7047	0.7282	1.06	1.11	1.09	45.88	....	452
0.8790	0.8925	....	0.8862	0.55	0.69	0.62	....	....	472
0.9838	0.9505	0.9249	0.9531	0.84	0.82	0.83	....	0.5 sap-wood	1134
			0.9196			0.73	57.31		
0.6046	0.6624	....	0.6335	0.71	0.55	0.63	....	....	280
0.5524	0.5078	....	0.5301	1.04	0.71	0.88	....	....	902
			0.5818			0.76	36.26		
0.4791	0.4820	....	0.4806	0.94	0.88	0.91	29.95	....	484
0.5886	0.5860	....	0.5873	0.95	0.84	0.90	36.00	....	802

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
35. Ilex Cassine. *Cassena. Yaupon. Yopon.*	345	Alabama	Cottage Hill	C. Mohr	Sandy	0.076	17	
	804	Florida	Saint John's river	A. H. Curtiss	Rich, sandy			
	952	Texas	Matagorda bay	C. Mohr	Light			
36. Ilex decidua	56	Missouri	Allenton	G. W. Letterman	Low, damp			
	335	Texas	Dallas	J. Reverchon	Upland			
	753	Florida	Chattahoochee river	A. H. Curtiss	Clay	0.086	33	
	945	Texas	New Braunfels	C. Mohr	Alluvial			
CYRILLACEÆ.								
37. Cyrilla racemiflora. *Iron Wood.*	341	Alabama	Chunchula	do	Damp, sandy	0.195		
	015	Georgia	Ogeechee river	A. H. Curtiss	Low			
38. Cliftonia ligustrina. *Titi. Iron Wood. Buckwheat Tree.*	338	Alabama	Cottage Hill	C. Mohr	Wet	0.194	47	
CELASTRACEÆ.								
39. Euonymus atropurpureus. *Burning Bush. Wahoo. Spindle Tree. Arrow Wood.*	63	Missouri	Allenton	G. W. Letterman	Alluvial			
	1078	do	do	do	do	0.092	22	
40. Myginda pallens	1188	Florida	Umbrella Key	A. H. Curtiss	Calcareous			
41. Schæfferia frutescens. *Yellow Wood. Box Wood.*	478	do	Upper Metacombe Key.	do	Coral	0.110	71	
	1201	do	do	do	do			
RHAMNACEÆ.								
42. Reynosia latifolia. *Red Iron Wood. Darling Plum.*	454	do	do	do	do	0.112	7	52
43. Condalia ferrea. *Black Iron Wood.*	460	do	do	do	do	0.166	22	56
44. Condalia obovata. *Blue Wood. Logwood. Purple Haw.*	941	Texas	New Braunfels	C. Mohr	Dry, calcareous	0.100	5	36
45. Rhamnus Caroliniana. *Indian Cherry.*	43	Missouri	Allenton	G. W. Letterman	Limestone			
	521	Tennessee	Nashville	A. Gattinger	do			
	803	Florida	Saint John's river	A. H. Curtiss	Rich hummock	0.108	19	10
	1094	Arkansas	Jonesboro'	T. B. Kitchens		0.059	14	
46. Rhamnus Californica	1256	California	Santa Cruz mountains.	C. G. Pringle				
47. Rhamnus Purshiana. *Bearberry. Bear Wood. Shittim Wood.*	993	Oregon	Portland	G. Engelmann and C. S. Sargent.	Rich, alluvial			
48. Ceanothus thyrsiflorus. *Blue Myrtle.*	1101	California	Santa Cruz	C. L. Anderson		0.090	11	

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.7257	0.7185		0.7221	0.74	0.70	0.72			345
0.6890	0.7191		0.7041	1.04	1.11	1.08			804
0.7475	0.7610		0.7547	0.89	0.72	0.81			952
			0.7270			0.87	45.31		
0.7976			0.7976	0.44	0.50	0.47			56
0.7888			0.7888	0.83	0.84	0.84			335
0.5910	0.5861		0.5885	0.87	0.79	0.83			753
0.7060	0.7894	0.7939	0.7931	0.67	0.67	0.67			945
			0.7420			0.70	46.25		
0.7147	0.6563		0.6855	0.41	0.43	0.42			341
0.6818	0.6608		0.6713	0.42	0.40	0.41			615
			0.6784			0.42	42.28		
0.6350	0.6147		0.6249	0.35	0.48	0.42	38.95		338
0.6240			0.6240	0.70	0.58	0.64			63
0.6868	0.7018		0.6943	0.51	0.53	0.52			1078
			0.6592			0.58	41.08		
0.9057	0.9039		0.9048	3.88	2.95	3.42	56.39		1188
0.7487	0.7728		0.7608	2.79	2.91	2.85			478
0.7012	0.7850		0.7881	2.15	2.28	2.22			1201
			0.7745			2.54	48.27		
1.0605	1.0825		1.0715	3.24	3.15	3.20	66.78		454
1.3020	1.3020		1.3020	8.00	8.61	8.31	81.14		460
1.2049	1.1949		1.1999	7.03	7.02	7.03	74.78	0.125 sap-wood	941
0.5954			0.5954	0.10	0.18	0.10			43
0.5940	0.5962		0.5951	0.76	0.98	0.87			521
0.4971	0.5301		0.5136	0.47	0.52	0.50		All sap-wood	803
0.4894 0.4789	0.4729 0.4825		0.4807	1.15	0.81	0.98		0.5 sap-wood	1094
			0.5462			0.64	34.04		
0.6000			0.6000	0.63	0.53	0.58	37.39		1256
0.5665	0.5678		0.5672	0.74	0.59	0.67	35.35	0.25 sap-wood	998
0.5805 0.5965	0.5604 0.5625		0.5750	0.70	0.68	0.60	35.83	Growth rapid	1101

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
49. Colubrina reclinata *Naked Wood.*	502	Florida	Umbrella Key	A. H. Curtiss	Coral	0.126	6	45
	1139	....do	....do	....do	....do	0.100	13	24
SAPINDACEÆ.								
50. Æsculus glabra *Ohio Buckeye. Fetid Buckeye.*	297	Missouri	Allenton	G. W. Letterman	Rich, moist			
	386	....do	....do	....do	Alluvial			
	427	Tennessee	Nashville	A. Gattinger	Rich, moist			
51. Æsculus flava *Sweet Buckeye.*	445	....do	....do	....do	Rich upland			
52. Æsculus Californica *California Buckeye.*	684	California	Marin county	G. R. Vasey	....do	0.250		
53. Ungnadia speciosa *Spanish Buckeye.*	944	Texas	New Braunfels	C. Mohr	Limestone	0.124	26	
54. Sapindus marginatus *Wild China. Soapberry.*	307	....do	Dallas	J. Reverchon	Rich, damp			
	589	....do	....do	....do	....do			
	824	New Mexico	Rio Gila cañon	E. L. Greene	....do			
	028	Texas	Austin	C. Mohr	Limestone	0.222	24	36
55. Sapindus Saponaria *Soapberry.*	568	Florida	Cape Sable	A. H. Curtiss	Rich, sandy, damp	0.134	41	
	1122	....do	Key Largo	....do	Coral			
56. Hypelate paniculata *Ink Wood. Iron Wood.*	463	....do	Upper Metacombe Key.	....do	....do	0.262	15	80
57. Hypelate trifoliata *White Iron Wood.*	464	....do	....do	....do	....do	0.224	13	72
58. Acer Pennsylvanicum *Striped Maple. Moose Wood. Striped Dogwood. Goose-foot Maple. Whistle Wood.*	99	Vermont	Huntingdon	C. G. Pringle	Gravelly			
	372	....do	....do	....do	....do			
50. Acer spicatum *Mountain Maple.*	98	....do	....do	....do	....do			
	371	....do	....do	....do	....do			
60. Acer macrophyllum *Broad-leaved Maple.*	982	Oregon	Portland	G. Englemann and C. S. Sargent.	Rich, alluvial	0.229	30	40
	1023	....do	Portland Furniture Company.	....do				
61. Acer circinatum *Vine Maple.*	962	....do	Portland	....do	Moist, alluvial			
	1013	....do	....do	....do	....do			
	1014	Washington territory.	Wilkeson	....do	....do			
62. Acer glabrum *Dwarf Maple.*	526	Colorado	Englemann's cañon	R. Douglas	Dry, gravelly	0.048	28	

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.8100	0.85[illegible]	....	0.8308	1.29	1.14	1.21	....	....	502
0.8046	0.8166	0.8112	0.8108	2.31	2.26	2.29	....	....	1130
			0.8208			1.75	51.15		
0.4270	0.4358	....	0.4314	1.01	1.00	1.01	....	....	297
0.4787	0.4625	....	0.4706	0.83	0.85	0.84	....	....	386
0.4606	....	....	0.4606	0.77	0.68	0.73	....	....	427
			0.4542			0.86	28.31		
0.4241	0.4307	....	0.4274	0.99	1.00	1.00	27.24	....	445
0.4921	0.5038	....	0.4980	0.66	0.73	0.70	31.04	....	681
0.6392	0.6272	....	0.6332	1.15	1.19	1.17	39.46	....	944
0.7520	0.7980	....	0.7750	1.42	1.27	1.35	....	....	307
0.8324	0.8616	....	0.8470	1.86	1.52	1.69	....	....	589
0.7978	0.8345	....	0.8162	1.44	....	1.44	....	....	824
0.7550	0.8522	0.8296	0.8123	1.54	1.52	1.53	....	....	928
			0.8126			1.50	50.64		
0.8595	0.8763	....	0.8670	3.82	3.30	3.56	....	....	568
0.7940	0.8024	0.8204	0.8056	5.00	5.25	5.13	....	....	1122
			0.8367			4.34	52.14		
0.9600	0.9465	....	0.9533	1.23	1.27	1.25	59.41	....	463
0.9656	0.8548	....	0.9102	1.35	1.41	1.38	56.72	....	464
0.5111	0.5119	....	0.5115	0.32	0.35	0.34	....	....	99
0.5564	0.5100	0.5780	0.5484	0.44	0.30	0.37	....	....	372
			0.5299			0.36	33.02		
0.5198	0.5205	....	0.5202	0.42	0.37	0.40	....	All sap-wood	98
0.5490	0.5528	0.5353	0.5457	0.48	0.41	0.45	....	....	371
			0.5330			0.43	33.22		
0.5057	0.5029	0.5254	0.5113	0.59	0.57	0.58	....	....	982
0.4323	0.5087	....	0.4705	0.49	0.49	0.49	....	....	1023
			0.4909			0.54	30.59		
0.6824	0.6720	....	0.6772	0.39	0.39	0.39	....	....	962
0.6587	0.6660	....	0.6624	0.35	0.37	0.36	....	....	1013
0.6370	0.6800	....	0.6585	0.41	0.44	0.43	....	....	1014
			0.6660			[illegible]	41.51		
0.6032	0.6023	....	0.6028	0.31	0.29	0.30	37.57	....	526

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
63. Acer grandidentatum	886	Utah	City Creek cañon	M. E. Jones	Moist, gravelly	0.050	12	
64. Acer saccharinum *Sugar Maple. Sugar Tree. Hard Maple. Rock Maple.*	105	Vermont		C. G. Pringle	Gravelly			
	203	Ohio	Woodsom Machine Company.	E. E. Barney				
	298	Missouri	Allenton	G. W. Letterman	Rich uplands			
	299	...do	...do	...do	... do			
	376	Vermont	Charlotte	C. G. Pringle	Gravelly			
	400	New England	Charlestown Navy-yard.	S. H. Pook				
	1233	Vermont	Charlotte	F. H. Horsford				
	1234	...do	...do	...do				
	1235	...do	...do	...do				
64. Acer saccharinum, *var.* **nigrum** *Black Sugar Mapl*	213	...do	...do	C. G. Pringle	Clay			
	274[1]	Missouri	Allenton	G. W. Letterman	Low, alluvial			
	274[2]	...do	...do	... do	Rich, alluvial			
	399	...do	...do	...do	Low, alluvial			
	440	Tennessee	Nashville	A. Gattinger	Rich			
	757	Florida	Chattahoochee	A. H. Curtiss	Clay	0.268	51	
	1167	Missouri	Allenton	G. W. Letterman	Rich, alluvial			
65. Acer dasycarpum *Soft Maple. White Maple. Silver Maple.*	103	Vermont	Charlotte	C. G. Pringle	Swampy			
	367	...do	...do	...do	...do			
	448	Missouri	Allenton	G. W. Letterman				
	1052	Massachusetts	Topsfield	J. Robinson	Low meadow			
66. Acer rubrum *Red Maple. Swamp Maple. Soft Maple. Water Maple.*	20	...do	Arnold Arboretum	C. S. Sargent	Drift	0.285	18	36
	530	Mississippi	Kemper's mill	C. Mohr	Rich, swampy	0.222	41	
	743	Georgia	Bainbridge	A. H. Curtiss	Low	0.252	22	54
	878	Massachusetts	Danvers	J. Robinson	... do	0.168	30	3
	1048	...do	North Reading	... do	... do	0.204	60	6
66. Acer rubrum, *var.* Drummondii	1239	Missouri	Poplar Bluff	G. W. Letterman				
	1240	...do	...do	...do				
67. Negundo aceroides *Box Elder. Ash-leaved Maple.*	290	Missouri	Allenton	G. W. Letterman	Rich bottom			
	311	Texas	Dallas	J. Reverchon	...do			
68. Negundo Californicum *Box Elder.*	645	California	Contra Costa county	G. R. Vasey	Rich, moist	0.240	14	
ANACARDIACEÆ.								
69. Rhus cotinoides *Chittam Wood.*	1176	Alabama	Huntsville	C. Mohr	Rich loam			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

SPECIFIC GRAVITY DETERMINATIONS.				ASH DETERMINATIONS.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.7012	0.6791	....	0.6902	0.66	0.61	0.64	43.01	....	886
0.6139	0.6003	....	0.6071	0.44	0.40	0.42	....	....	105
0.6363	0.6300	....	0.6332	0.51	0.45	0.48	....	....	203
0.7697	0.8098	....	0.7898	0.54	0.59	0.57	....	....	298
0.7828	0.7689	....	0.7759	0.60	0.57	0.59	....	....	299
0.6538	0.6783	....	0.6661	0.03	1.10	1.02	....	....	376
0.6242	....	....	0.6242	0.36	0.44	0.40	....	....	409
0.7106	....	....	0.7106	0.91	0.33	0.62	....	....	1233
0.6893	0.6899	....	0.6896	0.33	0.29	0.31	....	....	1234
0.7239	....	....	0.7239	0.48	0.35	0.42	....	....	1235
			0.6912			0.54	43.08		
0.7319	0.6935	0.6639	0.6964	1.48	1.01	1.25	....	....	213
0.7249	0.6980	....	0.7115	0.56	....	0.56	....	....	274[1]
0.7214	0.7002	....	0.7108	0.52	....	0.52	....	....	274[2]
0.7117	0.6709	....	0.6958	0.70	0.56	0.63	....	....	399
0.6410	0.6429	....	0.6419	1.31	1.02	1.17	....	....	440
0.6868	0.7008	0.7165	0.7014	0.55	0.33	0.44	....	....	757
0.6814	0.6840	....	0.6827	0.42	0.36	0.39	....	....	1167
			0.6915			0.71	43.09		
0.4889	0.5254	....	0.5072	0.31	0.32	0.32	....	....	103
0.4860	0.4828	....	0.4844	0.30	0.31	0.31	....	....	367
0.4760	0.5062	....	0.4911	0.40	0.42	0.41	....	....	448
0.6247	0.6163	0.6344	0.6251	0.29	0.27	0.28	....	....	1052
			0.5269			0.33	32.84		
0.6761	0.6845	....	0.6803	0.24	0.25	0.25	....	All sap-wood	20
0.5770	0.6064	....	0.5917	0.43	0.42	0.43	....	....	530
0.5288	0.5510	0.5601	0.5466	0.49	0.49	0.49	....	....	743
0.6397	0.6496	0.6406	0.6433	0.32	0.33	0.33	....	Second and third sp. gr. determinations made on sap-wood	878
0.6374	0.6185	0.6260	0.0273	0.38	0.32	0.35	....	....	1048
			0.6178			0.37	38.50		
0.5563	....	....	0.5563	0.31	0.31	0.31	....	....	1239
0.5355	....	....	0.5355	0.36	0.36	0.36	....	....	1240
			0.5459			0.34	34.02		
0.4332	0.4288	....	0.4310	0.76	1.22	0.09	....	....	290
0.4217	0.4474	....	0.4346	1.01	1.30	1.16	....	....	311
			0.4328			1.07	26.97		
0.4786	0.4856	....	0.4821	0.51	0.57	0.54	30.04	....	645
0.6196	0.6393	0.6686	0.6425	0.48	0.51	0.50	40.04	....	1176

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH. Sap-wood.	LAYERS OF GROWTH. Heart-wood.
70. Rhus typhina. *Staghorn Sumach.*	158	Vermont	Hinesburgh	C. G. Pringle	Gravelly			
	1060	Massachusetts	Danvers	J. Robinson	...do	0.120	2	34
71. Rhus copallina. *Dwarf Sumach.*	70	Missouri	Allenton	G. W. Letterman	Moist limestone			
	610	Georgia	Lower Altamaha river.	A. H. Curtiss	Dry, clay			
	736	Florida	Chattahoochee river.	...do	...do	0.175	5	19
71. Rhus copallina, *var.* lanceolata	330	Texas	Dallas	J. Reverchon	Dry, gravelly			
72. Rhus venenata. *Poison Sumach. Poison Elder.*	876	Massachusetts	Danvers	J. Robinson	Wet, swampy	0.070	1	20
	1037	...do	...do	...do	...do	0.085	4	16
	1041	...do	...do	...do	...do	0.067	4	27
73. Rhus Metopium. *Poison Wood. Coral Sumach. Mountain Manchineel. Bum Wood. Hog Plum. Doctor Gum.*	467	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	0.222	39	39
LEGUMINOSÆ.								
75. Eysenhardtia orthocarpa	1147	Arizona	Santa Rita mountains.	C. G. Pringle	Dry, rocky			
76. Dalea spinosa	1070	California	Agua Caliente	Parish Brothers	Dry, sandy			
77. Robinia Pseudacacia. *Locust. Black Locust. Yellow Locust.*	405		Charlestown Navy-yard.	S. H. Peek				
	441	Tennessee	Nashville	A. Gattinger	Limestone			
	815	West Virginia	Grafton	C. G. Pringle				
	845	Massachusetts	Danvers	J. Robinson	Gravelly	0.184	4	35
78. Robinia viscosa. *Clammy Locust.*	1061	...do	...do	...do	Loam	0.060	4	8
79. Robinia Neo-Mexicana. *Locust.*	1031	Colorado	Trinidad	W. B. Strong	Low, moist			
80. Olneya Tesota. *Iron Wood. Arbol de Hierro.*	650	California	Lower Colorado valley.	G. Engelmann and C. S. Sargent.	Dry, gravelly			
81. Piscidia Erythrina. *Jamaica Dogwood.*	564	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral			
82. Cladrastis tinctoria. *Yellow Wood. Yellow Ash. Gopher Wood.*	33	Kentucky	Mercer county	W. M. Linney	Limestone			
	439	Tennessee	Nashville	A. Gattinger	Alluvial			
83. Sophora secundiflora. *Frigolito.*	040	Texas	New Braunfels	C. Mohr	Limestone			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations. First.	Second.	Third.	Average.	Ash determinations. First.	Second.	Average.	Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
0.4476	0.4593	....	0.4535	0.43	0.54	0.49	....	....	158
0.4079 0.3912	0.4855 0.3869	....	0.4179	0.52	0.52	0.52	....	....	1060
			0.4357			0.50	27.15		
0.4997	0.5080	....	0.5039	0.62	0.62	0.62	....	....	70
0.5478	0.5579	....	0.5529	0.63	0.56	0.60	....	....	610
0.5472	0.4910	0.5367	0.5250	0.55	0.60	0.57	....	....	730
			0.5273			0.60	32.86		
0.5131	0.5236	....	0.5184	0.89	0.80	0.85	32.31	....	330
0.4383 0.4192	0.4362 0.4368	....	0.4326	0.90	0.88	0.89	....	....	876
0.4365 0.4535	0.4322 0.4449	....	0.4418	0.49	0.49	0.49	....	....	1037
0.4259	0.4511	0.4440	0.4403	0.50	0.60	0.55	....	....	1041
			0.4382			0.64	27.31		
0.8106	0.7728	....	0.7917	2.31	2.47	2.30	49.34	....	467
0.8091	0.8884	0.8646	0.8740	1.29	1.28	1.28	54.47	0.125 sap-wood............	1147
0.5714 0.5285	0.5904 0.5241	....	0.5536	3.41	4.68	4.04	34.50	First, second, and third sp. gr. determinations made on sap-wood; fourth sp. gr. determination made on 0.1 sap-wood.	1070
0.7550	0.7004	....	0.7727	0.22	0.26	0.24	....	....	405
0.7908	....	....	0.7908	1.26	1.12	1.10	....	....	441
0.6490	0.6387	....	0.6430	0.35	....	0.35	....	....	815
0.7410	0.7279	0.7087	0.7259	0.22	0.25	0.24	....	Third sp. gr. determination made on sap-wood. Cultivated	845
			0.7333			0.51	45.70		
0.8130 0.7942	0.8017 0.8287	....	0.8094	0.22	0.19	0.20	50.44	0.125 sap-wood. Cultivated	1061
0.7988	0.7855	0.8258	0.8034	0.62	0.58	0.60	50.07	....	1031
0.8953 1.1542	0.9600 1.1542	1.1374	1.0602	1.85 2.75	2.15 2.43	2.29	66.07	....	650
0.8770	0.8689	....	0.8734	3.42	3.34	3.38	54.43	....	564
0.6072	0.6485	....	0.6278	0.21	0.17	0.19	....	....	33
0.6277	....	....	0.6277	0.39	0.36	0.38	....	....	439
			0.6278			0.28	39.12		
1.0310	6.9800	0.0325	0.9842	1.44	1.74	1.59	61.34	First and second sp. gr. determinations made on sap-wood ...	940

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth. Sap-wood.	Heart-wood.
84. Sophora affinis	329	Texas	Dallas	J. Reverchon	Dry, calcareous			
	932	...do	Austin	C. Mohr	...do	0.064	10	16
85. Gymnocladus Canadensis *Kentucky Coffee Tree. Coffee Nut.*	296	Missouri	Allenton	G. W. Letterman	Low, rich			
	402	...do	...do	...do	Alluvial			
	519	Tennessee	Nashville	A. Gattinger	Limestone			
86. Gleditschia triacanthos *Honey Locust. Black Locust. Three-thorned Acacia. Sweet Locust. Honey Shucks.*	53[1]	Missouri	Allenton	G. W. Letterman	Low, rich			
	53[2]	...do	...do	...do	...do			
	444	Tennessee	Nashville	A. Gattinger	Dry, sandy barren			
87. Gleditschia monosperma *Water Locust.*	760	Florida	Chattahoochee river.	A. H. Curtiss	Alluvial	0.294	21	26
88. Parkinsonia Torreyana *Green-bark Acacia. Palo Verde.*	678	Arizona	Lower Colorado river.	G. Engelmann and C. S. Sargent.	Sandy			
89. Parkinsonia microphylla	1258	...do	Valley of the Gila river.	C. G. Pringle				
90. Parkinsonia aculeata	829	Florida		Department of Agriculture.				
	1208	Texas	Austin	S. B. Buckley				
91. Cercis Canadensis *Redbud. Judas Tree.*	59	Missouri	Allenton	G. W. Letterman	Low, rich	0.260	5	35
	436	Tennessee	Nashville	A. Gattinger	Limestone			
	1089	Missouri	Allenton	G. W. Letterman	Rich			
	1090	...do	...do	...do	...do			
	1091	...do	...do	...do	...do			
92. Cercis reniformis *Redbud.*	1142	Texas	Austin	S. B. Buckley	Limestone			
93. Prosopis juliflora *Mesquit. Algaroba. Honey Locust. Honey Pod.*	561	...do	Fort Stockton	B. L. Baldridge	Light, sandy			
	590	Arizona	Tucson	C. S. Sargent				
	680	...do	...do	...do				
	927	Texas	Austin	C. Mohr	Rich, calcareous			
94. Prosopis pubescens *Screw Bean. Screw-pod Mesquit. Tornilla.*	600	California	Fort Yuma	G. Engelmann and C. S. Sargent.				
	658	...do	...do	...do	Sandy			
	998	...do	...do	...do		0.064	8	
95. Leucæna glauca	1224	Mexico	Lampasas mountains	S. B. Buckley				
96. Leucæna pulverulenta	1222	Texas	Brownsville	...do	Sandy			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.8019	0.8161	....	0.8090	0.42	0.34	0.38	....	0.25 sap-wood	329
0.8540	0.9316	....	0.8928	1.04	1.13	1.09	....	0.5 sap-wood	932
			0.8509			0.73	53.03		
0.6700	0.6786	....	0.6743	0.70	0.57	0.64	....		296
0.6663	....	....	0.6663	0.45	0.50	0.48	....		402
0.7395	....	....	0.7395	0.98	0.82	0.90	....		519
			0.6934			0.67	43.21		
0.7330	0.7359	....	0.7345	0.55	0.61	0.58	....		53[1]
0.6418	0.6275	....	0.6346	0.69	....	0.69	....		53[2]
0.6528	....	....	0.6528	1.29	0.98	1.14	....		444
			0.6740			0.80	42.00		
0.7509	0.7245	0.7272	0.7342	0.66	0.79	0.73	45.76	First sp. gr. determination made on sap-wood	760
0.6330	0.6732	....	0.6531	1.25	1.00	1.12	40.70	Second sp. gr. determination made on sap wood	678
0.7176	0.7722	....	0.7449	4.20	3.08	3.64	49.75		1258
0.6325	....	....	0.6325	2.32	2.26	2.29	....		829
0.5848	0.5968	....	0.5908	2.17	2.51	2.34	....		1208
			0.6116			2.32	38.11		
0.6104	0.6070	0.6157	0.6110	0.59	0.56	0.58	....		50
0.7098	....	....	0.7098	0.67	0.67	0.67	....		436
0.6254	0.5959	....	0.6107	0.80	0.77	0.79	....		1089
0.6493	0.6084	....	0.6289	0.82	0.74	0.78	....		1090
0.6000	0.6117	....	0.6213	0.67	0.84	0.76	....		1091
			0.6363			0.72	39.65		
0.7392	0.7645	0.7502	0.7513	0.76	0.77	0.77	46.82	First and second sp. gr. determinstions made on half sap wood	1142
0.8322	0.8664	....	0.8493	3.35	2.69	3.02	....	Root	561
0.7137	0.6997	....	0.7067	1.67	1.71	1.69	....		590
0.7247	0.7726	....	0.7487	1.45	2.49	1.97	....		680
0.7478	0.7620	0.7587	0.7562	2.09	2.00	2.05	....	0.05 sap-wood	927
			0.7652			2.18	47.13		
0.7772	0.7910	....	0.7841	1.02	0.98	1.00	....	Dead tree; 0.75 sap-wood	600
0.7527	0.7930	....	0.7729	0.91	0.90	0.91	....	All sap-wood	658
0.7237	0.7278	....	0.7258	0.95	....	0.95	....	All sap-wood	998
			0.7609			0.95	47.42		
0.9265	0.9205	....	0.9235	3.27	3.31	3.29	57.55		1224
0.6655	0.6809	....	0.6732	0.90	1.13	1.01	41.95		1222

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
97. Acacia Wrightii *Cat's Claw.*	1209	Texas	Austin	S. B. Buckley				
98. Acacia Greggii *Cat's Claw.*	598	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, gravelly			
	697	...do	...do	...do	...do			
	893	...do	Clifton	E. L. Greene				
100. Lysiloma latisiliqua *Wild Tamarind.*	500	Florida	Boca Chica Key	A. H. Curtiss	Coral	0.202	14	29
	1112	...do	Key Largo	...do	...do			
101. Pithecolobium Unguis-cati *Cat's Claw.*	465	...do	Upper Metacombe Key.	...do	...do			
	1108	...do	Bahia Honda Key	...do	...do			
ROSACEÆ.								
102. Chrysobalanus Icaco *Cocoa Plum.*	480	...do	Bay Biscayne	A. H. Curtiss	Swampy	0.100	47	
103. Prunus Americana *Wild Plum. Canada Plum. Horse Plum.*	68	Missouri	Allenton	G. W. Letterman	Rich uplands			
	220	Vermont	Charlotte	C. G. Pringle	Gravelly			
	334	Texas	Dallas	J. Reverchon	Rich			
104. Prunus angustifolia *Chickasaw Plum. Hog Plum.*	435	Tennessee	Nashville	A. Gattinger	River bluff			
105. Prunus Pennsylvanica *Wild Red Cherry. Pin Cherry. Pigeon Cherry.*	233	Vermont	Charlotte	C. G. Pringle	Cold, gravelly			
106. Prunus umbellata *Sloe. Black Sloe.*	600	Georgia	Altamaha river	A. H. Curtiss	Clay	0.216	21	24
107. Prunus emarginata, *var.* mollis	968	Washington territory.	Wilkeson	G. Engelmann and C. S. Sargent.	Low, rich			
108. Prunus serotina *Wild Black Cherry. Rum Cherry.*	15	Massachusetts	Roxbury	C. S. Sargent	Gravelly	0.205	9	31
	106	Vermont	Charlotte	C. G. Pringle	...do			
	115	Michigan	Dansville	W. J. Beal	...do			
	127	Missouri	Allenton	G. W. Letterman	Rich loam			
	148	Illinois	Waukegan	R. Douglas	Gravelly			
	198	Ohio	Barney & Smith Manufacturing Co.	E. E. Barney				
	317	Michigan	Hersey	W. J. Beal	Rich			
	368	Vermont	Charlotte	C. G. Pringle	Gravelly			
	405	Virginia or Middle states.	Charlestown Navy-yard.	S. H. Pook				
	725	Pennsylvania	Williamsport	C. G. Pringle				
	763	Florida	Chattahoochee river.	A. H. Curtiss	Clay	0.218	15	48
	1053	Massachusetts	Topsfield	J. Robinson	Gravelly	0.320	11	33
109. Prunus Capuli *Wild Cherry.*	294	New Mexico	Pinos Altos mountains.	E. L. Greene	Alluvial	0.238	7	12
	418	...do	...do	...do	...do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.9380	0.9404		0.9392	0.68	0.57	0.63	58.53		1209
0.8703			0.8703	0.68	0.89	0.79		0.05 sap-wood	598
0.8162	0.8616		0.8389	0.95		0.95		0.05 sap-wood	697
0.8558			0.8558	1.00		1.00			893
			0.8550			0.91	53.28		
0.6033	0.5663		0.5848	2.00	2.44	2.22			509
0.6901	0.7159	0.6901	0.6987	1.98	2.07	2.03		Rongh bark	1112
			0.6418			2.12	40.00		
0.8829	0.8349		0.8589	2.48	2.25	2.37			465
0.8885	1.0135		0.9510	3.00	2.09	2.55			1108
			0.9049			2.46	56.39		
0.7290	0.8129		0.7709	0.87	0.87	0.87	48.04		480
0.6750	0.6745		0.6748	0.11	0.09	0.10			68
0.7035	0.6800		0.6918	0.17	0.21	0.19			220
0.7876	0.8079		0.7978	0.33	0.21	0.27			334
			0.7215			0.18	44.96		
0.6675	0.7092		0.6884	0.28	0.28	0.28	42.90		435
0.5014	0.5031		0.5023	0.36	0.43	0.40	31.30		233
0.8162	0.8242		0.8202	0.14	0.10	0.12	51.11		606
0.4310	0.4694		0.4502	0.18	0.23	0.21	28.06		908
0.7047	0.7079		0.7063	0.13	0.14	0.14		0.5 sap-wood	15
0.5525	0.5539		0.5532	0.13	0.11	0.12			106
0.5809	0.4832		0.5321	0.12	0.15	0.14			115
0.6736	0.6235		0.6486	0.19	0.17	0.18			127
0.6473	0.6508		0.6491	0.11	0.13	0.12			148
0.5675	0.5659		0.5667	0.13	0.11	0.12			198
0.5373	0.5186		0.5280	0.19	0.17	0.18			317
0.5131	0.5351		0.5241	0.14	0.17	0.16			368
0.4680			0.4680	0.06	0.09	0.08			406
0.5734	0.5777		0.5756	0.09	0.10	0.10			725
0.5755	0.5221		0.5488	0.17	0.34	0.25			703
0.6833	0.6857	0.6880	0.6857	0.15	0.17	0.16			1053
			0.5822			0.15	36.28		
0.7282	0.6940		0.7111	0.16	0.12	0.14			294
0.8459	0.8837		0.8648	0.28	0.26	0.27		0.33 sap-wood	418
			0.7879			0.20	49.10		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
110. Prunus demissa *Wild Cherry.*	637	California	Strawberry valley	G. Engelmann and C. S. Sargent.	Low, rich			
111. Prunus Caroliniana *Wild Orange. Mock Orange. Wild Peach.*	549	Alabama	Mobile	C. Mohr	Sandy			
	806	Florida	Jacksonville	A. H. Curtiss	...do	0.171	8	61
	916	...do	Chattahoochee	C. Mohr	Alluvial	0.202	12	50
	1032	...do	Jacksonville	A. H. Curtiss	Sandy			
	1062	Texas	Victoria	C. Mohr	Rich, moist	0.180	26	34
112. Prunus sphærocarpa	1217	Florida	Edge of Everglades.	A. H. Curtiss	Rocky			
113. Prunus ilicifolia *Islay.*	1158	California	Santa Cruz	C. L. Anderson		0.206	80	
114. Vauquelinia Torreyi	1152	Arizona	Santa Rita mountains.	C. G. Pringle				
115. Cercocarpus ledifolius *Mountain Mahogany.*	883	Utah	City Creek cañon	M. E. Jones	Rocky			
	904			Department of Agriculture.				
116. Cercocarpus parvifolius *Mountain Mahogany.*	825	California	Siskiyou county	G. Engelmann and C. S. Sargent.		0.062	3	27
117. Pyrus coronaria *American Crab. Sweet-scented Crab.*	808	Delaware	Kiamensi	W. M. Canby	Clay			
	1087	Pennsylvania	Nazareth	J. Henry	Moist			
	1088	...do	...do	...do	...do			
118. Pyrus angustifolia *American Crab Apple. Southern Crab Apple.*	313	South Carolina	Aiken	H. W. Ravenel	Rich, damp	0.130	25	
119. Pyrus rivularis *Oregon Crab Apple.*	1002	Oregon	Portland	G. Engelmann and C. S. Sargent.	Rich hills	0.186		
120. Pyrus Americana *Mountain Ash.*	214	Vermont	Charlotte	C. G. Pringle	Gravelly			
	365	..do	Huntingdon	...do	...do			
121. Pyrus sambucifolia *Mountain Ash.*	410	...do	Mount Mansfield	...do	...do	0.106	17	
122. Cratægus rivularis	885	Utah	City Creek cañon	M. E. Jones	...do	0.064	14	13
123. Cratægus Douglasii	999	Oregon	Cascades of the Columbia river.	G. Engelmann and C. S. Sargent.	Rich	0.200	29	
124. Cratægus brachyacantha *Hogs' Haw.*	926	Louisiana	Webster parish	C. Mohr	Clay			
125. Cratægus arborescens	363^1	South Carolina	Aiken	H. W. Ravenel	Rich			
	363^2	...do	...do	...do	...do			
	607	Georgia	Ogeechee	A. H. Curtiss	Low	0.108	40	

OF DRY SPECIMENS OF WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.7025	0.6937	0.6890	0.6951	0.51	0.48	0.50	43.32	....	637
0.9515	0.9855	....	0.9685	0.32	0.33	0.33	....	....	549
0.8874	0.8227	0.8314	0.8472	0.39	0.37	0.38	....	....	806
0.7766	0.7797	....	0.7782	0.44	0.44	0.44	....	....	916
0.8660	0.8721	....	0.8691	0.46	0.49	0.48	....	....	1032
0.9030	0.8610	0.8790	0.8810	0.43	0.43	0.43	....	....	1062
			0.8688			0.41	54.14		
0.9062	0.8934	....	0.8998	0.97	0.70	0.87	56.07	....	1217
0.9885	0.9720	....	0.9803	0.80	0.76	0.78	61.09	....	1158
1.1340	1.1408	....	1.1374	1.44	1.46	1.45	70.88	....	1152
1.0608	1.0332	1.0400	1.0447	1.27	1.12	1.19	....	0.125 sap-wood..........	883
1.0950	1.1080	....	1.1015	1.09	0.69	0.89	....	....	904
			1.0731			1.04	66.87		
0.9365	....	....	0.9365	0.45	....	0.45	58.36	....	825
0.6973	0.7228	0.7320	0.7174	0.52	0.48	0.60	....	....	808
0.6640	0.6762	0.6788	0.6730	0.60	0.38	0.44	....	....	1087
0.7402	0.7266	0.7057	0.7240	0.49	0.75	0.62	....	....	1088
			0.7048			0.52	43.92		
0.6945	0.6845	....	0.6895	0.33	0.33	0.33	42.97	....	313
0.8266	0.8366	....	0.8316	0.41	0.41	0.41	51.82	....	1002
0.5345	0.5429	0.5539	0.5438	0.98	1.23	1.11	....	....	214
0.5512	0.5416	....	0.5464	0.50	0.56	0.56	....	0.25 sap-wood..........	305
			0.5451			0.83	33.97		
0.5893	0.5963	....	0.5928	0.39	0.31	0.35	36.94	Sap-wood..........	410
0.7672	0.7734	....	0.7703	0.33	0.37	0.35	48.00	....	885
0.7025	0.6928	0.6898	0.6950	0.29	0.36	0.33	43.31	....	909
0.6750	0.6835	....	0.6793	0.37	0.46	0.42	42.33	....	020
0.6366 0.6093	0.6230 0.6225	....	0.6228	0.63	0.70	0.67	....	....	363[1]
0.6263	0.6590	....	0.6427	0.38	....	0.38	....	....	363[2]
0.6934	0.6699	....	0.6817	0.62	0.68	0.65	....	....	607
			0.6491			0.57	40.45		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
126. Cratægus Crus-galli *Cockspur Thorn. Newcastle Thorn.*	328	Massachusetts	Brookline	J. Robinson	Loam	0.180		
	1093	Missouri	Allenton	G. W. Letterman	Low, wet			
127. Cratægus coccinea *Scarlet Haw. Red Haw. White Thorn.*	100	Vermont	Monkton	C. G. Pringle	Gravelly			
128. Cratægus subvillosa *Scarlet Haw.*	949	Texas	Victoria	C. Mohr	Alluvial	0.180	61	
	1081	Missouri	Saint Louis	H. Eggert		0.106	28	
129. Cratægus tomentosa *Black Thorn. Pear Haw.*	154	Vermont	Charlotte	C. G. Pringle	Clay			
	426	Tennessee	Nashville	A. Gattinger	Limestone			
130. Cratægus cordata *Washington Thorn.*	447	do	do	do	Low			
131. Cratægus apiifolia *Parsley Haw.*	759	Florida	Chattahoochee	A. H. Curtiss	Alluvial	0.080	27	
132. Cratægus spathulata *Small-fruited Haw.*	300	South Carolina	Aiken	H. W. Ravenel	Rich, damp			
	614	Georgia	Ogeechee river	A. H. Curtiss	Low	0.880	38	
134. Cratægus æstivalis *May Haw. Apple Haw.*	239	South Carolina	Bonneau's Depot	H. W. Ravenel	Damp, rich			
135. Cratægus flava *Summer Haw. Yellow Haw.*	301	do	Aiken	do	Dry, fertile	0.224	58	
	569	Florida	Tampa	A. H. Curtiss	Sandy			
135. Cratægus flava, *var.* pubescens. *Summer Haw. Red Haw.*	767	do	Aspalaga	do	Dry clay	0.142	44	
136. Heteromeles arbutifolia *Toyon. Tollon. California Holly.*	1160	California	Santa Cruz	C. L. Anderson		0.184	21	34
137. Amelanchier Canadensis *Juneberry. Shad Bush. Service Tree. May Cherry.*	150	Vermont	Charlotte	C. G. Pringle	Gravelly			
	241	Kentucky	Brumfield Station	W. M. Linney	Waverly shale	0.140	34	69
	849	Massachusetts	Danvers	J. Robinson	Loam	0.190	43	21
HAMAMELACEÆ.								
138. Hamamelis Virginica *Witch Hazel.*	867	do	Beverly	do	Rocky			
	875	do	Danvers	do	do			
	1259	Tennessee	Montvale	A. H. Curtiss				
139. Liquidambar Styraciflua *Sweet Gum. Star-leaved Gum. Liquidamber. Red Gum. Bilsted.*	546	Alabama	Kemper's mill	C. Mohr	Rich, alluvial			
	[illegible]	Arkansas	Little Rock	G. W. Letterman				
	[illegible]	New Jersey	Mount Holly	S. P. Sharples	Clay	0.208	30	17
	1181	Mississippi	Yazoo River bottom	R. Abbey	Alluvial			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

SPECIFIC GRAVITY DETERMINATIONS.				ASH DETERMINATIONS.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.6590	0.67[illegible]	0.6632	0.6642	0.57	0.55	0.56	....	Cultivated	328
0.7781	0.7667	0.7791	0.7746	0.49	0.60	0.55	....	....	1093
			0.7194			0.56	44.83		
0.8654	0.8582	....	0.8618	0.36	0.40	0.38	53.71	....	100
0.7909	0.7144	....	0.7527	0.77	0.78	0.78	....	....	949
0.8376	0.8382	....	0.8379	0.54	0.68	0.61	....	....	1081
			0.7953			0.69	49.56		
0.7649	0.7712	....	0.7681	0.50	0.44	0.47	....	....	154
0.8059	0.7110	....	0.7585	0.53	0.51	0.52	....	....	426
			0.7633			0.50	47.57		
0.7105	0.7481	....	0.7293	0.48	0.44	0.46	45.45	....	447
0.7506	0.7400	....	0.7453	0.72	1.22	0.97	46.45	....	739
0.7524	0.7698	....	0.7611	0.71	0.67	0.69	....	....	300
0.6716	0.6700	....	0.6708	0.60	0.63	0.62	....	....	614
			0.7159			0.66	44.61		
0.6625	0.6503	....	0.6564	0.57	0.56	0.57	40.91	....	239
0.7724	0.7620	....	0.7672	0.82	0.94	0.88	....	....	301
0.8172	0.7718	....	0.7945	0.65	0.73	0.69	....	....	569
			0.7809			0.79	48.67		
0.7770	0.7596	....	0.7683	0.91	0.91	0.91	47.83	....	767
0.9610	0.9042	....	0.9326	0.62	0.46	0.54	58.18	....	1160
0.6074	0.7642	....	0.6858	0.61	0.64	0.63	....	First sp. gr. determination made on 0.75 sap-wood; second sp. gr. determination made on 0.5 sap-wood.	156
0.7904	0.7944	....	0.7924	0.42	0.53	0.48	....	0.25 sap-wood	241
0.8600	0.9028	0.8570	0.8733	0.65	0.45	0.55	....	First and third sp. gr. determinations made on 0.9 sap-wood; second sp. gr. determination made on sap-wood.	849
			0.7838			0.55	48.85		
0.7067 0.7081	0.7393 0.7826	....	0.7342	0.43	0.44	0.44	....	....	867
0.6662 0.7028	0.7828 0.6985	....	0.7126	0.27	0.33	0.30	....	....	875
0.6099	....	....	0.6099	0.32	0.30	0.36	....	....	1250
			0.6856			0.37	42.72		
0.6415	0.6176	....	0.6295	0.47	0.49	0.48	....	....	546
0.5773	[illegible]	....	0.5719	0.48	0.73	0.61	....	....	1005
0.5841	0.5991	....	0.5916	0.29	0.34	0.32	....	All sap-wood	1173
0.5605	0.5549	0.5692	0.5615	0.67	0.66	0.67	....	....	1181

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
139. Liquidambar Styraciflua—continued	1182	Mississippi	Yazoo River bottom	R. Abbey	Alluvial			
	1183	do	do	do	do			
RHIZOPHORACEÆ.								
140. Rhizophora Mangle *Mangrove.*	485	Florida	Bay Biscayne	A. H. Curtiss	Salt-marsh	0.250	31	50
COMBRETACEÆ.								
141. Conocarpus erecta *Button Wood.*	489	do	do	do	do	0.164	15	34
142. Laguncularia racemosa *White Button Wood. White Mangrove.*	507	do	Sugar-loaf Sound	do	do			
MYRTACEÆ.								
143. Calyptranthes Chytraculia	1265	do	Key Largo	do	Coral			
144. Eugenia buxifolia *Gurgeon Stopper. Spanish Stopper.*	456	do	Upper Matacombe Key.	do	do	0.084	43	
	1118	do	Lost Man's river	do	Humus and coral			
	1120	do	Elliott's Key	do	Coral			
	1198	do	Upper Matacombe Key.	do	do			
145. Eugenia dichotoma *Naked Wood.*	566	do	Caximbas pass	do	Sandy	0.084	5	53
	1200	do	Palm Hummock	do	Coral			
146. Eugenia monticola *Stopper. White Stopper.*	1115	do	Umbrella Key	do	do	0.150	15	
	1135	do	do	do	do			
	1189	do	do	do	do			
147. Eugenia longipes *Stopper.*	1197	do	No-Name Key	do	do			
148. Eugenia procera *Red Stopper.*	1127	do	Miami	do	do	0.141	87	
CACTACEÆ.								
149. Cereus giganteus *Suwarrow. Saguaro. Giant Cactus.*	693	Arizona	Tucson	G. Engelmann and C. S. Sargent.	Dry, gravelly			
CORNACEÆ.								
150. Cornus alternifolia *Dogwood.*	860	Massachusetts	Danvers	J. Robinson	Loam			
	861	do	do	do	do			
151. Cornus florida *Flowering Dogwood. Box Wood.*	67	Missouri	Allenton	G. W. Letterman	Uplands	0.143	47	
	701	Florida	Chattahoochee	A. H. Curtiss	Calcareous	0.128	72	
	812	West Virginia	Grafton	C. G. Pringle	Dry			
	1077	Missouri	Allenton	G. W. Letterman	Gravelly	0.122	44	7
	1092	do	do	do	Flinty			
152. Cornus Nuttallii *Flowering Dogwood.*	960	Oregon	Portland	G. Engelmann and C. S. Sargent.				

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.6125	0.5891	0.6256	0.6091	0.72	0.77	0.75	....	....	1182
0.5825	0.5765	0.5878	0.5823	0.85	0.77	0.81	....	....	1183
			0.5910			0.01	36.83		
1.1391	1.1842	....	1/1617	1.80	1.83	1.82	72.40	....	485
0.0939	0.9860	....	0.9900	0.32	0.32	0.32	61.70	....	489
0.7100	0.7174	....	0.7137	1.69	1.54	1.62	44.48	....	507
0.8930	0.9282	0.8765	0.8992	3.04	3.59	3.32	56.04	....	1205
0.8753	....	....	0.8753	1.11	1.26	1.19	....	....	456
1.0625	1.0400	....	1.0513	1.19	1.05	1.12	....	....	1118
0.8645	0.8540	1.0200	0.9128	2.23	2.15	2.19	....	....	1120
0.8857	0.9232	....	0.9045	1.66	1.38	1.52	....	....	1198
			0.9360			1.50	58.33		
0.8526	0.8392	....	0.8459	0.85	0.91	0.88	....	....	566
0.9542	0.9472	....	0.9507	0.58	0.60	0.59	....	....	1200
			0.8983			0.74	55.98		
0.8910	0.9110	....	0.9010	2.05	1.95	2.00	....	....	1115
0.9180	0.9340	0.9202	0.9241	1.60	1.05	1.77	....	....	1135
0.9140	0.9295	....	0.9217	1.83	1.99	1.91	....	....	1189
			0.9156			1.89	57.06		
1.1450	1.1020	....	1.1235	3.36	3.60	3.48	70.02	....	1197
0.9425	0.9482	....	0.9453	2.44	2.79	2.62	58.91	....	1127
0.3259	0.3116	....	0.3188	3.89	3.01	3.45	19.87	....	693
0.6572	0.6748	0.6048	0.6456	0.43	0.41	0.42	....	All sap-wood	860
0.6987	0.6932	0.6893	0.6937	0.39	0.43	0.41	....	All sap-wood	861
			0.6696			0.41	41.73		
0.8264	0.8264	....	0.8264	0.51	0.60	0.56	....	....	67
0.7599	0.7710	....	0.7655	0.75	0.84	0.80	....	....	761
0.7892	0.7863	....	0.7878	0.73	0.83	0.78	....	....	812
0.8690	0.8916	....	0.8803	0.66	0.58	0.62	....	....	1077
0.8114	0.8215	....	0.8165	0.62	0.60	0.61	....	....	1092
			0.8153			0.67	50.81		
0.7487	0.7474	....	0.7481	0.48	0.52	0.50	46.62	....	960

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH. Sap-wood.	Heart-wood.
153. Nyssa capitata. *Ogeechee Lime. Sour Tupelo. Gopher Plum.*	605	Georgia	Ogeechee river	A. H. Curtiss	Swampy	0.220	27	
154. Nyssa sylvatica. *Tupelo. Sour Gum. Pepperidge. Black Gum.*	235	South Carolina	Bonneau's Depot	H. W. Ravenel	Muck			
	517	Tennessee	Cumberland river	A. Gattinger				
	608	Georgia	Ogeechee river	A. H. Curtiss	Muck	0.220	49	
	750	Florida	Chattahoochee	...do	Clay	0.214	49	
	813	West Virginia	Grafton	C. G. Pringle				
	833	Massachusetts	West Newbury	J. Robinson	Rich	0.256	66	32
	834	... do	...do	...do	...do			
	835	... do	Chebacco pond	...do	Low, rich			
155. Nyssa uniflora. *Large Tupelo. Cotton Gum. Tupelo Gum.*	128	South Carolina	Bonneau's Depot	H. W. Ravenel	Swampy			
	235	...do	...do	...do		0.188	80	
	550	Alabama	Stockton	C. Mohr	Alluvial	0.320	67	19
	604	Georgia	Ogeechee river	A. H. Curtiss	Swampy			
CAPRIFOLIACEÆ.								
156. Sambucus glauca. *Elder.*	681	California	Contra Costa county.	G. R. Vasey	Gravelly	0.320	6	28
157. Sambucus Mexicana. *Elder.*	1220	Arizona	Santa Catalina mountains.	C. G. Pringle				
158. Viburnum Lentago. *Sheepberry. Nannyberry.*	108	Vermont	Charlotte	...do	Muck			
	370	...do	Hinesburg	...do	Swampy			
159. Viburnum prunifolium. *Black Haw. Stag Bush.*	42	Kentucky	Mercer county	W. M. Linney	Shale			
	1104	...do	... do	...do	Trenton limestone.			
	739	Georgia	Bainbridge	A. H. Curtiss	Clay	0.076	36	
RUBIACEÆ.								
160. Exostemma Caribæum	466	Florida	Upper Metacombe Key.	...do	Coral	0.076	28	25
161. Pinckneya pubens. *Georgia Bark.*	257	South Carolina	Bluffton	J. H. Mellichamp	Sandy, swamp	0.108	5	34
	381	...do	...do	...do	...do			
162. Genipa clusiæfolia. *Seven-year Apple.*	457	Florida	Upper Metacombe Key.	A. H. Curtiss	Sandy			
	1132	...do	Elliott's Key	...do	Coral			
	1105	...do	Upper Metacombe Key.	... do	...do			
163. Guettarda elliptica	471	... do	... do	...do	...do	0.095	34	
	1129	...do	Umbrella Key	...do	...do			
	1194	...do	...do	...do	...do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations. First.	Second.	Third.	Average.	Ash determinations. First.	Second.	Average.	Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
0.4680	0.4546	....	0.4613	0.35	0.33	0.34	28.75	....	605
0.5656	0.5649	....	0.5652	0.66	0.81	0.74	....	....	235
0.5650	....	....	0.5650	0.89	0.79	0.84	....	....	517
0.6070	0.6104	....	0.6092	0.49	0.43	0.46	....	N. Caroliniana...........	608
0.6436	0.6682	....	0.6559	0.49	0.49	0.49	....	....	750
0.6198	0.5865	....	0.6031	0.52	0.53	0.53	....	....	813
0.6849	0.6787	0.6881	0.6839	0.41	0.40	0.41	....	....	833
0.7467	0.6748	0.6708	0.6974	0.38	0.39	0.38	....	....	834
0.7429	0.6626	0.7022	0.7026	0.32	0.34	0.33	....	....	835
			0.6353			0.52	39.59		
0.5580	0.5700	....	0.5645	0.72	0.76	0.74	....	....	128
0.5656	0.5649	....	0.5653	0.66	0.81	0.74	....	....	236
0.5002	0.5525	....	0.5264	0.58	0.59	0.59	....	....	550
0.4424	0.4002	....	0.4213	0.76	0.66	0.71	....	....	604
			0.5194			0.70	32.37		
0.5070	0.5098	....	0.5087	1.60	1.55	1.57	31.70	....	681
0.4588	0.4668	0.4586	0.4614	1.83	2.17	2.00	28.75	....	1220
0.7285	0.7075	....	0.7180	0.27	0.28	0.28	....	0.1 sap-wood...........	108
0.7519	0.7332	....	0.7426	0.29	0.30	0.30	....	....	370
			0.7303			0.29	45.51		
0.8106	....	....	0.8106	0.46	0.49	0.48	....	0.75 sap-wood...........	42
0.9140	....	....	0.9140	0.47	....	0.47	....	All sap-wood...........	1104
0.7749	....	....	0.7749	0.60	....	0.60	....	All sap-wood...........	739
			0.8332			0.52	51.92		
0.9200	0.9419	....	0.9310	0.24	0.22	0.23	58.02	....	466
0.5528	0.5613	....	0.5571	0.28	0.27	0.28	....	....	257
0.5126	0.5131	....	0.6129	0.49	0.58	0.54	....	....	381
			0.5350			0.41	33.41		
1.0219	....	....	1.0219	0.71	0.60	0.66	....	All sap-wood...........	457
1.0425	1.0270	0.9175	0.9957	1.00	1.02	1.01	....	Second and third sp. gr. determinations made on 0.2 sap-wood..	1132
1.0705	1.0840	....	1.0772	1.48	1.55	1.52	....	....	1195
			1.0316			1.06	64.29		
0.9375	0.8933	....	0.9154	0.88	0.79	0.84	....	....	471
0.8400	0.8598	....	0.8504	0.94	1.03	0.99	....	....	1129
0.7490	0.7217	....	0.7353	1.33	1.32	1.32	....	....	1194
			0.8337			1.05	51.96		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
ERICACEÆ.								
164. Vaccinium arboreum *Farkleberry.*	343	Alabama	Citronelle	C. Mohr	Sandy	0.127	65	
	612	Georgia	Altamaha river	A. H. Curtiss	Swampy			
165. Andromeda ferruginea	1033	Florida	Jacksonville	do	Hummock			
	1034	do	do	do		0.216	5	29
166. Arbutus Menziesii *Madroña.*	643	California	Contra Costa county	G. R. Vasey	Gravelly			
	679	do	Marin county	do	do			
167. Arbutus Xalapensis	596	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Rocky			
168. Arbutus Texana	1085	Texas	Hays county	S. B. Buckley	Limestone	0.086	22	26
169. Oxydendrum arboreum *Sorrel Tree. Sour Wood.*	353	Alabama	Cottage Hill	C. Mohr	Light, rich	0.130	28	
	515	Tennessee	Nashville	A. Gattinger	Sandy, rocky			
170. Kalmia latifolia *Laurel. Calico Bush. Spoon Wood. Ivy.*	262^1	Virginia	Fancy Gap	H. Shriver	Moist	0.082	74	
	262^2	do	do	do	do			
	262^3	do	do	do	do			
171. Rhododendron maximum *Great Laurel. Rose Bay.*	263^1	do	do	do	do	0.078	52	
	263^2	do	do	do	do			
MYRSINACEÆ.								
172. Myrsine Rapanea	1123	Florida	Bay Biscayne	A. H. Curtiss	Coral			
173. Ardisia Pickeringia *Marlberry. Cherry.*	494	do	do	do	do	0.080	15	18
	1136	do	do	do	do			
	1192	do	Palm creek	do	do			
174. Jacquinia armillaris *Joe Wood.*	498	do	Key Largo	do	do			
	1130	do	Elliott's Key	do	do			
	1199	do	Umbrella Key	do	do			
SAPOTACEÆ.								
175. Chrysophyllum oliviforme	492	do	Bay Biscayne	do	do	0.105	18	
176. Sideroxylon Mastichodendron *Mastic.*	461	do	Upper Metacombe Key.	do	do	0.266	29	49

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.7814	0.7479	....	0.7647	0.42	0.45	0 44	....	....	343
0.7740	0.7405	....	0.7573	0.35	0.32	0.34	....	....	612
			0.7610			0.39	47.42		
0.7766	0.8021	....	0.7894	0.45	0.37	0.41	....	....	1033
0.7037	0.7174	....	0.7106	0.56	0.45	0.51	....	....	1034
			0.7500			0.46	46.74		
0.6452	0.6939	....	0.6696	0.42	0.33	0.38	....	....	643
0.7482	0.7332	....	0.7407	0.42	0.39	0.41	....	....	679
			0.7052			0.40	43.95		
0.7202 0.6842	0.6955 0.7397	....	0.7099	0.21	0.24 0.30	0.25	....	....	596
0.7585	0.7674	0.7292	0.7500	0.54	0.48	0.51	46.74	0.5 sap-wood........	1085
0.7920	0.7574	0.7916	0.7803	0.42	0.49	0.46	....	....	353
0.7114	....	....	0.7114	0.27	0.31	0.29	....	....	515
			0.7458			0.37	46.48		
0.7536	....	....	0.7536	0.61	....	0.61	....	....	262[1]
0.7214	....	....	0.7214	0.31	....	0.31	....	....	262[2]
0.6730	....	....	0.6730	0.32	....	0.32	....	....	262[3]
			0.7160			0.41	44.62		
0.6266	....	....	0.6266	0.43	....	0.43	....	....	263[1]
0.6341	....	....	0.6341	0.29	....	0.29	....	....	263[2]
			0.6303			0.36	39.28		
0.8491	0.8541	0.7990	0.8341	0.74	0.88	0.81	51.98	....	1123
0.8154	0.8412	....	0.8283	1.81	1.84	1.83	....	....	494
0.8800	0.8532	....	0.8666	1.74	1.95	1.85	....	....	1136
0.8770	0.8942	....	0.8856	1.75	1.95	1.85	....	....	1192
			0.8602			1.85	53.61		
0.5693	0.6500	0.6582	0.6258	4.09	3.82	3.96	....	....	498
0.6437	0.6475	....	0.6456	3.47	3.74	3.61	....	....	1130
0.8300	0.7965	....	0.8132	2.85	2.73	2.79	....	....	1199
			0.6948			3.45	43.30		
0.8986	0.9433	0.9660	0.9360	1.36	1.11	1.24	58.33	....	492
1.0125	1.0140	1.0052	1.0109	4.90	5.37	5.14	63.00	....	461

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
177. Dipholis salicifolia *Bustic. Cassada.*	488	Florida	Bay Biscayne	A. H. Curtiss	Coral	0.170	36	14
	500	do	Umbrella Key	do	do	0.150	7	25
	1101	do	No-Namo Key	do	do			
178. Bumelia tenax	746	Georgia	Bainbridge	do	Low	0.128	29	
179. Bumelia lanuginosa *Gum Elastic. Shittim Wood.*	60	Missouri	Allenton	G. W. Letterman	Limestone	0.286	57	
	930	Texas	Austin	C. Mohr	do	0.237	65	
	1083	Missouri	Allenton	G. W. Letterman	do			
180. Bumelia spinosa	1140	Arizona	Santa Catalina mountains.	C. G. Pringle	Rocky			
	1151	do	do	do	do			
181. Bumelia lycioides *Iron Wood. Southern Buckthorn.*	333	Tennessee	Nashville	A. Gattinger	Alluvial			
182. Bumelia cuneata *Ants' Wood. Downward Plum. Saffron Plum.*	503	Florida	Long Key	A. H. Curtiss	Coral			
	1124	do	Boca Chica Key	do	do			
183. Mimusops Sieberi *Wild Dilly.*	458	do	Upper Metacombe Key.	do	do	0.170	12	40
EBENACEÆ.								
184. Diospyros Virginiana *Persimmon.*	01	Missouri	Allenton	G. W. Letterman	Rich upland	0.158	56	
	425	Tennessee	Nashville	A. Gattinger	Rich loam			
	811	West Virginia	Grafton	C. G. Pringle				
	1084	Missouri	Allenton	G. W. Letterman	Rich upland			
	1162	do	do	do	do			
185. Diospyros Texana *Black Persimmon. Mexican Persimmon. Chapote.*	930	Texas	Austin	C. Mohr	Calcareous	0.098	37	
STYRACACEÆ.								
186. Symplocos tinctoria *Horse Sugar. Sweet Leaf.*	347	Alabama	Cottage Hill	do	Sandy	0.134	26	
	560	Arkansas	Texarkana	G. W. Letterman	do	0.123	47	
187. Halesia diptera *Snow-drop Tree. Silver-bell Tree.*	738	Georgia	Bainbridge	A. H. Curtiss	Low			
	922	Florida	Apalachicola	C. Mohr	Alluvial			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.9813	0.8887	....	0.9350	0.34	0.32	0.33	....	....	458
0.9737	0.9233	....	0.9485	0.26	0.31	0.29	....	....	500
0.9312	0.8912	....	0.9112	0.37	0.33	0.35	....	....	1191
			0.9316			0.32	58.06		
0.7106	0.7479	....	0.7293	0.71	0.84	0.78	45.45	....	746
0.7541	0.7299	....	0.7420	1.10	1.02	1.06	....	....	50
0.5947	0.5997	0.5777	0.5907	1.44	1.28	1.36	....	....	930
0.6221	0.6386	....	0.6304	1.27	1.27	1.27	....	....	1083
			0.6544			1.23	40.78		
0.6580	0.6991	....	0.6786	1.19	1.04	1.11	....	....	1146
0.6392 0.6565	0.6003 0.6658	....	0.6419	1.32	1.43	1.37	....	....	1151
			0.6603			1.24	41.15		
0.7467	....	....	0.7467	0.81	0.81	0.81	46.53	....	333
0.7567	0.7465	....	0.7516	2.29	2.31	2.30	....	....	503
0.8420	0.8384	....	0.8402	1.60	1.43	1.51	....	....	1124
			0.7959			1.90	49.60		
1.0525	1.0989	1.1000	1.0838	2.89	2.32	2.61	67.54	....	458
0.7639	0.7465	....	0.7552	1.03	1.03	1.03	....	....	61
0.8552	....	....	0.8552	0.95	1.12	1.04	....	Female	425
0.7962	0.7864	....	0.7913	0.83	0.70	0.77	....	....	811
0.7790	0.7920	....	0.7855	0.86	1.02	0.94	....	....	1084
0.7710	0.7722	0.7570	0.7667	0.97	1.05	1.01	....	Wood with black streaks	1162
			0.7908			0.96	49.28		
0.8325	0.8391	0.8664	0.8460	3.34	3.32	3.33	52.72	....	936
0.5205	0.5593	....	0.5429	0.72	0.81	0.77	....	....	347
0.5079	0.5360	....	0.5220	0.62	0.57	0.60	....	....	560
			0.5325			0.68	33.18		
0.5481	0.5381	....	0.5431	0.57	0.42	0.50	....	....	738
0.5999	0.5957	....	0.5978	0.35	0.35	0.35	....	....	922
			0.5705			0.42	35.55		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
188. Halesia tetraptera. *Rattlebox. Snow-drop Tree. Silver-bell Tree. Calico Wood.*	275	Virginia	Carter's ferry	H. Shriver	Rocky			
	613	Georgia	Altamaha river	A. H. Curtiss	Clay	0.088	17	
OLEACEÆ.								
189. Fraxinus Greggii	1221	Mexico	Lampasas mountains.	S. B. Buckley				
190. Fraxinus anomala	1105	Utah	Kane county	A. L. Siler	Sandy			
191. Fraxinus pistaciæfolia. *Ash.*	591	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Low			
	892	Eastern Arizona	San Francisco mountains.	E. L. Greene				
193. **Fraxinus Americana.** ***White Ash.***	25	Massachusetts	Acushnet	E. A. Dana				
	39[1]	Missouri	Allenton	G. W. Letterman	Siliceous hills			
	39[2]	...do	...do	...do	Alluvial			
	39[3]	...do	...do	...do	...do			
	114[1]	Michigan	Dansville	W. J. Beal	Clay			
	114[3]	...do	Hudson	...do				
	114[4]	...do	Lansing	...do				
	114[5]	...do	Dansville	...do	Clay			
	130	South Carolina	Bonneau's Depot	H. W. Ravenel	Wet			
	144	Illinois	Waukegan	Robert Douglas	Clay			
	170	Ohio	Pineo, Daniels & Co.	E. E. Barney				
	173	...do	Farmers' Friend Manufacturing Co.	...do				
	175	...do	J. W. Stoddard & Co.	...do				
	190	...do	Woodsum Machine Co.	...do				
	191	...do	B. E. McSherry & Co.	...do				
	212	Virginia	Wytheville	H. Shriver				
	227[1]	Vermont	Charlotte	C. G. Pringle	Gravelly			
	227[3]	...do	...do	...do	Swampy			
	267[1]	Virginia	Wytheville	H. Shriver				
	267[2]	...do	...do	...do				
	267[3]	...do	...do	...do				
	431	Tennessee	Nashville	A. Gattinger	Limestone			
	551	Alabama	Kemper's mill	C. Mohr	Alluvial	0.268	79	
	728	Pennsylvania	Williamsport	C. G. Pringle				
	747	Georgia	Bainbridge	A. H. Curtiss	River-bottom	0.260	95	
	1045	Massachusetts	Reading	J. Robinson		0.215	64	
192. **Fraxinus Americana, *var.* Texensis**	364	Texas	Dallas	J. Reverchon	Dry, calcareous	0.384	69	
	937	...do	Austin	C. Mohr	Rich, calcareous			
193. Fraxinus pubescens. *Red Ash.*	130	Michigan	Lansing	W. J. Beal	Poor			
	229[1]	Vermont	Charlotte	C. G. Pringle	Clay			
	229[2]	...do	...do	...do	...do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.5617	0.5460	...	0.5539	0.38	0.36	0.37	...	...	275
0.5569	0.5864	...	0.5717	0.48	0.38	0.43	...	...	613
			0.5628			0.40	35.07		
0.7778	0.8030	...	0.7904	0.97	0.89	0.93	49.26	...	1221
0.6708	0.6485	...	0.6597	0.81	0.88	0.85	41.11	Growth slow	1106
0.6336 0.7267	0.6243 0.6656	...	0.6625	0.84 0.44	0.88 0.69	0.71	...	...	591
0.6868	0.7120	...	0.6994	0.51	0.54	0.53	...	...	892
			0.6810			0.62	42.43		
0.5911	0.6682	...	0.6297	0.29	0.32	0.31	...	...	25
0.6253	0.6481	...	0.6367	0.33	0.34	0.34	...	Wood from hills not considered valuable.	39[1]
0.6223	...	...	0.6223	0.51	...	0.51	...	All sap-wood	39[2]
0.6771	...	...	0.6771	...	...	...	...	...	39[3]
0.5265	0.4711	...	0.4988	0.53	...	0.53	...	...	114[1]
0.7225	...	...	0.7225	0.60	...	0.60	...	...	114[3]
0.6506	...	...	0.6506	0.38	...	0.38	...	...	114[4]
0.6086	...	...	0.6086	0.32	...	0.32	...	...	114[5]
0.6744	0.7005	...	0.6875	0.36	0.89	0.38	...	All sap-wood	130
0.7631	0.7600	...	0.7616	0.45	0.45	0.45	...	All sap-wood; second growth. Growth rapid	144
0.7449	...	...	0.7449	0.35	0.37	0.36	...	...	170
0.7179	0.7116	...	0.7148	0.39	0.39	0.39	...	...	173
0.6470	0.6473	...	0.6472	0 31	0.29	0.30	...	...	175
0.6383	0.6387	...	0.6335	...	...	...	...	...	190
0.6116	...	...	0.6116	0.24	0.24	0.24	...	...	101
0.6157	0.6213	...	0.6185	0.45	0.42	0.44	...	0.5 sap-wood	212
0.6253	0.6326	...	0.6290	0.30	...	0.30	...	...	227[1]
0.6489	0.6987	...	0.6738	0.26	...	0.26	...	...	227[2]
0.6097	...	...	0.6097	0.43	...	0.43	...	0.5 sap-wood	267[1]
0.6329	...	...	0.6329	0.35	...	0.35	...	0.5 sap-wood	267[2]
0.6763	...	...	0.6763	0.44	...	0.44	...	All sap-wood	267[3]
0.6449	...	...	0.6449	0.74	0.69	0.72	...	...	431
0.6176	0.6481	...	0.6329	0.55	0.48	0.52	...	...	551
0.6423	0.5944	...	0.6184	0.37	0.28	0.33	...	...	728
0.6590	0.5972	...	0.5786	0.68	0.71	0.70	...	...	747
0.9131	0.8141	0.8016	0.8429	0.47	0.39	0.43	...	...	1045
			0.6543			0.42	40.77		
0.8252	0.8530	...	0.8391	0.56	0.49	0.53	...	...	864
0.7095	0.6667	...	0.6881	0.86	0.87	0.87	...	...	937
			0.7630			0.70	47.59		
0.5066	0.6529	0.6779	0.0125	0.26	...	0.26	...	Poor quality	189
0.6619	...	...	0.6619	0.21	...	0.21	...	...	229[1]
0.6455	...	...	0.6455	0.22	...	0.22	...	...	229[2]

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH. Sap-wood.	Heart-wood.
193. Fraxinus pubescens—continued	229[3]	Vermont	Charlotte	C. G. Pringle	Clay			
	1059	Massachusetts	Topsfield	J. Robinson	River-bottom			
194. Fraxinus viridis. *Green Ash.*	57	Missouri	Allenton	G. W. Letterman	Rich, wet			
	308	Texas	Dallas	J. Reverchon	...do	0.512	45	42
	438	Tennessee	Nashville	A. Gattinger	Rich upland			
	948	Texas	Victoria	C. Mohr	Rich, wet	0.144	31	
	957	...do	Matagorda bay	...do	...do	0.184	34	
194. Fraxinus viridis, *var.* Berlandieriana. *Ash.*	1211	...do	Austin	S. B. Buckley	...do			
195. Fraxinus platycarpa. *Water Ash.*	536	Alabama	Stockton	C. Mohr	Rich, alluvial	0.090	27	
196. Fraxinus quadrangulata. *Blue Ash.*	66	Missouri	Allenton	G. W. Letterman	Dry upland	0.138	35	
	125	Michigan	Lansing	W. J. Beal	Rich loam			
	286[1]	Kentucky	Mercer county	W. M. Linney	Limestone			
	286[2]	...do	...do	...do	...do			
	286[3]	...do	...do	...do	...do			
	291	Missouri	Allenton	G. W. Letterman	Sandy loam			
	423	...do	...do	...do	Rich upland			
	518	Tennessee	Nashville	A. Gattinger	Rich limestone			
197. Fraxinus Oregana. *Oregon Ash.*	964	Oregon	Portland	G. Engelmann and C. S. Sargent.	Low, wet	0.355	46	47
	1001	...do	Weidler's saw-mill	...do				
	1024	...do	Portland Furniture Company.	...do				
	1030	...do	...do	...do				
198. Fraxinus sambucifolia. *Black Ash. Hoop Ash. Ground Ash.*	102	Vermont	Charlotte	C. G. Pringle	Wet, peaty			
	122	Michigan	Dansville	W. J. Beal	...do			
	147	Illinois	Waukegan	Robert Douglas	Low, wet			
	376	Vermont	Charlotte	C. G. Pringle	Wet, peaty			
	839	Massachusetts	Danvers	J. Robinson	Rich, loamy	0.236	55	
199. Forestiera acuminata. *Privet.*	616	Georgia	Ogeechee river	A. H. Curtiss	Rich, moist	0.075	31	
	737	...do	Bainbridge	...do		0.150	55	
	955	Texas	Matagorda bay	C. Mohr	Alluvial			
200. Chionanthus Virginica. *Fringe Tree. Old Man's Beard.*	276	Virginia	Carter's ferry	H. Shriver	Rich, moist			
	751	Florida	Chattahoochee	A. H. Curtiss	Clay upland	0.141	47	

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations. First.	Second.	Third.	Average.	Ash determinations. First.	Second.	Average.	Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
0.6459			0.6459	0.20		0.20			229[3]
0.5957	0.5260		0.5598	0.42	0.41	0.42		All sap-wood	1059
0.5685	0.5489								
			0.6251			0.26	38.96		
0.6640	0.6701		0.6671	0.47	0.62	0.55		First sp. gr. determination made on 0.5 sap-wood	57
0.5947	0.6277		0.6112	0.54	0.57	0.56			308
0.7350			0.7350	0.82	0.80	0.81		All sap-wood	438
0.7728	0.8217	0.7902	0.7949	0.63	0.56	0.60		Second and third sp. gr. determinations made on sap-wood	948
0.7198	0.7807		0.7503	0.82	0.76	0.79		Second sp. gr. determination made on sap-wood	957
			0.7117			0.65	44.35		
0.5774	0.5786		0.5780	0.51	0.56	0.54	36.02		1211
0.3567	0.3515		0.3541	0.69	0.76	0.73	22.07		536
0.8246	0.8440		0.8343	0.63	0.67	0.65			66
0.4929			0.4929	0.96		0.96			125
0.7789			0.7789	0.74		0.74			286[1]
0.8131			0.8131	0.81		0.81		Second growth	286[2]
0.7469			0.7469	0.82		0.82		Second growth	286[3]
0.5967	0.6086		0.6027	0.88	0.90	0.89			291
0.6897	0.6746		0.6822	0.78	0.74	0.76			423
0.7960			0.7960	0.00	0.61	0.61			518
			0.7184			0.78	46.78		
0.6432	0.5947		0.6189	0.11	0.43	0.27		Second sp. gr. determination made on sap-wood	964
0.5314	0.6123		0.5719	0.73		0.73			1001
0.4553	0.4736		0.4645	0.12	0.15	0.14		Brash	1024
0.6317	0.6425		0.6371	0.21	0.24	0.23		Tough	1030
			0.5731			0.34	35.72		
0.6209	0.6338		0.6274	0.62	0.57	0.60			102
0.5034			0.5034	0.89		0.89			122
0.6859	0.6812		0.6836	0.84	0.88	0.86		Second sp. gr. determination made on 0.125 sap-wood	147
0.6485	0.5928		0.0207	0.77	0.83	0.80			378
0.7020	0.7465		0.7243	0.40	0.48	0.47		All sap-wood	839
			0.6318			0.72	39.37		
0.7067	0.7500		0.7284	0.75	0.72	0.74			616
0.5829	0.5681		0.5755	0.65	0.72	0.69			737
0.5988	0.6002		0.5995	0.88	0.60	0.74			955
			0.0345			0.72	39.54		
0.6476	0.4628		0.5552	0.53		0.53			276
0.7150	0.7165	0.7259	0.7191	0.39	0.56	0.48			751
			0.6372			0.51	39.71		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth. Sap-wood.	Layers of growth. Heart-wood.
201. Osmanthus Americanus *Devil Wood.*	283	Louisiana	Amite	C. Mohr	Rich, alluvial			
	344	Alabama	Cottage Hill	...do	Low, rich			
	584	Florida	Saint John's river	A. H. Curtiss	Sandy loam	0.190	45	19
BORRAGINACEÆ.								
202. Cordia Sebestena *Geiger Tree.*	1202	...do	Key West	...do	Coral			
	1218	...do	...do	...do	...do			
203. Cordia Boissieri	1223	Texas	Brownsville	S. B. Buckley	Limestone			
204. Bourreria Havanensis *Strong Bark.*	455	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	0.092	45	
	1137	...do	Key Largo	...do	...do			
205. Ehretia elliptica *Knackaway. Anaqua.*	827	Texas		Department of Agriculture.				
	942	...do	New Braunfels	C. Mohr	Rich, alluvial	0.170	25	
BIGNONIACEÆ.								
206. Catalpa bignonioides *Catalpa. Catawba. Bean Tree. Cigar Tree. Indian Bean.*	167	Ohio	Alexandersville	S. H. Binkley and E. E. Barney.	Clayey loam			
	540	Alabama	Stockton	C. Mohr	Low, wet			
	744	Georgia	Bainbridge	A. H. Curtiss	Clay	0.238	8	17
207. Catalpa speciosa *Western Catalpa.*	38	Missouri	Charleston	C. S. Sargent	Wet clay	0.288	8	51
	160	Ohio	Dayton	E. E. Barney	Clay			
	166	Illinois	Cairo	D. Axtell	...do			
	171	Indiana	Wabash river	E. E. Barney	Low, alluvial bottom.			
	180	Tennessee	Obion river	E. P. Hynds and E. E Barney.	...do			
	181	Missouri	New Madrid	E. E. Barney	...do			
	182	Illinois	Ullin	...do	...do			
	183	Missouri	New Madrid	...do	...do			
	184	...do	...do	...do	...do			
	210	Indiana	Vincennes	...do	...do			
208. Chilopsis saligna *Desert Willow.*	556	New Mexico	Valley of the Upper Gila river.	E. L. Greene	Alluvial			
	595	Arizona	Tucson	G. Engelmann and C. S. Sargent.	Moist, gravelly			
	682	...do	...do	...do	...do			
209. Crescentia cucurbitina *Black Calabash Tree.*	1216	Florida	Bay Biscayne	A. H. Curtiss	Coral			
VERBENACEÆ.								
210. Citharexylum villosum *Fiddle Wood.*	483	...do	...do	...do	...do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations. First.	Specific gravity determinations. Second.	Specific gravity determinations. Third.	Specific gravity determinations. Average.	Ash determinations. First.	Ash determinations. Second.	Ash determinations. Average.	Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
0.8156	0.8652	....	0.8404	0.68	0.65	0.67	....	0.5 sap-wood	283
0.8606	....	....	0.8606	0.26	0.29	0.28	....	All sap-wood	344
0.7100	0.7544	....	0.7322	0.43	0.43	0.43	....	First sp. gr. determination made on sap-wood; second sp. gr. determination made on 0.75 sap-wood.	584
			0.8111			0.46	50.55		
0.7740	....	....	0.7740	....	4.09	4.09	....		1202
0.6008	0.6942	....	0.6475	4.43	4.28	4.35	....		1218
			0.7108			4.22	44.30		
0.6710	0.6870	....	0.6790	3.67	3.39	3.53	42.31		1223
0.8280	0.8248	....	0.8264	3.38	3.20	3.29	....		455
0.7703	0.7960	0.7980	0.7883	2.28	2.27	2.28	....		1137
			0.8073			2.79	50.31		
0.6636	0.6548	....	0.6592	1.23	1.27	1.25	....		827
0.6274	0.6302	....	0.6288	1.33	1.41	1.37	....		942
			0.6440			1.31	40.13		
0.4293	0.4270	....	0.4282	0.40	0.41	0.41	....	Cultivated	167
0.4694	0.4979	....	0.4837	0.26	0.34	0.30	....		540
0.4426	0.4177	....	0.4302	0.47	0.37	0.42	....		744
			0.4474			0.38	27.88		
0.4601	0.4446	....	0.4524	0.30	0.41	0.36	....		38
0.4586	0.4467	....	0.4527	0.34	0.39	0.37	....	Cultivated	160
0.3897	0.3829	....	0.3863	0.36	0.34	0.35	....		166
0.3850	0.3878	....	0.3864	0.32	0.30	0.31	....		171
0.4156	0.3783	0.4260	0.4066	0.45	0.50	0.48	....		180
0.3900	....	....	0.3900	0.38	0.42	0.40	....	From an old fence-rail	181
0.3968	....	....	0.3968	0.47	0.43	0.45	....	From a post 47 years in the ground	182
0.4493	....	....	0.4493	0.48	0.37	0.43	....	From a standing tree killed by earthquake in 1812	183
0.4535	....	....	0.4535	0.40	0.34	0.37	....		184
0.3911	0.3007	....	0.3909	0.38	0.39	0.39	....		210
			0.4165			0.39	25.96		
0.6059	....	....	0.6059	0.37	0.37	0.37	....		556
0.5631	....	....	0.5631	0.43	0.41	0.42	....		595
0.6003	0.6026	....	0.6015	0.32	0.32	0.32	....		683
			0.5902			0.37	30.78		
0.6270	0.6368	....	0.6319	1.47	1.23	1.35	39.38		1216
0.8775	0.8644	....	0.8710	0.49	0.54	0.52	54.28		483

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH. Sap-wood.	Heart-wood.
211. Avicennia nitida. *Black Mangrove. Black Tree. Black Wood.*	490	Florida	Bay Biscayne	A. H. Curtiss	Coral	0.158	39	18
	826	...do		Department of Agriculture.				
	828	...do		...do				
NYCTAGINACEÆ.								
212. Pisonia obtusata. *Pigeon Wood. Beef Wood. Cork Wood. Pork Wood.*	474	...do	Upper Metacombe Key.	A. H. Curtiss	Coral			
POLYGONACEÆ.								
213. Coccoloba Floridana. *Pigeon Plum.*	473	...do	...do	...do	...do	0.156	48	27
214. Coccoloba uvifera. *Sea Grape.*	453	...do	...do	...do	Sandy	0.214	17	29
LAURACEÆ.								
215. Persea Carolinensis. *Red Bay.*	585	...do	Saint John's river	...do	Sandy loam	0.188	12	45
215. Persea Carolinensis, *var.* palustris	340	Alabama	Mobile county	C. Mohr	Damp, sandy	0.372	110	
216. Nectandra Willdenoviana. *Lance Wood.*	479	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral			
	1138	...do	Bay Biscayne	...do	...do	0.086	27	
	1196	...do	Upper Metacombe Key.	...do	...do			
217. Sassafras officinale. *Sassafras.*	71	Missouri	Allenton	G. W. Letterman	Low, rich			
	387	...do	...do	...do	Alluvial			
	446	Tennessee	Nashville	A. Gattinger	Rich			
	814	West Virginia	Grafton	C. G. Pringle				
	854	Massachusetts	Danvers	J. Robinson	Rich loam	0.232	11	68
	1163	Missouri	Allenton	G. W. Letterman	Low, alluvial			
218. Umbellularia Californica. *Mountain Laurel. California Laurel. Spice Tree. Cajiput. California Olive. California Bay Tree.*	703	Oregon	Coos bay	G. Engelmann and C. S. Sargent.				
	897	California		Department of Agriculture.				
EUPHORBIACEÆ.								
219. Drypetes crocea. *Guiana Plum. White Wood.*	468	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral			
	1185	...do	No-Name Key	...do	...do			
	1193	...do	Upper Metacombe Key.	...do	...do			
219. Drypetes crocea, *var.* latifolia	459	...do	...do	...do	...do	0.292	112	52
	1187	...do	...do	...do	...do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
1.0019	1.0485	....	1.0702	1.99	1.12	1.56	....	0.5 sap-wood	400
0.9066	1.0522	....	0.9794	1.71	1.72	1.71	....	First sp. gr. determination made on sap-wood; second sp. gr. determination made on 0.5 sap-wood.	826
0.7074	0.6762	....	0.6918	4.54	4.01	4.27	....	All sap-wood	828
			0.9138			2.51	56.95		
0.6475	0.6582	....	0.6529	7.44	7.79	7.62	40.69	....	474
0.9629	1.0040	....	0.9835	5.25	4.81	5.03	61.29	0.66 sap-wood	473
0.9149	0.9098	0.9759	0.9635	1.11	1.63	1.37	60.04	First sp. gr. determination made on 0.5 sap-wood; third sp. gr. determination made on 0.25 sap-wood.	453
0.6373	0.6485	....	0.6429	0.66	0.85	0.76	40.07	....	585
0.5977	0.6815	....	0.6396	0.46	0.27	0.37	39.86	....	340
0.8206	0.7650	....	0.7928	0.82	0.68	0.75	....	0.9 sap-wood	470
0.7980 0.8148	0.8482 0.7980	....	0.8147	0.52	0.59	0.56	....	All sap-wood	1138
0.7222	0.6787	....	0.7005	0.48	0.47	0.48	....	....	1196
			0.7093			0.60	47.94		
0.5030	0.5210	....	0.5120	0.11	0.09	0.10	....	....	71
0.4900	0.4828	....	0.4864	0.08	0.09	0.09	....	....	387
0.4542	....	....	0.4542	0.04	0.05	0.05	....	....	446
0.6266	0.5363	....	0.5315	0.06	0.07	0.07	....	....	814
0.5765	....	0.5773	0.5769	0.06	0.23	0.15	....	....	854
0.4558	0.4319	0.5055	0.4644	0.12	0.15	0.13	....	....	1163
			0.5042			0.10	31.42		
0.6326	0.6202	....	0.6264	0.36	0.27	0.32	....	....	703
0.6697	0.6840	....	0.6769	0.55	0.36	0.46	....	....	897
			0.6517			0.39	40.61		
0.9195	0.8448	....	0.8821	8.58	8.16	8.37	....	All sap-wood	468
0.8918	0.9119	....	0.9019	3.10	3.26	3.23	....	....	1185
0.9690	0.9882	....	0.9786	7.07	6.58	6.83	....	....	1193
			0.9209			6.14	67.39		
1.0069	0.0390	....	0.9730	8.69	9.09	8.89	....	....	459
0.9048	0.8878	....	0.8963	7.70	7.70	7.70	....	....	1187
			0.9346			8.29	58.24		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH. Sap-wood.	LAYERS OF GROWTH. Heart-wood.
220. Sebastiania lucida	469	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	0.116	30	40
Crab Wood. Poison Wood.	1126	...do	...do	...do	...do			
	1206	...do	Key Largo	...do	...do			
221. Hippomane Mancinella	1110	...do	Key West	...do	...do	0.129	35	
Manchineel.								
URTICACEÆ.								
222. Ulmus crassifolia	324	Texas	Dallas	J. Reverchon	Rich loam	0.484	52	76
Cedar Elm.	929	...do	Austin	C. Mohr	...do			
223. Ulmus fulva	30[1]	Kentucky	Mercer county	W. M. Linney	Limestone			
Red Elm. Slippery Elm. Moose Elm.	30[3]	...do	...do	...do	...do			
	30[4]	...do	...do	...do	...do			
	101	Vermont	Hinesburg	C. G. Pringle	Gravelly loam			
	120	Michigan	Dansville	W. J. Beal	Gravelly			
	134	Missouri	Allenton	G. W. Letterman	Rich, alluvial			
	366	Vermont	Charlotte	C. G. Pringle	Gravelly			
	309	...do	...do	...do	...do			
	429	Tennessee	Nashville	A. Gattinger	Clay			
	869	Massachusetts	Boxford	J. Robinson	Rich loam			
224. Ulmus Americana	19	...do	Arnold Arboretum	C. S. Sargent	Drift	0.561	19	38
White Elm. American Elm. Water Elm.	202	Ohio	S. M. Brown & Co	E. E. Barney	Limestone			
	281[1]	Missouri	Allenton	G. W. Letterman	Alluvial			
	281[2]	...do	...do	...do	...do			
	958	Texas	Colorado river	C. Mohr	...do	0.230	17	5
	1036	Massachusetts	Danvers	J. Robinson	Gravelly	0.160	7	17
	1049	...do	North Reading	...do	...do	0.215	21	10
225. Ulmus racemosa	116[1]	Michigan	Dansville	W. J. Beal	...do			
Rock Elm. Cork Elm. Hickory Elm.	116[2]	...do	Big Rapids	...do	Low, gravelly			
White Elm. Cliff Elm.	116[3]	...do	...do	...do	...do			
	116[4]	...do	Hudson	...do	Alluvial			
	314	...do	Hersey	...do	Rich loam			
	428	Tennessee	Nashville	A. Gattinger	...do			
226. Ulmus alata	133	South Carolina	Bonneau's Depot	H. W. Ravenel	...do			
Wahoo. Winged Elm.	380	Tennessee	Davidson county	A. Gattinger	Loam			
	533	Mississippi	Kemper's mill	C. Mohr	Alluvial	0.244	82	38

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
1.1105	1.0855	....	1.1025	4.96	4.48	4.72	....	0.25 sap-wood	469
1.0900	1.0765	1.0640	1.0768	1.82	1.96	1.89	....	0.5 sap-wood	1126
1.0832	1.1010	....	1.0921	1.65	1.82	1.74	....		1206
			1.0905			2.78	67.96		
0.5945	0.5600	....	0.5772	5.20	5.11	5.16	35.97		1110
0.6286	0.7185	....	0.6736	1.05	1.03	1.04	....	Ash of a knot, 1.85	324
0.7867	0.7640	....	0.7754	1.41	1.30	1.36	....		929
			0.7245			1.20	45.15		
0.8363	0.8358	....	0.8361	1.30	1.00	1.15	....		30[1]
0.7062	....	....	0.7062	0.79	....	0.79	....		30[3]
0.6499	....	....	0.6499	0.60	....	0.60	....		30[4]
0.5699	0.5538	....	0.5619	0.86	0.81	0.84	....		101
0.6769	....	....	0.6769	0.82	....	0.82	....		120
0.6841	0.6841	....	0.6841	0.68	0.79	0.74	....		134
0.6540	0.7589	....	0.7065	1.24	0.84	1.04	....		366
0.7330	0.6303	....	0.6817	0.12	0.11	0.12	....		369
0.6706	....	....	0.6706	1.22	1.31	1.27	....		429
0.7613 0.7978	0.7522 0.8180	....	0.7823	1.07	0.70	0.88	....		869
			0.6956			0.83	43.35		
0.5462	0.5309	....	0.5386	0.86	0.82	0.84	....	Specific gravity of wet sap-wood, 1.026	19
0.7459	0.7287	....	0.7373	0.40	0.56	0.48	....	Second sp. gr. determination made on sap-wood	202
0.6221	0.6054	0.6346	0.6207	0.93	....	0.93	....		281[1]
0.6299	....	....	0.6299	0.86	....	0.86	....		281[2]
0.6495	0.6480	0.6265	0.6413	1.04	0.99	1.02	....	First sp. gr. determination made on 0.5 sap-wood; second sp. gr. determination made on 0.75 sap-wood; third sp. gr. determination made on sap-wood.	958
0.6382	0.7102	0.6742	0.6742	0.75	1.01	0.88	....	Third sp. gr. determination made on sap-wood	1036
0.7173	0.7085	0.7116	0.7124	0.75	0.45	0.60	....	First sp. gr. determination made on 0.25 sap-wood; second and third sp. gr. determinations made on sap-wood.	1049
			0.6506			0.80	40.54		
0.8144	....	....	0.8144	0.42	....	0.42	....		116[1]
0.6846	....	....	0.6846	....	....	....	....		116[2]
0.6803	0.5996	....	0.6400	0.34	....	0.34	....		116[3]
0.7345	....	....	0.7345	0.79	....	0.79	....		116[4]
0.7290	0.7570	....	0.7430	0.59	0.69	0.64	....		314
0.7414	....	....	0.7414	0.90	0.72	0.81	....		428
			0.7263			0.60	45.26		
0.8710	0.8544	....	0.8627	1.02	1.12	1.07	....	All sap-wood	133
0.5979	0.6220	....	0.6100	1.14	1.17	1.16	....	0.5 sap-wood	380
0.7632	0.7860	....	0.7746	0.76	0.72	0.74	....		533
			0.7491			0.99	46.09		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
227. Planera aquatica	758	Florida	Chattahoochee	A. H. Curtiss	Rich, alluvial	0.246	38	
	918	....do	....do	C. Mohr	....do			
228. Celtis occidentalis *Sugarberry. Hackberry.*	69	Missouri	Allenton	G. W. Letterman	Limestone	0.108	50	
	75^1	....do	....do	....do	Low, rich			
	75^2	....do	....do	....do	Alluvial			
	306	Texas	Dallas	J. Reverchon	....do			
	375	Tennessee	Davidson county	A. Gattinger	Loam			
	864	Massachusetts	Plum Island	J. Robinson	Sandy		4	30
	873	....do	Salem	....do	Loam			
	1111	Missouri	Saint Louis	Henry Eggert	Moist loam	0.132	23	
228. Celtis occidentalis, *var.* reticulata *Hackberry. Palo Blanco.*	652	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry			
229. Ficus aurea	486	Florida	Bay Biscayne	A. H. Curtiss	Coral			
230. Ficus brevifolia	1204	....do	Key Largo	....do	....do			
231. Ficus pedunculata *Wild Fig. India-rubber Tree.*	508	....do	Boca Chica Key	....do	....do			
232. Morus rubra *Red Mulberry.*	132	Missouri	Allenton	G. W. Letterman	Rich loam			
	433	Tennessee	Nashville	A. Gattinger	....do			
233. Morus microphylla *Mexican Mulberry.*	450	New Mexico	Silver City	E. L. Greene	Moist clay	0.078	7	25
	1106	Texas	Austin	S. B. Buckley	Limestone	0.098	4	25
234. Maclura aurantiaca *Osage Orange. Bois d'Arc.*	253	....do	Dallas	J. Reverchon	Bottom			
	421	Pennsylvania	West Chester	S. P. Sharples	Clay loam	0.710	3	44
PLATANACEÆ.								
235. Platanus occidentalis *Sycamore. Button Wood. Button-ball Tree. Water Beech.*	21	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.680	35	53
	126	Missouri	Allenton	G. W. Letterman	Rich, alluvial			
	195	Ohio	Miami valley	E. E. Barney	....do			
236. Platanus racemosa *Sycamore. Button Wood.*	686	California	Carmel river	G. R. Vasey	Clay	0.280	20	
237. Platanus Wrightii *Sycamore.*	648	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Rich, gravelly			
JUGLANDACEÆ.								
238. Juglans cinerea *Butternut. White Walnut.*	16	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.560	5	50
	76^1	Missouri	Allenton	G. W. Letterman	Rich loam			
	76^2	....do	....do	....do	Alluvial			
	123	Michigan	Dansville	W. J. Beal	Gravelly clay			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.5735	0.5631	....	0.5683	0.48	0.48	0.48	....	All sap-wood	758
0.4674	0.5137	....	0.4906	0.42	0.42	0.42	....	All sap-wood	918
			0.5294			0.45	32.99		
0.7802	0.7419	....	0.7611	1.89	1.89	1.89	....	C. pumila	69
0.6858	....	....	0.6858	0.74	....	0.74	....		75[1]
0.6592	....	....	0.6592	0.68	....	0.68	....		75[2]
0.6010	0.7637	....	0.7274	1.70	1.60	1.65	....		306
0.8384	0.7956	....	0.8170	0.97	0.90	0.94	....	C. Mississippiensis	375
0.7784	0.7186	0.7385	0.7452	1.05	0.75	0.90	....		864
0.7999	0.7908	0.7604	0.7837	0.89	1.07	0.98	....		873
0.6570	0.6547	0.6396	0.6504	0.89	0.04	0.92	....		1111
			0.7287			1.09	45.41		
0.7400	0.7150	....	0.7275	1.32	1.12	1.22	45.34		652
0.2537	0.2695	....	0.2616	5.17	4.88	5.03	16.30		486
0.6321	0.6475	....	0.6398	4.55	4.18	4.36	39.87		1204
0.4680	0.4798	....	0.4739	4.83	5.00	4.92	29.53		508
0.6242	0.5993	....	0.6118	0.77	0.60	0.68	....		132
0.5679	....	....	0.5679	0.69	0.78	0.74	....		433
			0.5898			0.71	36.76		
0.7169	0.7157	....	0.7163	0.57	0.54	0.56	....		450
0.8270	0.8262	....	0.8266	0.79	0.82	0.81	....		1106
			0.7715			0.68	48.08		
0.7841	0.7495	....	0.7668	0.87	0.88	0.88	47.78		253
0.8551	0.7054	....	0.7803	0.38	0.59	0.49	48.63	Cultivated. First sp. gr. determination made on limb-wood; second sp. gr. determination made on root-wood.	421
			0.7736			0.68	48.21		
0.6060	0.6111	....	0.6086	0.35	0.32	0.33	....		21
0.6073	0.5748	....	0.5911	0.47	0.67	0.57	....		126
0.4986	0.5091	....	0.5038	0.40	0.57	6.48	....		195
			0.5678			0.46	35.38		
0.5151	0.4609	....	0.4880	1.17	1.05	1.11	30.41		686
0.4783	0.4688	....	0.4736	1.34	1.36	1.35	29.51	Grown at 4,000 feet altitude	648
0.4183	0.4343	....	0.4263	0.35	0.30	0.33	....		16
0.4014	0.4005	....	0.4010	0.49	0.43	0.46	....		76[1]
0.4633	0.4355	....	0.4494	0.69	....	0.69	....		76[2]
0.3638	....	....	0.3638	0.79	....	0.79	....		123

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
238. Juglans cinerea—continued	145	Illinois	Waukegan	Robert Douglas	Alluvial			
	176	Ohio	Barney & Smith Manufacturing Co.	E. E. Barney				
	393	Michigan	Lansing	W. J. Beal	Gravelly loam			29
	1057	Massachusetts	Topsfield	J. Robinson	Drift	0.152	8	37
239. Juglans nigra *Black Walnut.*	112	Missouri	Allenton	G. W. Letterman	Alluvial			
	117	Michigan	Dansville	W. J. Beal	Gravelly			
	149	Illinois	Waukegan	Robert Douglas	Loam			
	209	Ohio	Barney & Smith Manufacturing Co.	E. E. Barney				
	318	Michigan	Lansing	W. J. Beal	Loam			
	325	Texas	Dallas	J. Reverchon	Alluvial	0.272	24	84
	407		Charlestown Navy-yard.	S. H. Pook				
	430	Tennessee	Nashville	A. Gattinger	Limestone			
	766	Florida	Aspalaga	A. H. Curtiss	Clay	0.286	8	23
	934	Texas	Austin	C. Mohr	Moist, calcareous			
	951	...do	New Braunfels	...do	...do			
240. Juglans rupestris *Walnut.*	415	New Mexico	Pinos Altos mountains.	E. L. Greene	Alluvial	0.207	15	32
	672	California	Contra Costa county.	G. R. Vasey	...do	0.313	11	18
	1227	Arizona	Santa Catalina mountains.	C. G. Pringle				
241. Carya olivæformis *Pecan. Illinois Nut.*	322^{1}	Mississippi	Greenville	C. Mohr	Alluvial	0.260	33	48
	322^{2}	...do	...do	...do	...do			
	326	Texas	Dallas	J. Reverchon	...do			
242. Carya alba *Shell-bark Hickory. Shag-bark Hickory.*	3	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.305	25	37
	29^{1}	Kentucky	Danville	W. M. Linney	Shale			
	29^{2}	...do	...do	...do	...do			
	29^{3}	...do	...do	...do	...do			
	48	Missouri	Allenton	G. W. Letterman	Upland			
	118^{1}	Michigan	Hudson	W. J. Beal	Clay			
	118^{2}	...do	...do	...do	...do			
	118^{3}	...do	Lansing	...do	...do			
	152	Missouri	Allenton	G. W. Letterman	Rich upland			
	240	Virginia	Wytheville	H. Shriver	Clay			
	422	Missouri	Allenton	G. W. Letterman	Alluvial			
	531	Mississippi	Kemper's mill	C. Mohr	...do	0.288	28	81
	530	...do	...do	...do	...do	0.366	31	102
	816	West Virginia	Grafton	C. G. Pringle	...do			
	1056	Massachusetts	Topsfield	J. Robinson	Rich loam	0.250	53	
	1097	Missouri	Allenton	G. W. Letterman	Alluvial			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

SPECIFIC GRAVITY DETERMINATIONS.				ASH DETERMINATIONS.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0. 4394	0. 4388	....	0. 4391	0. 51	....	0. 51	....	....	145
0. 3941	0. 4023	....	0. 3982	0. 44	0. 44	0. 44	....	....	176
0. 3379	....	....	0. 3379	0. 43	....	0. 43	....	....	393
0. 4538	0. 4355	0. 4698	0. 4530	0. 41	0. 53	0. 47	....	....	1057
			0. 4086			0. 51	25. 46		
0. 5778	0. 5881	....	0. 5830	0. 63	....	0. 63	....	....	112
0. 5807	....	....	0. 5807	0. 48	....	0. 48	....	....	117
0. 5579	0. 5559	....	0. 5569	0. 12	0. 12	0. 12	....	....	149
0. 5025	0. 5265	....	0. 5145	0. 63	0. 49	0. 56	....	....	209
0. 6313	0. 8191	....	0. 6252	0. 62	....	0. 62	....	....	318
0. 5608	0. 5833	....	0. 5721	1. 92	1. 99	1. 96	....	....	325
0. 5750	....	....	0. 5750	0. 60	0. 69	0. 65	....	....	407
0. 6376	....	....	0. 6370	0. 93	1. 05	0. 99	....	....	430
0. 6415 0. 6435	0. 6363 0. 6400	....	0. 6403	0. 78 0. 51	0. 65 0. 77	0. 68	....	First sp. gr. determination made on sap-wood	765
0. 7830	0. 8002	....	0. 7916	1. 22	1. 64	1. 43	....	First sp. gr. determination made on 0.5 sap-wood	934
0. 6669	0. 6388	....	0. 6499	0. 71	0. 57	0. 64	....	....	951
			0. 6115			0. 79	38. 11		
0. 6789	0. 6469	0. 6753	0. 6670	0. 57	1. 09	0. 83	....	All sap-wood	415
0. 6266	0. 5011	....	0. 5939	0. 85	0. 97	0. 01	....	....	672
0. 7258	0. 6848	....	0. 7053	1. 15	1. 42	1. 28	....	....	1227
			0. 6554			1. 01	40. 85		
0. 7390	0. 6925	....	0. 7158	0. 96	1. 18	1. 07	....	Second sp. gr. determination made on 0.5 sap-wood	322^1
0. 7020	0. 6982	....	0. 7001	0. 93	....	0. 93	....	Second sp. gr. determination made on 0.5 sap-wood	322^2
0. 7314	0. 7445	....	0. 7380	1. 33	1. 46	1. 40	....	....	326
			0. 7180			1. 13	44. 75		
0. 7618	0. 7814	....	0. 7716	0. 61	0. 58	0. 60	....	All sap-wood	8
0. 9680	....	....	0. 9680	0. 73	....	0. 73	....	All sap-wood	29^1
0. 9205	....	....	0. 9205	0. 80	....	0. 86	....	All sap-wood	29^2
0. 9859	1. 0080	....	0. 9970	0. 65	....	0. 65	....	All sap-wood	29^3
0. 8240	0. 8260	....	0. 8255	0. 37	0. 43	0. 40	....	....	48
0. 8028	....	....	0. 8028	0. 28	....	0. 28	....	....	118^1
0. 7974	....	....	0. 7974	0. 66	....	0. 66	....	....	118^2
0. 8019	....	....	0. 8019	1. 14	....	1. 14	....	....	118^3
0. 8064	0. 7677	....	0. 7871	0. 87	0. 66	0. 77	....	....	152
0. 8470	0. 7477	....	0. 7974	0. 63	0. 93	0. 78	....	All sap-wood	240
0. 7289	0. 7756	....	0. 7523	0. 92	0. 90	0. 91	....	....	422
0. 8696	0. 9370	....	0. 9033	0. 79	0. 78	0. 79	....	....	531
0. 8729	0. 8692	....	0. 8711	0. 78	0. 88	0. 83	....	....	539
0. 7470	0. 7505	....	0. 7523	0. 76	0. 60	0. 71	....	....	816
0. 8800	0. 9035	0. 9245	0. 9027	0. 54	0. 69	0. 62	....	....	1056
0. 6835	0. 8051	....	0. 7443	0. 90	0. 90	0. 90	....	....	1097
			0. 8372			0. 73	52. 17		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
243. Carya sulcata *Big Shell-bark. Bottom Shell-bark.*	27	Kentucky	Mercer county	W. M. Linney	Limestone			
	91^2	do	do	do	Alluvial			
	91^3	do	do	do	do			
	336	Tennessee	Nashville	A. Gattinger	do			
	383	Missouri	Allenton	G. W. Letterman	do			
	391	do	do	do	do			
	1082	do	do	do	do			
	1164	do	do	do	do			
	1165	do	do	do	do			
	1166	do	do	do	do			
	1170	do	do	do	do			
244. Carya tomentosa *Mocker Nut. Black Hickory. Bull Nut. Big-bud Hickory. White-heart Hickory. King Nut.*	52	do	do	do	Rich upland			
	72	Kentucky	Perryville	W. M. Linney	Utica shale			
	254	Missouri	Allenton	G. W. Letterman	Rich upland			
	289	do	do	do	do			
	348	Alabama	Citronelle	C. Mohr	Sandy	0.200	42	31
245. Carya porcina *Pig Nut. Brown Hickory. Black Hickory. Switch-bud Hickory.*	6	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.317	29	55
	51	Missouri	Allenton	G. W. Letterman	Flinty			
	88	do	do	do	Rich loam	0.159	41	6
	121	Michigan	Dansville	W. J. Beal	Gravelly clay			
	288	Missouri	Allenton	G. W. Letterman	Rich loam	0.100	47	13
	442	Tennessee	Nashville	A. Gattinger	Upland			
	538	Alabama	Kemper's mill	C. Mohr	Alluvial	0.354	63	59
	1051	Massachusetts	North Reading	J. Robinson	Drift	0.228	31	42
	1098	Missouri	Allenton	G. W. Letterman	Flinty			
	1168	do	do	do	do			
246. Carya amara *Bitter Nut. Swamp Hickory.*	153	do	do	do	Rich upland			
	401	do	do	do	do			
	838	Massachusetts	Danvers	J. Robinson	Rich loam			
	871	do	do	do	do	0.115	18	19
247. Carya myristicæformis *Nutmeg Hickory.*	237	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich, swampy	0.402	7	107
248. Carya aquatica *Water Hickory. Swamp Hickory. Bitter Pecan.*	129	do	do	do	Swampy			
	362	Mississippi	Vicksburg	C. Mohr		0.277	28	18
	740	Georgia	Bainbridge	A. H. Curtiss	Alluvial			
	017	Florida	Chattahoochee	C. Mohr	do	0.262	23	28

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.8791	0.8767	....	0.8779	0.72	0.70	0.71	....	....	27
0.7527	0.6859	....	0.7193	1.09	....	1.09	....	....	91[2]
0.7345	....	....	0.7345	1.04	....	1.04	....	....	91[3]
0.7654	....	....	0.7654	....	....	....	....	....	336
0.9020	0.8610	....	0.8815	0.99	0.92	0.96	....	First sp. gr. determination made on 0.5 sap-wood..........	383
0.8512	0.8424	....	0.8468	0.91	1.24	1.07	....	....	391
0.8911	0.9061	0.8831	0.8934	0.83	0.90	0.87	....	All sap-wood..........	1082
0.8827	0.8854	....	0.8840	0.81	0.84	0.83	....	....	1164
0.7054	0.6898	0.7414	0.7122	0.73	0.72	0.73	....	....	1165
0.8508	0.8432	....	0.8470	0.90	0.95	0.93	....	0.5 sap-wood..........	1166
0.8024	0.7275	0.7389	0.7563	0.84	0.71	0.78	....	....	1170
			0.8108			0.90	50.53		
0.8524	0.8168	....	0.8346	0.97	0.84	0.91	....	....	52
0.8610	0.8709	....	0.8660	1.02	1.06	1.04	....	0.5 sap-wood..........	72
0.8334	0.8500	....	0.8417	0.72	1.05	0.89	....	Second sp. gr. determination made on sap-wood; second growth	254
....	0.7279	....	0.7279	1.29	1.65	1.47	....	....	289
0.8316	0.8462	....	0.8389	0.99	1.03	1.01	....	First sp. gr. determination made on 0.5 sap-wood; second sp. gr. determination made on sap-wood.	348
			0.8218			1.06	51.21		
0.8157	0.8139	....	0.8148	0.60	0.60	0.60	....	....	6
0.8827	....	....	0.8827	1.25	1.40	1.33	....	....	51
0.9189	0.9290	....	0.9240	0.85	0.85	0.85	....	Second sp. gr. determination made on sap-wood; second growth	88
0.6803	....	....	0.6803	1.58	....	1.58	....	....	121
0.8554	0.8530	....	0.8542	0.83	0.71	0.77	....	First sp. gr. determination made on sap-wood; second sp. gr. determination made on 0.9 sap-wood.	288
0.7926	....	....	0.7926	0.68	0.70	0.69	....	All sap-wood..........	442
0.8530	0.7152	....	0.7841	0.82	0.86	0.84	....	First sp. gr. determination made on 0.8 sap-wood; second sp. gr. determination made on sap-wood.	538
0.8842	0.8481	0.8537	0.8620	0.74	0.75	0.75	....	Third sp. gr. determination made on sap-wood..........	1051
0.8990	0.7640	....	0.8315	1.27	1.29	1.28	....	Second sp. gr. determination made on sap-wood..........	1098
0.7470	0.7355	0.8913	0.7913	1.15	1.19	1.17	....	All sap-wood..........	1168
			0.8217			0.99	51.21		
0.7814	0.7830	....	0.7822	1.00	0.97	0.99	....	....	153
0.5927	0.5754	....	0.5841	0.97	0.93	0.95	....	....	401
0.7530	0.7142	....	0.7336	0.94	1.03	0.99	....	....	838
0.9208	....	....	0.9208	1.42	0.92	1.17	....	0.5 sap-wood..........	871
			0.7552			1.03	47.00		
0.7919	0.8112	....	0.8016	1.07	1.05	1.06	49.96	All sap-wood..........	237
0.7639	0.7332	....	0.7486	1.31	2.03	1.67	....	All sap-wood..........	129
0.7719	0.7700	....	0.7710	1.05	1.32	1.19	....	0.5 sap-wood..........	362
0.8248	0.8244	....	0.8246	1.32	1.05	1.19	....	0.5 sap-wood..........	740
0.6422	0.6313	0.5821	0.6185	0.91	1.17	1.04	....	0.5 sap-wood..........	917
			0.7407			1.27	46.16		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
MYRICACEÆ.								
249. Myrica cerifera *Bayberry. Wax Myrtle.*	580	Florida	Saint John's river	A. H. Curtiss	Sandy loam	0.198	18	22
250. Myrica Californica	665	California	Santa Cruz	G. Engelmann and C. S. Sargent.	Rich loam			
CUPULIFERÆ.								
251. Quercus alba *White Oak.*	8	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.560	12	88
	26	do	Acushnet	E. A. Dana				
	32^1	Kentucky	Mercer county	W. M. Linney	Limestone			
	32^2	do	Boyle county	do	Slate			
	32^3	do	do	do	Shale			
	49^1	Missouri	Allenton	G. W. Letterman	Rich upland			
	49^2	do	do	do	do			
	49^3	do	do	do	do			
	113^1	Michigan	Big Rapids	W. J. Beal	Gravelly	0.374	34	18
	113^2	do	Dansville	do	Sandy			
	113^3	do	Hudson	do				
	150	Illinois	Waukegan	Robert Douglas	Gravelly clay			
	169	Ohio	Pineo, Daniels & Co.	E. E. Barney				
	196	do	Barney & Smith Manufacturing Co.	do				
	228^1	Vermont	Champlain valley	C. G. Pringle	Clay			
	228^2	do	Charlotte	do	Gravelly loam			
	228^3	do	do	do	do			
	238	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich, damp loam			
	250	Virginia	Wytheville	H. Shriver	Clay			
	251	do	do	do		0.225	56	
	259^1	do	do	do	Gravelly			
	259^2	do	do	do	do			
	259^3	do	do	do	do			
	403	Maryland	Charlestown Navy-yard.	S. H. Pook				
	443	Tennessee	Nashville	A. Gattinger	Rich bottom			
	547	Alabama	Kemper's mill	C. Mohr	Alluvial			
	748	Florida	Chattahoochee	A. H. Curtiss	Clay	0.236	8	43
	740	do	do	do	do	0.248	13	74
	895	Massachusetts		M. C. Beedle				
	1050	do	North Reading	J. Robinson		0.203	7	11
	1257		Charlestown Navy-yard.	S. H. Pook				
252. Quercus lobata *White Oak. Weeping Oak.*	670	California	Redding	G. R. Vasey	Gravelly loam	0.356	15	17
253. Quercus Garryana *White Oak.*	985	Oregon	Weidler's saw-mill	G. Engelmann and C. S. Sargent.				
	988	do	Portland	do	Rich loam	0.393	80	82
	1027	do	Portland Furniture Company.	do				
	1029	do	do	do				
254. Quercus obtusiloba *Post Oak. Iron Oak.*	37^1	Kentucky	Harrodsburg	W. M. Linney	Shale			
	37^2	do	do	do	do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
{ 0.5639 0.5723	0.5592 0.5519 }	0.5711	0.5637	{ 0.54 0.47 }	...	0.51	35.13	...	586
0.6793	0.6613	...	0.6703	0.33	0.33	0.33	41.77	...	665
0.7165	0.7093	...	0.7129	0.37	0.31	0.34	...	...	8
0.7970	0.8012	...	0.7991	0.30	0.25	0.28	...	...	26
0.8480	0.8451	0.7965	0.8290	0.45	0.47	0.46	...	...	32^{1}
0.6328	...	...	0.6328	...	...	...	...	...	32^{2}
0.6305	...	...	0.6305	...	...	...	...	...	32^{3}
0.6965	0.6526	...	0.6746	0.37	0.43	0.40	...	...	49^{1}
0.7826	...	...	0.7826	0.45	...	0.45	...	...	49^{2}
0.6829	0.7385	...	0.7107	0.30	...	0.30	...	...	40^{3}
0.6006	...	...	0.6006	0.37	...	0.37	...	...	113^{1}
0.6852	0.7012	...	0.6932	0.41	...	0.41	...	...	113^{2}
0.7017	...	...	0.7017	0.24	...	0.24	...	...	113^{3}
0.7892	0.8735	...	0.8314	0.47	0.42	0.45	...	...	150
0.7672	...	...	0.7672	0.21	0.23	0.22	...	...	169
0.6203	0.6305	...	0.6254	0.57	0.65	0.61	...	...	196
0.8304	...	...	0.8304	0.30	...	0.39	...	...	228^{1}
0.8670	...	...	0.8670	0.33	...	0.33	...	...	228^{2}
0.8091	...	...	0.8091	0.37	...	0.37	...	...	228^{3}
0.7830	0.7391	...	0.7611	0.43	0.42	0.43	...	...	238
0.7874	0.7419	...	0.7647	0.35	0.33	0.34	...	...	250
0.6848	0.6084	...	0.6016	0.21	0.25	0.23	...	...	251
0.7556	...	...	0.7550	...	...	...	...	...	259^{1}
0.7069	...	...	0.7069	0.30	...	0.30	...	...	259^{2}
0.8056	...	...	0.8056	0.37	...	0.37	...	...	259^{3}
0.7390	0.7437	...	0.7414	0.49	0.44	0.47	...	...	403
0.6549	...	...	0.6549	1.37	1.64	1.51	...	...	443
0.8566	0.7794	...	0.8180	0.45	0.29	0.37	...	...	547
0.7732	0.7562	...	0.7647	0.47	0.50	0.40	...	Brash: rough bark	748
0.8066	0.8228	...	0.8147	0.34	0.31	0.33	...	Tough: smooth bark	749
0.7672	0.7734	...	0.7703	0.33	0.37	0.35	...	Taken from beam in old court-house at Cambridge, built in 1757.	895
0.8065	0.7584	0.7358	0.7669	0.26	0.22	0.24	...	...	1050
...	...	...	0.8439	...	...	...	...	...	1257
			0.7470			0.41	46.35		
0.7849	0.7672	0.6706	0.7400	0.25	0.34	0.30	46.17	Third sp. gr. determination made on sap-wood	670
0.7814	0.8425	...	0.8120	0.33	0.25	0.29	...	...	985
0.6549	0.7600	...	0.7075	0.33	0.33	0.33	...	...	988
0.7478	0.7574	0.7704	0.7585	0.37	0.41	0.39	...	Brash	1027
0.6698	0.7369	...	0.7034	0.62	0.49	0.56	...	Tough	1029
			0.7453			0.39	46.45		
0.8200	0.8008	...	0.8104	0.62	...	0.62	...	Second sp. gr. determination made on 0.5 sap-wood	37^{1}
0.8765	...	...	0.8765	0.74	...	0.74	...	0.5 sap-wood	37^{2}

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
254. Quercus obtusiloba—continued	37^3	Kentucky	Harrodsburg	W. M. Linney	Shale			
	151	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich upland			
	256	Missouri	Allenton	G. W. Letterman	Clay			
	351	Alabama	Citronelle	C. Mohr	...do	0.244	38	88
	771	Florida	Aspalaga	A. H. Curtiss	Gravelly barrens	0.264	32	115
255. Quercus undulata, *var.* Gambelii *Scrub Oak.*	295	New Mexico	Pinos Altos mountains.	E. L. Greene		0.196	18	67
	417	...do	...do	...do				
	525	Colorado	Engelmann's cañon	Robert Douglas	Rocky			
	1150	Arizona	Santa Rita mountains.	C. G. Pringle				
256. Quercus macrocarpa *Burr Oak. Mossy-cup Oak. Over-cup Oak.*	79^1	Kentucky	Mercer county	W. M. Linney	Alluvial			
	79^2	...do	...do	...do	...do			
	79^3	...do	...do	...do	...do			
	79^4	...do	...do	...do	...do			
	137	Missouri	Allenton	G. W. Letterman	Moist upland			
	143	Illinois	Waukegan	Robert Douglas	Rich			
	168	Ohio	Woodsum Machine Company.	E. E. Barney				
	204	...do	Barney & Smith Manufacturing Co.	...do				
	310	Texas	Dallas	J. Reverchon	Rich, moist	0.528	13	120
	400	Missouri	Allenton	G. W. Letterman	Alluvial			
	412	Vermont	Charlotte	C. G. Pringle	Clay			
	432	Tennessee	Nashville	A. Gattinger	Alluvial			
	583	Illinois	Waukegan	Robert Douglas				
	831	...do	Winnebago county	M. S. Bebb	Loam			
	832	...do	...do	...do	...do			
	933	Texas	Austin	C. Mohr	Alluvial			
	1071	Vermont	Charlotte	C. G. Pringle				
	1072	...do	...do	...do				
	1073	...do	...do	...do				
257. Quercus lyrata *Over-cup Oak. Swamp Post Oak. Water White Oak.*	424	Tennessee	Nashville	A. Gattinger	Low			
	545	Mississippi	Kemper's mill	C. Mohr	Alluvial	0.339	19	73
	762	Florida	Chattahoochee	A. H. Curtiss	...do	0.266	20	70
	953	Texas	Matagorda bay	C. Mohr	Loam			
258. Quercus bicolor *Swamp White Oak.*	12	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.305	8	60
	54^1	Missouri	Allenton	G. W. Letterman	Alluvial			
	54^2	...do	...do	...do	...do			
	54^3	...do	...do	...do	...do			
	846	Massachusetts	West Newbury	J. Robinson	Low, swampy	0.206	5	30

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.8459	...	...	0.8459	1.56	...	1.56	...	...	37[8]
0.8920	0.8882	0.9170	0.8991	0.79	0.79	0.79	...	...	151
0.8522	0.8196	...	0.8359	0.46	0.52	0.49	...	...	256
0.7888	0.7516	...	0.7702	0.52	0.53	0.53	...	...	351
0.8548	0.7942	0.8072	0.8187	0.63	0.88	0.76	...	...	771
			0.8367			0.79	52.14		
0.8382	0.8562	...	0.8472	...	...	...	...	...	295
0.8680	0.7748	0.7862	0.8097	0.78	0.79	0.79	...	First sp. gr. determination made on 0.75 sap-wood	417
0.7684	0.7894	...	0.7789	1.08	1.37	1.23	...	...	525
0.9487	0.9052	...	0.9270	1.10	0.80	0.95	...	...	1150
			0.8407			0.09	52.39		
0.7070	...	...	0.7070	0.96	...	0.96	...	...	79[1]
0.7205	...	...	0.7205	0.66	...	0.66	...	...	79[2]
0.7275	0.7275	...	0.7275	0.70	...	0.70	...	...	79[3]
0.6426	0.6300	...	0.6363	1.18	...	1.18	...	...	79[4]
0.8469	...	...	0.8469	0.41	0.37	0.39	...	Second growth	137
0.8280	0.8276	...	0.8278	0.60	0.92	0.76	...	...	143
0.6440	0.6383	...	0.6416	0.31	0.32	0.32	...	...	168
0.6458	0.6177	...	0.6318	0.37	0.43	0.40	...	...	204
0.7722	0.8166	...	0.7944	1.08	1.03	1.06	...	...	310
0.6183	0.6411	...	0.6297	0.60	0.60	0.60	...	...	400
0.8630	0.8496	...	0.8563	0.26	0.27	0.27	...	...	412
0.7271	...	...	0.7271	0.74	0.75	0.75	...	...	432
0.9229	0.9543	0.9390	0.9387	1.18	1.46	1.32	...	...	583
0.6842	0.7112	...	0.6977	0.78	0.70	0.74	...	From fence-post 6 years in the ground	831
0.6107	0.7075	...	0.0591	0.98	0.93	0.90	...	Old fence-post	832
0.7605	0.8402	0.8047	0.8018	1.11	1.18	1.15	...	...	933
0.7740	0.8087	0.7360	0.7720	0.45	0.46	0.46	...	...	1071
0.7845	0.7924	0.8018	0.7929	0.32	0.45	0.39	...	...	1072
0.7598	0.7630	0.7317	0.7515	0.44	0.35	0.40	...	...	1073
			0.7453			0.71	46.45		
0.8060	0.7863	...	0.7962	0.50	0.50	0.58	...	...	424
0.7802	0.7502	...	0.7652	0.22	0.23	0.23	...	...	545
0.8050	0.7649	...	0.7850	0.23	0.18	0.21	...	...	762
0.0790	...	...	0.9790	1.72	1.44	1.58	...	...	953
			0.8313			0.65	51.81		
0.7552	0.7315	...	0.7434	0.26	0.28	0.27	...	...	12
0.8616	0.8628	...	0.8622	0.39	...	0.39	...	...	54[1]
0.6833	...	...	0.6833	0.98	...	0.98	...	...	54[2]
0.7114	...	...	0.7114	0.98	...	0.98	...	...	54[3]
0.8404	0.8186	0.8330	0.8307	0.27	0.31	0.29	...	...	840
			0.7602			0.58	47.75		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth. Sap-wood.	Heart-wood.
259. Quercus Michauxii. *Basket Oak. Cow Oak.*	240	South Carolina	Bonneau's Depot	H. W. Ravenel	Alluvial			
	524	Alabama	Kemper's mill	C. Mohr	....do	0.322	22	69
	755	Florida	Chattahoochee	A. H. Curtiss	....do	0.260	12	32
260. Quercus Prinus. *Chestnut Oak. Rock Chestnut Oak.*	31[1]	Kentucky	Boyle county	W. M. Linney	Shale			
	31[2]	....do	....do	....do	....do			
	31[3]	....do	....do	....do	....do			
	35	....do	....do	....do	Limestone			
	434	Tennessee	Nashville	A. Gattinger	Rocky upland			
	925	Alabama	Cullman	C. Mohr	Dry, rocky	0.436	34	84
261. Quercus prinoides. *Yellow Oak. Chestnut Oak. Chinquapin Oak.*	28	Kentucky	Harrodsburg	W. M. Linney				
	34[1]	....do	Mercer county	....do	Limestone			
	34[2]	....do	Boyle county	....do	Waverly shale			
	34[3]	....do	Mercer county	....do	Utica shale			
	58	Missouri	Allenton	G. W. Letterman	Poor, hilly			
	273	....do	....do	....do	Limestone			
	287	....do	....do	....do	Flinty			
	323	Texas	Dallas	J. Reverchon	Calcareous	0.220	24	35
	514	Tennessee	Nashville	A. Gattinger	Alluvial			
	588	Texas	Dallas	J. Reverchon	....do			
	856	Massachusetts	Boxford	J. Robinson	Damp	0.364	10	123
262. Quercus Douglasii. *Mountain White Oak. Blue Oak.*	688	California	Contra Costa county	G. R. Vasey	Clay	0.338	59	
263. Quercus oblongifolia. *White Oak.*	601	....do	San Diego county	....do	Dry, gravelly			
	700	....do	San Gabriel	G. Engelmann	....do	0.202	16	5
264. Quercus grisea. *White Oak.*	410	New Mexico	Silver City	E. L. Greene	Dry, rocky	0.212	38	40
	698	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	....do			
	1145	....do	....do	C. G. Pringle	....do			
265. Quercus reticulata	1148	....do	....do	....do	....do			
266. Quercus Durandii	035	Texas	Austin	C. Mohr	Damp, calcareous.	0.164	24	39
	1103	....do	....do	S. B. Buckley	....do			
267. Quercus virens. *Live Oak.*	404	Florida	Charlestown Navy-yard.	S. H. Pook				
	799	....do	Saint John's river	A. H. Curtiss	Sandy	0.238	39	15

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.7674	0.8312	....	0.7993	0.33	0.48	0.40	....	....	240
0.8253	0.7704	....	0.7979	0.57	0.57	0.57	....	....	524
0.8200	0.8090	....	9.8145	0.38	0.35	0.37	....	....	755
			0.8039			0.45	50.10		
0.7126	0.7102	....	0.7114	9.36	....	0.36	....	....	31[1]
0.6549	0.6659	....	0.6604	0.33	....	0.33	....	....	31[2]
0.7726	....	....	0.7726	....	....	....	....	....	31[3]
0.8308	....	....	0.8308	0.70	0.87	0.79	....	....	35
0.6870	....	....	0.6870	1.94	1.93	1.94	....	....	434
0.8550	0.8185	....	0.8368	0.40	0.49	0.45	....	....	925
			0.7499			0.77	46.73		
0.8401	0.8419	....	0.8410	1.50	1.40	1.45	....	....	28
0.7951	....	....	0.7951	1.49	....	1.49	....	....	34[1]
0.8712	....	....	0.8712	0.30	0.49	0.44	....	....	34[2]
0.9643	....	....	0.9643	1.62	....	1.62	....	....	34[3]
0.6566	0.6525	....	0.6546	1.39	1.25	1.32	....	....	58
0.9237	0.8548	....	0.8893	1.16	1.31	1.24	....	....	273
0.8248	0.8644	....	0.8446	0.64	0.57	0.61	....	....	287
1.0240	1.0728	....	1.0484	1.25	1.09	1.17	....	....	823
0.8592	0.8750	....	0.8671	1.43	1.49	1.46	....	....	514
0.9183	0.9405	....	0.9291	1.38	1.22	1.30	....	....	588
0.7652	0.7458	0.7706	0.7605	0.43	0.43	0.43	....	....	856
			0.8605			1.14	53.63		
0.0958	0.7898	....	0.8928	0.80	0.88	0.84	55.64	Second sp. gr. determinatiou made on sap-wood	688
1.0078 0.9495	1.0790 1.1500	1.0160 1.0882	1.0486	4.62 2.28	4.69 4.68	4.07	....	First and second sp. gr. determinations made on sap-wood	601
0.8420	0.8374	....	0.8397	0.99	1.31	1.15	....	All sap-wood	700
			0.9441			2.61	58.84		
0.0171	0.0835	0.8703	0.9236	1.22	1.26	1.24	....	0.5 sap-wood	419
0.9897	....	....	0.9897	2.57	3.33	2.95	....	0.5 sap-wood	698
1.1340	1.0945	....	1.1143	1.32	1.19	1.26	....	....	1145
			1.0092			1.82	62.89		
0.9430	0.9528	....	0.9479	0.51	0.53	0.52	59.07	....	1148
0.9762 0.8648	0.8000 0.8690	....	0.8775	1.71 1.80	....	1.75	....	0.5 sap-wood	935
0.9640	1.0835	....	1.0238	1.82	....	1.82	....	....	1103
			0.9507			1.78	59.25		
1.0350	....	....	1.0350	....	....	....	....	....	404
0.9005	0.8949	....	0.8977	1.23	1.21	1.22	....	....	792

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth. Sap-wood.	Layers of growth. Heart-wood.
267. Quercus virens—continued	919	Alabama	Mobile county	C. Mohr	Rich, sandy			
	951	Texas	Matagorda bay	...do	Sandy loam			
268. Quercus chrysolepis *Live Oak. Maul Oak. Valparaiso Oak.*	574	Oregon	Saw-mill, Ashland	G. Engelmann and C. S. Sargent.				
	649	California	San Bernardino	W. G. Wright				
	653	...do	Marin county	G. R. Vasey	Gravelly			
269. Quercus Emoryi *Black Oak.*	594	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, rocky			
270. Quercus agrifolia *Enceno Coast Live Oak.*	663	California	Marin county	G. R. Vasey	Loam	0.247		
271. Quercus Wislizeni *Live Oak.*	677	...do	Auburn	G. Engelmann				
272. Quercus rubra *Red Oak. Black Oak.*	7	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.534	8	73
	45[1]	Kentucky	Mercer county	W. M. Linney	Shale			
	45[2]	...do	...do	...do	...do			
	89	Missouri	Allenton	G. W. Letterman	Rich loam	0.149	5	40
	92[1]	Kentucky	Mercer county	W. M. Linney	Alluvial			
	92[4]	...do	...do	...do	Limestone			
	140	Michigan	Dansville	W. J. Beal	Sandy			
	141	...do	...do	...do	...do			
	146	Illinois	Waukegan	Robert Douglas	Gravelly			
	197	Ohio	Barney & Smith Manufacturing Co	E. E. Barney				
	215	Vermont	Charlotte	C. G. Pringle	Gravelly			
	216	...do	...do	...do	...do			
	217	...do	...do	...do	...do			
	218	...do	...do	...do	...do			
	553	Alabama	Kemper's mill	C. Mohr	Alluvial	0.368	38	97
	869	Massachusetts	Danvers	J. Robinson	Drift			
	929	Mississippi	Enterprise	C. Mohr	Alluvial			
	1043	Massachusetts	North Reading	J. Robinson	Drift	0.230	6	27
272. Quercus rubra, *var.* Texana *Red Oak.*	931	Texas	Austin	C. Mohr	Calcareous	0.118	13	20
273. Quercus coccinea *Scarlet Oak.*	23	Massachusetts	Hingham	T. T. Bouvé	Light, sandy			
	752	Florida	Aspalaga	A. H. Curtiss	Clay	0.230	15	
274. Quercus tinctoria *Black Oak. Yellow-bark Oak. Quercitron Oak. Yellow Oak.*	17	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.630	8	74
	36[1]	Kentucky	Danville Junction	W. M. Linney	Shale			
	36[2]	...do	...do	...do	...do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations. First.	Second.	Third.	Average.	Ash determinations. First.	Second.	Average.	Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
0.8225	0.9330	....	0.8778	1.25	1.30	1.27	....	....	919
1.0090	0.9709	....	0.9900	1.09	0.76	0.93	....	0.33 sap-wood	954
			0.9501			1.14	59.21		
0.7888	0.7592	....	0.7740	0.80	0.62	0.71	....	....	574
0.8830	0.8827	....	0.8829	0.33	0.34	0.34	....	....	649
0.8787	0.9033	....	0.8910	0.73	0.79	0.76	....	....	653
			0.8493			0.60	52.93		
0.9975 0.9201	0.9019 0.8855	....	0.9263	1.86 2.61	2.19 2.78	2.36	57.73	Second sp. gr. determination made on sap-wood	594
0.8290	0.8216	....	0.8253	1.21	1.34	1.28	51.43	....	663
0.7936 0.8018	0.7788 0.7657	....	0.7855	0.94 0.96	0.98 1.18	1.02	48.95	....	677
0.6381	0.6440	....	0.6411	0.14	0.10	0.12	....	....	7
0.5186	0.5910	....	0.5548	0.46	....	0.46	....	....	45[1]
0.5169	0.6251	....	0.5710	0.43	....	0.43	....	....	45[2]
0.7480	....	....	0.7480	0.27	....	0.27	....	....	89
0.5899	....	....	0.5899	0.47	0.47	0.47	....	....	92[1]
0.7516	0.7512	0.7516	0.7515	0.15	....	0.15	....	....	92[4]
0.6410	....	....	0.6410	0.20	0.21	0.21	....	....	140
0.5952	....	....	0.5952	0.23	0.24	0.24	....	....	141
0.7481	0.7514	....	0.7498	0.22	0.31	0.27	....	....	146
0.6516	0.6615	....	0.6566	0.10	0.17	0.17	....	....	197
0.6423	0.6997	....	0.6710	0.27	0.22	0.25	....	....	215
0.6897	0.7090	....	0.6994	0.20	0.24	0.22	....	....	216
0.6669	0.6867	....	0.6768	0.20	0.26	0.23	....	Second growth from stump	217
0.6765	0.7020	....	0.6897	0.33	0.32	0.33	....	....	218
0.6389	0.6589	....	0.6489	0.37	0.34	0.36	....	....	553
0.6636	0.6252	0.6573	0.6487	0.07	0.14	0.11	....	....	866
0.5244	0.5604	....	0.5424	0.25	0.21	0.23	....	....	920
0.7130	0.6806	0.6920	0.6952	0.14	0.19	0.17	....	....	1043
			0.6540			0.26	40.75		
0.9142	0.9018	....	0.9080	0.93	0.76	0.85	56.50	0.5 sap-wood	931
0.7111	0.7079	....	0.7095	0.11	0.16	0.14	....	....	23
0.7667	0.7762	....	0.7715	0.22	0.28	0.25	....	....	752
			0.7405			0.19	46.15		
0.7364	0.7305	....	0.7335	0.13	0.08	0.11	....	....	17
0.6863	....	....	0.6863	0.21	....	0.21	....	....	36[1]
0.7205	....	....	0.7205	0.31	....	0.31	....	....	36[2]

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth. Sap-wood.	Layers of growth. Heart-wood.
274. Quercus tinctoria—continued	36³	Kentucky	Danville Junction	W. M. Linney	Slate			
	41	Missouri	Allenton	G. W. Letterman	Hilly			
	74	...do	...do	...do	Rich upland	0.165	6	16
	86	...do	...do	...do	...do			
	244	Virginia	Wytheville	H. Shriver	Clay			
	247	...do	...do	...do	...do			
	437	Tennessee	Nashville	A. Gattinger	...do			
	921	Alabama	Cullman	C. Mohr	Sandy			
275. Quercus Kelloggii	028	Oregon	Saw-mill, Ashland	G. Engelmann and C. S. Sargent.				
Black Oak.	903	...do	Eugene City	G. H. Collier		0.224	17	78
276. Quercus nigra	268	Missouri	Allenton	G. W. Letterman	Clay			
Black Jack. Jack Oak.	339	Alabama	Citronelle	C. Mohr	Sandy	0.128	13	46
277. Quercus falcata	131	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich loam			
Spanish Oak. Red Oak.	245	Virginia	Wytheville	H. Shriver	Clay			
	265¹	...do	Carroll county	...do	...do			
	265²	...do	...do	...do				
	265³	...do	...do	...do				
	548	Mississippi	Kemper's mill	C. Mohr	Rich loam			
278. Quercus Catesbæi	342	Alabama	Cottage Hill	...do	Barren, sandy			
Turkey Oak. Scrub Oak. Forked-leaf Black Jack. Black Jack.	770	Florida	Aspalaga	A. H. Curtiss	...do	0.301	62	
279. Quercus palustris	47	Missouri	Allenton	G. W. Letterman	Rich, alluvial			
Pin Oak. Swamp Spanish Oak. Water Oak.	282	...do	...do	...do	...do			
280. Quercus aquatica	349	Alabama	Cottage Hill	C. Mohr	Sandy loam	0.350	8	16
Water Oak. Duck Oak. Possum Oak. Punk Oak.	511	Tennessee	Tullahoma	A. Gattinger	...do			
	742	Georgia	Bainbridge	A. H. Curtiss	Alluvial	0.310	18	23
281. Quercus laurifolia	756	Florida	Saint John's river	...do	Sandy loam			
Laurel Oak.	801	...do	...do	...do	...do	0.240	83	26
282. Quercus heterophylla *Bartram's Oak.*	1171	New Jersey	Mount Holly	S. P. Sharples	Clay	0.329	6	19
283. Quercus cinerea *Upland Willow Oak. Blue Jack. Sand Jack*	352	Alabama	Citronelle	C. Mohr	Pine-barren			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.7749			0.7749	0.18		0.18			36[3]
0.7596	0.7352		0.7474	0.17	0.14	0.16			41
0.8014			0.8014	0.22	0.19	0.21		0.33 sap-wood; second growth	74
0.7192			0.7192	0.28	0.18	0.23			86
0.5070	0.5175		0.5123	0.44	0.63	0.54			244
0.7164	0.6586		0.6875	0.14	0.15	0.15			247
0.6765			0.6765	0.35	0.37	0.36			437
0.6622	0.6972	0.7100	0.6898	0.59	0.70	0.65			921
			0.7045			0.28	43.90		
0.6565	0.6582		0.6573	0.18	0.21	0.20			628
0.6273	0.6322		0.6297	0.33	0.30	0.32			963
			0.6435			0.26	40.10		
0.7304	0.7492		0.7398	0.96	0.92	0.94			268
0.7309	0.7192		0.7251	1.41	1.32	1.37		All sap-wood	339
			0.7324			1.16	45.64		
0.6892	0.7003		0.6948	0.27	0.27	0.27			131
0.5701	0.6780		0.6241	0.27	0.33	0.30			245
0.6613			0.6613	0.15		0.15			265[1]
0.7334			0.7334	0.22		0.22			265[2]
0.6556			0.6556	0.25		0.25			265[3]
0.8052	0.7696		0.7874	0.29	0.28	0.29			548
			0.6928			0.25	43.17		
0.6679	0.6736		0.6708	0.85	0.80	0.83			342
0.7906	0.7854		0.7880	0.90	0.90	0.90			770
			0.7294			0.87	45.45		
0.6917	0.6465		0.6691	0.65	0.57	0.61			47
0.7480	0.6890		0.7185	0.92	1.07	1.00		Second growth	282
			0.6938			0.81	43.24		
0.7167	0.7149		0.7158	0.45	0.39	0.42			349
0.7064	0.7202		0.7143	0.82	0.84	0.83			511
0.7237	0.7624		0.7431	0.35	0.19	0.27			742
			0.7244			0.51	45.14		
0.7474	0.7075		0.7275	0.48	0.46	0.47		All sap-wood	756
0.8146	0.7995		0.8071	0.93	1.41	1.17			801
			0.7673			0.82	47.82		
0.6818 0.6882	0.6834 0.6802		0.6834	0.19	0.14	0.17	42.59		1171
0.6502	0.6337		0.6420	1.27	1.15	1.21	40.00		352

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
284. Quercus hypoleuca	416	New Mexico	Pinos Altos mountains.	E. L. Greene	Dry, rocky	0.203	49	20
	599	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	do			
285. Quercus imbricaria *Shingle Oak. Laurel Oak.*	40[1]	Kentucky	Harrodsburg	W. M. Linney	Utica shale			
	40[2]	do	do	do	do			
	40[3]	do	do	do	do			
	50	Missouri	Allenton	G. W. Letterman	Rich, moist			
	135	do	do	do	Rich loam			
286. Quercus Phellos *Willow Oak. Peach Oak.*	512	Tennessee	Tullahoma	A. Gattinger	Moist, siliceous	0.184	15	
287. Quercus densiflora *Tanbark Oak. Chestnut Oak. Peach Oak.*	687	California	Marin county	G. R. Vasey	Gravelly	0.400	25	85
288. Castanopsis chrysophylla *Chinquapin.*	720	do	Mendocino county	A. Kellogg				
289. Castanea pumila *Chinquapin.*	573	Arkansas	Hot Springs	G. W. Letterman	Sandy loam	0.615		
290. Castanea vulgaris, *var.* Americana *Chestnut.*	18	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.666	34	42
	258[1]	Virginia	Fancy Gap	H. Shriver	Moist			
	258[2]	do	do	do	do			
	258[3]	do	do	do	do			
	516	Tennessee	Nashville	A. Gattinger	Sandy			
	727	Pennsylvania	Williamsport	C. G. Pringle				
	868	Massachusetts	Danvers	J. Robinson	Loam	0.110	4	21
291. Fagus ferruginea *Beech.*	9	do	Arnold Arboretum	C. S. Sargent	Drift	0.190	9	26
	44[2]	Kentucky	Mercer county	W. M. Linney	Hudson River shale.			
	44[3]	do	do	do	do			
	55[3]	do	do	do	do			
	55[4]	do	do	do	do			
	119	Michigan	Dansville	W. J. Beal	Gravelly			
	765	Florida	Chattahoochee	A. H. Curtiss	do	0.272	82	
	853	Massachusetts	Hamilton	J. Robinson	do			
292. Ostrya Virginica *Hop Hornbeam. Iron Wood. Lever Wood.*	11	do	Arnold Arboretum	C. S. Sargent	Drift	0.285	26	44
	87	Missouri	Allenton	G. W. Letterman	Rich loam	0.085	35	
	870	Massachusetts	Danvers	J. Robinson	Rocky			
	877	do	do	do	Rich loam			
	1047	do	North Reading	do		0.190	62	14
293. Carpinus Caroliniana *Hornbeam. Blue Beech. Water Beech. Iron Wood.*	46	Missouri	Allenton	G. W. Letterman	Damp, alluvial			
	73[1]	Kentucky	Mercer county	W. M. Linney	Trenton limestone			
	73[2]	do	do	do	do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.7826	0.8304	....	0.8065	1.27	1.27	1.27	....	All sap-wood	416
0.7774	....	....	0.7952	1.21	1.35	1.41	....	0.5 sap-wood	599
0.8208	0.7735	0.8089		1.64	1.42				
			0.8009			1.34	49.91		
0.7402	0.7394	....	0.7398	0.23	....	0.23	....	....	40[1]
0.7234	....	....	0.7234	0.65	....	0.65	....	....	40[2]
0.8332	....	....	0.8332	0.79	....	0.79	....	....	40[3]
0.7517	0.7360	....	0.7439	0.22	0.34	0.28	....	....	50
0.7200	0.7285	....	0.7243	0.23	0.18	0.21	....	Second growth	135
			0.7529			0.43	46.92		
0.7532	0.7412	....	0.7472	0.51	0.48	0.50	46.56	....	512
0.6650	0.7004	....	0.6827	1.55	1.41	1.49	42.55	....	687
0.5520	0.5627	....	0.5574	0.35	....	0.35	34.74	0.33 sap-wood	729
0.5698	0.6076	....	0.5887	0.12	0.11	0.12	36.69	....	573
0.3829	0.3827	....	0.3828	0.10	0.12	0.11	....	....	18
0.4720	....	....	0.4720	0.26	....	0.26	....	....	258[1]
0.4716	....	....	0.4716	0.21	....	0.21	....	....	258[2]
0.4494	....	....	0.4494	....	....	....	....	....	258[3]
0.4693	....	....	0.4693	0.18	0.21	0.20	....	....	516
0.4663	0.4247	....	0.4455	0.10	0.17	0.17	....	....	727
0.4613	0.4594	0.4656	0.4621	0.14	0.12	0.13	....	....	868
			0.4504			0.18	28.07		
0.6663	0.6556	....	0.6610	0.34	0.33	0.34	....	....	9
0.6200	....	....	0.6200	0.75	....	0.75	....	Red beech	44[2]
0.6343	....	....	0.6343	0.70	....	0.70	....	Red beech	44[3]
0.7992	....	....	0.7992	0.57	....	0.57	....	White beech	55[3]
0.7150	0.7200	....	0.7175	0.54	....	0.54	....	White beech	55[4]
0.7619	0.6605	....	0.7112	0.31	0.38	0.35	....	....	110
0.6897	0.6560	....	0.6729	0.47	....	0.47	....	....	765
0.7017	0.6825	0.6870	0.6904	0.29	0.38	0.34	....	First and second sp. gr. determinations made on 0.5 sap-wood; third sp. gr. determination made on sap-wood.	853
			0.6883			0.51	42.89		
0.7608	0.7636	....	0.7022	0.34	0.37	0.30	....	....	11
0.8919	....	....	0.8910	0.49	0.67	0.58	....	....	87
0.8512	0.8402	0.8870	0.8595	0.53	0.60	0.60	....	....	870
0.8491	0.8296	0.8534	0.8440	0.55	0.51	0.53	....	....	877
0.7818	0.7940	0.7768	0.7842	0.51	0.39	0.45	....	....	1047
			0.8284			0.50	51.02		
0.7657	0.7711	....	0.7684	0.76	0.80	0.78	....	....	46
0.7264	....	....	0.7264	0.80	0.70	0.80	....	....	73[1]
0.7526	0.7504	....	0.7515	1.34	....	1.34	....	....	73[2]

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
293. Carpinus Caroliniana—continued	77	Missouri	Allenton	G. W. Letterman	Rich, alluvial	0.052	22	
	872	Massachusetts	Danvers	J. Robinson	Low, rich			
	1038	do	do	do	Gravelly			
BETULACEÆ.								
294. Betula alba, *var.* populifolia. *White Birch. Old-field Birch. Gray Birch.*	10	do	Arnold Arboretum	C. S. Sargent	Drift	0.170	10	26
	848	do	Danvers	J. Robinson	Gravelly	0.196	16	33
295. Betula papyrifera. *Canoe Birch. White Birch. Paper Birch.*	223	Vermont	Charlotte	C. G. Pringle	Gravelly			
	224	do	do	do	do			
	225	do	do	do	do			
	722	Montana	Missoula	Sereno Watson	Wet			
	836	Massachusetts	Townsend	J. Robinson		0.234	26	
	990	Alaska	Chilcoot inlet	Paul Schultze		0.188	57	
	1065	Vermont	Charlotte	C. G. Pringle				
	1066	do	do	do				
	1067	do	do	do				
296. Betula occidentalis. *Black Birch.*	528	Colorado	Engelmann's cañon	Robert Douglas	Wet, sandy			
	629	California	Strawberry valley	G. Engelmann and C. S. Sargent.	Wet, peaty			
297. Betula lutea. *Yellow Birch. Gray Birch.*	155	Vermont	Charlotte	C. G. Pringle	Swampy			
	230[1]	do	do	do	Clay			
	230[2]	do	do	do	Gravelly			
	843	Massachusetts	Danvers	J. Robinson	do	0.160	34	
	1068	Vermont	Charlotte	C. G. Pringle	do			
	1069	do	do	do	do			
	1070	do	do	do	do			
298. Betula nigra. *Red Birch. River Birch.*	136	Missouri	Allenton	G. W. Letterman	Moist loam			
	398	do	do	do	Alluvial			
	841	Massachusetts	North Andover	J. Robinson	do	0.192	30	
	842	do	do	do	do	0.214	32	8
	1184	Missouri	Allenton	G. W. Letterman	Sandy loam			
299. Betula lenta. *Cherry Birch. Black Birch. Sweet Birch. Mahogany Birch.*	4	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.302	12	61
	221	Vermont	Charlotte	C. G. Pringle	Gravelly			
	844	Massachusetts	Danvers	J. Robinson	do	0.118	41	22

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.7591	0.6907	....	0.7249	0.60	0.52	0.56	....	....	77
0.7014	0.7085	0.7137	0.7079	0.88	0.93	0.91	....	....	872
0.7080	0.6804	0.6896	0.6927	0.55	0.65	0.60	....	....	1038
			0.7286			0.83	45.41		
0.5361	....	....	0.5361	0.32	0.27	0.30	....	Sap-wood	10
0.6330	0.6088	0.6061	0.6160	0.28	0.28	0.28	....	First and third sp. gr. determinations made on sap-wood	848
			0.5760			0.29	35.90		
0.4594	0.4757	....	0.4676	0.24	0.24	0.24	....	All sap-wood	223
0.6021	0.5979	....	0.6000	0.30	0.31	0.31	....	0.5 sap-wood	224
0.6686	0.6207	....	0.6297	0.25	0.22	0.24	....	First sp. gr. determination made on 0.5 sap-wood; second sp. gr. determination made on 0.75 sap-wood.	225
0.6240	0.6096	....	0.6168	0.25	0.22	0.24	....	All sap-wood	722
0.6290	0.6260	0.6395	0.6315	0.20	0.19	0.20	....	All sap-wood	836
0.6081	0.6060	....	0.6070	0.24	0.25	0.25	....	All sap-wood	990
0.6801	0.6227	0.6112	0.6380	0.28	0.26	0.27	....	All sap-wood	1065
0.6002	0.5665	0.5843	0.5837	0.25	0.24	0.25	....	All sap-wood	1066
0.5894	0.5908	0.5745	0.5849	0.26	0.22	0.24	....	All sap-wood	1067
			0.5955			0.25	37.11		
0.5880	0.6183	....	0.6032	0.18	0.18	0.18	....	All sap-wood	528
0.6543	0.5777	0.5767	0.6028	0.44	0.37	0.41	....	....	629
			0.6030			0.30	37.58		
0.5759	0.6237	....	0.5098	0.29	0.20	0.25	....	0.5 sap-wood	155
0.7047	....	....	0.7047	0.33	....	0.33	....	0.875 sap-wood	230[a]
0.6416	....	....	0.6416	0.60	....	0.60	....	....	230[b]
0.7032	0.7200	0.7080	0.7104	0.16	0.25	0.20	....	All sap-wood	843
0.6468	0.6293	0.6573	0.6445	0.28	0.25	0.27	....	....	1068
0.6380	0.6472	0.6256	0.6369	0.28	0.22	0.25	....	....	1069
0.6557	0.6543	0.6382	0.6494	0.27	0.27	0.27	....	....	1070
			0.6553			0.31	40.84		
0.5608	0.5721	....	0.5665	0.30	0.31	0.31	....	All sap-wood	186
0.5554	0.5508	....	0.5531	0.27	0.31	0.29	....	All sap-wood	898
0.5010	0.5750	0.5811	0.5827	0.38	0.38	0.38	....	From butt: Sap-wood	841
0.6049	0.5975	0.5965	0.5996	0.38	0.38	0.38	....	From top of trunk: Sap-wood	842
0.5556	0.5836	0.5988	0.5793	0.44	0.40	0.42	....	....	1184
			0.5762			0.35	35.91		
0.7555	0.7604	....	0.7579	0.16	0.20	0.18	....	All sap-wood	4
0.7344	0.6945	....	0.7145	0.25	0.32	0.29	....	....	221
0.8115	0.8160	0.8109	0.8128	0.26	0.33	0.30	....	All sap-wood	844
			0.7017			0.26	47.47		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
300. Alnus maritima *Seaside Alder.*	809	Delaware	Adger's mill	W. M. Canby	Moist, sandy loam.	0.108	25	
	810	... do	Pepper's mill	...do	...do			
301. Alnus rubra *Alder.*	967	Alaska	Sitka	Paul Schultze				
	991	Washington territory.	Puyallup	G. Engelmann and C. S. Sargent.				
	1025	Oregon	Portland Furniture Company.	...do				
302. Alnus rhombifolia *Alder.*	717	Montana	Missoula	Sereno Watson	Wet			
	979	Oregon	Drain	C. S. Sargent	Moist loam			
303. Alnus oblongifolia *Alder.*	694	California	San Bernardino	W. G. Wright				
304. Alnus serrulata *Black Alder. Smooth Alder.*	541	Alabama	Stockton	C. Mohr	Wet			
	611	Georgia	Altamaha river	A. H. Curtiss	Damp	0.108	38	
305. Alnus incana *Speckled Alder. Hoary Alder. Black Alder.*	374	Vermont	Hinesburgh	C. G. Pringle	Wet loam			
	862	Massachusetts	Danvers	J. Robinson	...do			
SALICACEÆ.								
306. Salix nigra *Black Willow.*	232	Vermont	Shelburne	C. G. Pringle	Wet, sandy			
	855	Massachusetts	Topsfield	J. Robinson	Alluvial	0.202	12	50
307. Salix amygdaloides *Willow.*	884	Utah	Salt Lake City	M. E. Jones	Clay			
	908	Colorado	Cañon City	E. Weston				
	911	...do	...do					
308. Salix lævigata *Willow.*	690	California	Santa Cruz	G. Engelmann and C. S. Sargent.	Moist, sandy			
309. Salix lasiandra *Willow.*	1219	...do	...do	C. L. Anderson				
309. Salix lasiandra, *var.* lancifolia	640	...do	Strawberry valley	G. Engelmann and C. S. Sargent.	Moist, rich			
	981	Oregon	Portland	F. Skinner	Alluvial			
309. Salix lasiandra, *var.* Fendleriana	889	Utah	City Creek cañon	M. E. Jones	Gravelly			
310. Salix longifolia *Sand-bar Willow.*	1174	Illinois	Rockford	M. S. Bebb		0.120	4	11
310. Salix longifolia, *var.* exigua	955	Texas	Matagorda bay	C. Mohr	Moist, saline			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.4988	0.5186	....	0.5087	0.34	0.35	0.35	....	....	809
0.4923	0.4889	....	0.4906	0.37	0.47	0.42	....	....	810
			0.4996			0.39	31.13		
0.4922	0.4851	....	0.4887	0.39	0.40	0.39	....	....	967
0.4855	0.4847	....	0.4856	0.59	0.49	0.54	....	....	991
0.4829	0.4565	....	0.4697	0.36	0.28	0.32	....	....	1025
			0.4813			0.42	29.99		
0.4556	0.3722	0.3604	0.4077	0.39	0.45	0.39	....	First sp. gr. determination made on sap-wood; second sp. gr. determination made on 0.5 sap-wood.	717
0.4427				0.43	0.30				
0.4172	0.4183	....	0.4178	0.19	0.25	0.22	....	....	979
			0.4127			0.31	25.72		
0.4138	0.3823	....	0.3981	0.42	0.43	0.42	24.81	....	694
0.4714	0.4635	....	0.4675	0.32	0.34	0.33	....	....	541
0.4573	0.4738	....	0.4656	0.47	0.39	0.43	....	....	611
			0.4666			0.38	29.08		
0.4029	0.4842	....	0.4436	0.47	0.40	0.44	....	All sap-wood	374
0.4960	0.4642	0.4732	0.4778	0.38	0.40	0.39	28.71	0.75 sap-wood	862
			0.4607			0.42	....		
0.4327	0.4102	....	0.4215	0.62	0.79	0.71	....	....	232
0.4790	0.4621	0.4676	0.4696	0.65	0.71	0.68	....	First and second sp. gr. determinations made on 0.60 sap-wood; third sp. gr. determination made on 0.5 sap-wood.	855
			0.4456			0.70	27.77		
0.4530	....	....	0.4530	0.55	0.89	0.72	....	....	884
0.4680	0.4448	....	0.4488	1.08	0.91	1.11	....	One tree	908
0.4612	0.4201			1.38	1.08				911
			0.4509			0.92	28.10		
0.4916	0.4828	....	0.4872	0.56	0.60	0.58	30.36	....	690
0.4810	0.4702	....	0.4756	0.60	0.50	0.60	29.64	....	1219
0.4502	0.4536	....	0.4519	0.61	0.73	0.67	....	....	640
0.5063	0.4573	0.4089	0.4575	1.09	0.72	0.91	....	....	981
			0.4547			0.79	28.34		
0.4576	0.4619	....	0.4598	0.53	0.58	0.56	28.65	....	889
0.4901	0.4950	....	0.4930	0.46	0.49	0.48	30.72	....	1174
0.5221	0.533[illegible]	0.5482	0.5342	1.02	1.09	1.06	33.29	....	955

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH. Sap-wood.	Heart-wood.
311. Salix sessilifolia	1143	Oregon	Mouth of Willamette river.	Jos. Howells	Alluvial			
312. Salix discolor *Glaucous Willow.*	859	Massachusetts	Topsfield	J. Robinson	Loam	0.091	7	6
	1225	New York	Ellenburg	J. H. Sears	...do			
313. Salix flavescens	641	New Mexico	Pinos Altos mountains.	E. L. Greene				
	721	Montana	Pattee's cañon, Missoula.	S. Watson	Rich, moist			
	888	Utah	City Creek cañon	M. E. Jones	Moist, gravelly	0.060	13	4
313. Salix flavescens, *var.* Scouleriana *Black Willow.*	972	Washington territory.	Seattle	G. Engelmann and C. S. Sargent.	Moist, sandy	0.160	22	10
314. Salix Hookeriana	966	Oregon	Winchester bay	...do	Sandy saline			
315. Salix cordata, *var.* vestita *Diamond Willow.*	1175	Nebraska	Brownsville	R. W. Furnas	Alluvial	0.148	5	11
	1180	Iowa	Sioux City	W. G. Wright	...do	0.117	8	14
316. Salix lasiolepis *Willow.*	669	California	Santa Cruz	G. Engelmann and C. S. Sargent.	Sandy loam	0.128	16	
317. Salix Sitchensis *Silky Willow.*	1161	Oregon	Sauvie's Island	Jos. Howells	Alluvial			
318. Populus tremuloides *Aspen. Quaking Asp.*	272[1]	Colorado	Alpine	T. S. Brandegee	Damp			
	272[2]	...do	...do	...do	...do			
	272[3]	...do	...do	...do	...do			
	411	Vermont	Charlotte	C. G. Pringle	Moist			
	1035	Massachusetts	Danvers	J. Robinson	Gravelly	0.137	17	7
319. Populus grandidentata *Poplar.*	157	Vermont	Charlotte	C. G. Pringle	Sandy loam			
	847	Massachusetts	Danvers	J. Robinson	Gravelly	0.220	41	
320. Populus heterophylla *River Cottonwood. Swamp Cottonwood.*	522	Tennessee	Nashville	A. Gattinger	Alluvial			
	554	Alabama	Stockton	C. Mohr	...do			
231. Populus balsamifera *Balsam. Tacamahac. Balm of Gilead.*	150	Vermont	Shelburne	C. G. Pringle	Sandy loam			
	961	Alaska	Chilcoot inlet	Paul Schultze	Alluvial			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.4326	0.4545	0.4319	0.4397	0.49	0.50	0.50	27.40	....	1143
0.4930 0.4434	0.4184 0.4643	....	0.4548	0.48	0.40	0.49	....	....	859
0.3974	....	....	0.3974	0.36	0.37	0.37	....	....	1225
			0.4261			0.43	26.55		
0.4912	0.5081	....	0.4997	0.79	0.68	0.74	....	....	641
0.5234	0.4953	....	0.5094	0.36	0.42	0.39	....	....	721
0.4923	0.4707	....	0.4815	0.67	0.72	0.70	....	....	888
			0.4969			0.61	30.97		
0.5320	0.5504	....	0.5412	0.43	0.34	0.39	33.73	....	972
0.5471	0.5229	....	0.5350	0.33	0.32	0.32	33.34	....	966
0.5750	0.5683	....	0.5710	0.49	0.44	0.47	....	....	1175
0.6393	0.6450	....	0.6422	0.72	0.71	0.72	....	....	1180
			0.6060			0.59	37.82		
0.5704	0.5323	0.5734	0.5587	1.01	0.95	0.98	34.82	....	669
0.5011	0.5133	....	0.5072	0.67	0.52	0.59	31.61	....	1161
0.3785	....	....	0.3785	0.76	....	0.76	....	All sap-wood	272[1]
0.3570	....	....	0.3579	0.72	....	0.72	....	All sap-wood	272[2]
0.3569	....	....	0.3569	....	....	....	....	All sap-wood	272[3]
0.4880	0.5021	....	0.4951	0.31	0.31	0.31	....	All sap-wood	411
0.4184 0.4227	0.4255 0.4446	....	0.4278	0.43	0.39	0.41	....	All sap-wood	1035
			0.4032			0.55	25.13		
0.5119	0.4872	....	0.4996	....	0.43	0.43	....	All sap-wood	157
0.4205	0.4416	0.4182	0.4268	0.45	0.47	0.46	....	All sap-wood	847
			0.4632			0.45	28.87		
0.4023	0.4113	....	0.4068	0.74	0.70	0.72	....	All sap-wood	522
0.4115	0.4105	....	0.4110	0.90	0.90	0.90	....	....	554
			0.4089			0.81	25.48		
0.3524	0.3404	....	0.3464	1.12	0.72	0.02	....	All sap-wood	159
0.3843	0.3768	....	0.3800	0.39	0.40	0.40	....	....	961
			0.3635			0.66	22.65		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH. Sap-wood.	LAYERS OF GROWTH. Heart-wood.
321. Populus balsamifera, *var.* candicans	1054	Massachusetts	Topsfield	J. Robinson	Gravelly	0.203	11	19
322. Populus angustifolia *Black Cottonwood.*	552	Colorado	Manitou Springs	Robert Douglas	Sandy loam	0.098	10	11
323. Populus trichocarpa *Black Cottonwood. Balsam Cottonwood.*	1012	Oregon	Saint John's Barrel Factory, Portland.	F. Skinner				
	1028	...do	Portland Furniture Company.	G. Engelmann and C. S. Sargent.				
324. Populus monilifera *Cottonwood. Necklace Poplar. Carolina Poplar. Big Cottonwood.*	109	Ohio	Barney and Smith Manufacturing Co.	E. E. Barney				
	234	Vermont	Charlotte	C. G. Pringle	Alluvial			
	255	Missouri	Allenton	G. W. Letterman	...do			
	304	...do	...do	...do	...do			
	309	Texas	Dallas	J. Reverchon	...do	0.806	5	59
	754	Florida	Chattahoochee	A. H. Curtiss	...do	0.250	20	
325. Populus Fremontii *Cottonwood.*	659	California	Sacramento valley	G. R. Vasey	...do	0.444	16	19
325. Populus Fremontii, *var.* Wislizeni *Cottonwood. White Cottonwood.*	646	...do	San Bernardino	W. G. Wright	...do			
CONIFERÆ.								
326. Libocedrus decurrens *White Cedar. Bastard Cedar. Post Cedar. Incense Cedar.*	570	...do	Saw-mill, Strawberry valley.	G. Engelmann and C. S. Sargent.				
	634	...do	...do	...do				
	662	...do	Saw-mill, San Bernardino mountains.	W. G. Wright				
327. Thuya occidentalis *White Cedar. Arbor-vitæ.*	104	Vermont	Monkton	C. G. Pringle	Cold, peaty			
	379	...do	...do	...do	...do			
	782	New Brunswick		Intercolonial railway.				
	783	...do	Bridgeton	Ed. Sinclair				
	790	Province of Quebec	Amqui	A. Grant				
	792	...do		Grand Trunk railway.				
	796	...do		...do				
	874	Maine	Mattawamkeag	J. Robinson		0.172	19	71
	1099	Wisconsin	Eau Claire	H. C. Putnam	Drift			
328. Thuya gigantea *Red Cedar. Canoe Cedar.*	1017	Oregon	Weidler's saw-mill, Portland.	G. Engelmann and C. S. Sargent.				
	1021	...do	Portland Furniture Company.	...do				
329. Chamæcyparis sphæroidea *White Cedar.*	350	Alabama	Cottage Hill	C. Mohr	Sandy, wet	0.298	7	20
	850	Massachusetts	Beverly	J. Robinson	Swampy			
	851	...do	...do	...do	...do			
	852	...do	...do	...do	...do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0. 3959	0. 4222	0. 4301	0. 4161	0. 48	0. 43	0. 46	25. 93	Cultivated. First and second sp. gr. determinations made on sap-wood.	1054
0. 3942	0. 3881	....	0. 3912	0. 82	0. 75	0. 79	24. 38	....	552
0. 3511	0. 3656	0. 3567	0. 3578	1. 47	0. 87	1. 17	....	Third sp. gr. determination made on sap-wood	1012
0. 4163	0. 3937	....	0. 4050	1. 56	1. 18	1. 37	....	....	1028
			0. 3814			1. 27	23. 77		
0. 3817	0. 3946	....	0. 3882	1. 34	1. 43	1. 39	....	....	199
0. 3939	0. 3302	....	0. 3621	0. 68	0. 94	0. 81	....	....	234
0. 3315	0. 3444	....	0. 3380	1. 18	0. 92	1. 05	....	....	255
0. 3201	0. 3231	....	0. 3216	0. 83	0. 79	0. 81	....	....	304
0. 4706	0. 4778	....	0. 4742	1. 09	0. 96	1. 03	....	....	309
0. 4355	0. 4632	....	0. 4494	0. 69	0. 60	0. 65	....	....	754
			0. 3889			0. 96	24. 24		
0. 5490	0. 4655	0. 4597	0. 4914	0. 77	....	0. 77	30. 62	All sap-wood	659
0. 4827	0. 4176	0. 4860	0. 4621	1. 17	1. 09	1. 13	28. 80	....	646
0. 3891	0. 3830	....	0. 3861	0. 03	0. 04	0. 04	....	....	570
0. 3428	0. 3769	....	0. 3599	0. 13	0. 17	0. 15	....	....	634
0. 4586	0. 4596	....	0. 4501	0. 08	0. 05	0. 06	....	....	662
			0. 4017			0. 08	25. 03		
0. 3048	0. 3021	....	0. 3035	0. 29	0. 25	0. 27	....	....	104
0. 2847	0. 2870	....	0. 2859	0. 29	0. 29	0. 29	....	....	379
0. 3284	0. 3275	....	0. 3280	0. 49	0. 51	0. 50	....	....	782
0. 3163	0. 3275	0. 3272	0. 3237	0. 39	0. 44	0. 42	....	....	783
0. 3016	0. 3007	....	0. 3012	0. 29	0. 31	0. 30	....	....	790
0. 3452	0. 2880	....	0. 3166	0. 36	0. 44	0. 40	....	....	792
0. 3108	0. 3104	....	0. 3106	0. 43	0. 37	0. 40	....	....	796
0. 3584	0. 3529	0. 3697	0. 3603	0. 39	0. 34	0. 37	....	....	874
0. 3121	0. 3232	....	0. 3177	0. 37	0. 38	0. 38	....	....	1099
			0. 3104			0. 37	19. 72		
0. 3996	0. 4178	....	0. 4087	0. 12	0. 14	0. 13	....	....	1017
0. 3460	0. 3551	....	0. 3500	0. 24	0. 19	0. 22	....	....	1021
			0. 3796			0. 17	23. 66		
0. 3337	0. 3447	....	0. 3302	0. 94	0. 90	0. 92	....	....	350
0. 3105	0. 3644	0. 3081	0. 3277	0. 17	0. 15	0. 16	....	....	850
0. 3038	0. 3036	0. 3182	0. 3085	0. 13	0. 11	0. 12	....	....	851
0. 2990	0. 3091	0. 4527	0. 3536	0. 11	0. 13	0. 12	....	....	852
			0. 3322			0. 33	20. 70		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth. Sap-wood.	Layers of growth. Heart-wood.
330. Chamæcyparis Nutkaensis *Yellow Cypress. Sitka Cypress.*	969	Alaska	Sitka	Paul Schultze				
	983	British Columbia	Saw-mill, Victoria	G. Engelmann and C. S. Sargent.				
	994	Alaska	Peril strait	Paul Schultze				
	1000	...do	Weidier's saw-mill, Portland, Oregon.	G. Engelmann and C. S. Sargent.				
331. Chamæcyparis Lawsoniana *Port Orford Cedar. Oregon Cedar. White Cedar. Lawson's Cypress. Ginger Pine.*	701	Oregon	Dean & Co.'s saw-mill, Marshfield.	...do				
	707	...do	...do	...do				
332. Cupressus macrocarpa *Monterey Cypress.*	675	California	Monterey	...do	Gravelly loam			
333. Cupressus Goveniana	691	...do	Marin county	G. R. Vasey	Dry ridges	0.283	95	
	1100	...do	Calistoga	W. F. Fisher	...do	0.234	36	
335. Cupressus Guadalupensis	798	Eastern Arizona	San Francisco mountains.	E. L. Greene	Rocky			
	1149	Arizona	Santa Catalina mountains.	C. G. Pringle	...do			
336. Juniperus Californica *Juniper.*	1229	California	San Bernardino county.	...do	Gravelly			
336. Juniperus Californica, *var.* Utahensis *Juniper.*	887	Utah	Lewiston	M. E. Jones	...do	0.072	55	12
337. Juniperus pachyphlœa *Juniper.*	555	New Mexico	Silver City	E. L. Greene	Stony			
	592	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Gravelly			
	692	...do	...do	...do	...do			
338. Juniperus occidentalis *Juniper.*	624	California	Yreka plains	...do	...do			
338. Juniperus occidentalis, *var.* monosperma *Juniper.*	420	New Mexico	Silver City	E. L. Greene	Stony	0.175	22	64
	527	Colorado	Manitou Springs	Robert Douglas	Gravelly			
338. Juniperus occidentalis, *var.* conjugens *Juniper.*	939	Texas	Austin	C. Mohr	Limestone	0.134	23	28
	1102	...do	...do	S. B. Buckley	...do			
339. Juniperus Virginiana *Red Cedar. Savin.*	14	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.230	19	49
	327	Texas	Dallas	J. Reverchon	Calcareous	0.484	16	66
	734	Florida	Chattahoochee	A. H. Curtiss	...do			
	800	...do	Saint John's river	...do	Sandy loam			
	837	Massachusetts	Danvers	J. Robinson	Drift			
	924	Florida	Chattahoochee	C. Mohr	Alluvial			
	1055	Massachusetts	Topsfield	J. Robinson	Drift	0.203	15	37

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.4011	0.4484	....	0.4248	0.30	0.37	0.34	....	....	969
0.4987	0.5010	....	0.4999	0.29	0.34	0.32	....	....	983
0.5356	0.5166	....	0.5261	0.29	0.34	0.32	....	....	994
0.4555	0.4686	....	0.4621	0.39	0.36	0.38	....	....	1000
			0.4782			0.34	29.80		
0.4356	0.4487	....	0.4422	0.07	0.12	0.10	....	....	701
0.4380	0.5259	....	0.4819	0.08	0.09	0.09	....	....	707
			0.4621			0.10	28.80		
0.6260	0.6263	....	0.6261	0.55	0.59	0.57	39.02	....	675
0.4492	0.4733	....	0.4613	0.41	0.35	0.38	....	....	691
0.4620	0.4910	....	0.4765	0.54	0.47	0.51	....	....	1100
			0.4689			0.45	29.22		
0.4648	0.4643	0.4617	0.4636	0.43	0.38	0.41	....	All sap-wood	798
0.4826	0.5272	....	0.5049	0.41	0.51	0.46	....	....	1149
			0.4843			0.44	30.18		
0.6309	0.6255	....	0.6282	0.77	0.73	0.75	39.15	....	1229
0.5504	0.5539	....	0.5522	0.47	0.51	0.49	34.41	0.8 sap-wood	887
0.5744	0.6965	....	0.6355	0.11	0.16	0.14	....	....	555
0.5085	0.5619	....	0.5302	0.07	0.07	0.08	....	One tree	592
0.5185	0.5321			0.08	0.09				692
			0.5829			0.11	36.32		
0.5724	0.5807	....	0.5765	0.12	0.12	0.12	35.93	....	624
0.7329	0.7440	....	0.7385	0.68	0.68	0.68	....	....	420
0.6768	0.6935	....	0.6852	0.89	0.86	0.88	....	....	527
			0.7119			0.78	44.36		
....	0.6967	....	0.6967	0.45	0.47	0.46	....	....	939
0.6750	0.6840	0.6948	0.6846	0.39	0.53	0.46	....	....	1102
			0.6907			0.46	43.04		
0.5112	0.5045	....	0.5079	0.15	0.14	0.14	....	0.1 sap-wood	14
0.4585	0.4493	....	0.4539	0.12	0.14	0.13	....	....	327
0.5455	0.5310	0.5533	0.5433	0.16	0.17	0.16	....	....	734
0.4901	0.4727	....	0.4814	0.13	0.08	0.11	....	....	800
0.4804	0.4693	0.4733	0.4743	0.16	0.14	0.15	....	....	837
0.4838	0.4705	0.4740	0.4761	0.16	0.12	0.14	....	....	924
0.5290	0.4937	0.5107	0.5111	0.09	0.09	0.09	....	....	1055
			0.4926			0.13	30.70		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
340. Taxodium distichum *Bald Cypress. Black Cypress. Red Cypress. White Cypress. Deciduous Cypress.*	535	Alabama	Stockton	C. Mohr	Alluvial			
	542	do	Otis & Co., saw-mill.	do	do			
	543	do	do	do	do			
	581	Arkansas	Little Rock	G. W. Letterman	do			
	582	do	do	do	do			
	741	Florida	Chattahoochee	A. H. Curtiss		0.514	55	230
	894[1]			Department of Agriculture.				
	894[2]			do				
	923	Alabama	Stockton	C. Mohr	Alluvial			
	1212			do				
	1213			do				
	1214	Louisiana	Bayou La Battery	do	Alluvial			
341. Sequoia gigantea *Big Tree.*	657	California	Tulare county	G. Engelmann and C. S. Sargent.	Granite			
	666	do	do	do	do			
342. Sequoia sempervirens *Redwood.*	673	do	Russian river	C. S. Sargent				
	710	do	Santa Cruz	Turner, Kennedy & Shaw.				
	711[1]	do	do	do				
	711[2]	do	do	do				
	712	do	Mendocino county	J. Kentfield & Co				
	713	do	do	do				
	714	do	do	do				
	715	do	do	do				
343. Taxus brevifolia *Yew.*	978	Oregon	Portland	G. Engelmann and C. S. Sargent.	Moist, rich	0.279	8	45
344. Taxus Floridana *Yew.*	305	Florida	Flat Creek	A. H. Curtiss	Sandy loam			
345. Torreya taxifolia *Stinking Cedar. Savin.*	62	do	Chattahoochee	C. S. Sargent	Alluvial			
	277	do	do	A. H. Curtiss	Calcareous	0.284	12	78
346. Torreya Californica *California Nutmeg. Stinking Cedar.*	651	California	Marin county	G. R. Vasey	Stony	0.361	20	73
347. Pinus Strobus *White Pine. Weymouth Pine.*	1	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.510	19	51
	164	Michigan	Woodsum Machine Company.	E. E. Barney				
	208	do	Barney & Smith Manufacturing Co.	do				
	222	Vermont	Charlotte	C. G. Pringle	Wet, swampy			
	723	Pennsylvania	Williamsport	do				
	777	New Brunswick		Intercolonial railway.				

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.4559	0.4442	....	0.4501	0.44	0.40	0.42	....	....	535
0.5114	0.4896	....	0.5005	0.35	0.31	0.33	....	White cypress........	542
0.5017	0.5224	....	0.5121	0.60	0.52	0.59	....	Black cypress	543
0.4682	0.4545	....	0.4614	0.38	0.45	0.42	....	....	581
0.4683	0.5031	....	0.4857	0.34	0.29	0.32	....	....	582
0.4159	0.4094	0.3808	0.4020	0.27	0.36	0.32	....	White cypress sap-wood........	741
0.2444	0.2013	....	....	0.56	....	....	....	Butt of knee........	894[1]
0.2362	0.2394	....	....	0.55	....	....	....	Top of knee........	894[2]
0.3442	0.3656	....	0.4072	0.39	....	0.44	....	From opposite sides of center of tree next to heart.. — One tree.	923
0.4282	0.3705	....		0.48				Next outside of preceding........	
0.4599	0.5022	....						......do	
0.4112	0.4336	0.3492						Outside of tree........	
0.3860	0.3750	....	0.3805	0.50	0.50	0.50	....	Outside wood...... One tree: White cypress	1212
0.4123	0.4957	....	0.4540	0.51	0.53	0.52	....	Heart-wood........	1213
0.4878	0.4904	....	0.4891	0.36	0.37	0.37	....	Black cypress........	1214
			0.4543			0.42	27.65		
0.3234	0.3202	....	0.3240	0.64	0.50	0.44	....	....	657
0.3236	0.3289			0.41	0.33				
0 2524	0.2523	....	0.2524	0.50	0.64	0.57	....	All sap-wood	666
			0.2882			0.50	18.20		
0.3788	0.3965	....	0.3877	0.12	0.23	0.17	....	....	673
0.4242	0.4281	....	0.4262	0.16	0.19	0.18	....	Wood from top of tree........	710
0.3963	0.4444	....	0.4204	0.11	....	0.11	....	Wood from butt of tree........	711[1]
0.4912	0.4562	....	0.4737	0.14	....	0.14	....	Wood from butt of tree........	711[2]
0.3015	0.2982	....	0.2099	0.06	0.11	0.09	....	....	712
0.8610	0.3612	....	0.3611	0.18	0.15	0.17	....	....	713
0.5226	0.4714	....	0.4970	0.17	0.16	0.17	....	....	714
0.4827	0.5181	....	0.5004	0.10	0.13	0.12	....	Wood with curled grain	715
			0.4208			0.14	26.22		
0.6390	0.6553	0.6230	0.6391	0.22	0.22	0.22	39.83	....	978
0.6340	....	....	0.6340	0.20	0.22	0.21	39.51	....	305
0.6034	0.5369	....	0.5702	1.08	1.38	1.23	....	....	62
0.4728	0.4447	....	0.4588	0.25	0.21	0.23	....	....	277
			0.5145			0.73	32.06		
0.4823	0.4696	....	0.4760	1.27	1.40	1.34	29.60	....	651
0.3946	0.4100	....	0.4026	0.11	0.19	0.15	....	....	1
0.3481	0.3459	....	0.3470	0.13	0.17	0.15	....	....	164
0.3400	0.3418	....	0.3409	0.22	0.20	0.21	....	....	208
0.4880	0.6461	....	0.5670	0.23	0.21	0.22	....	....	222
0.3690	0.3850	....	0.3770	0.18	0.12	0.15	....	....	723
0.3600	0.3140	....	0.3373	0.23	0.30	0.20	....	....	777

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH. Sap-wood.	Heart-wood.
347. Pinus Strobus—continued	788	New Brunswick	Bridgeton	Ed. Sinclair				
	789	Province of Quebec.	Amqui	A. Grant				
	797	...do		Grank Trunk railway.				
	1044	Massachusetts	Reading	J. Robinson	Drift	0.215	15	16
348. Pinus monticola *White Pine.*	975	British Columbia	Hasting's saw-mill, Burrard inlet.	G. Engelmann and C. S. Sargent.				
	987	Oregon	Cascade mountains	C. S. Sargent	Moist loam			
349. Pinus Lambertiana *Sugar Pine.*	638	California	Saw-mill, Strawberry valley.	G. Engelmann and C. S. Sargent.				
	668	...do		G. R. Vasey				
	730	...do	Lassen's peak	Sierra Lumber Company, San Francisco.				
350. Pinus flexilis *White Pine.*	819	Colorado	Forest City	T. S. Brandegee	Gravelly	0.502	38	120
	913	Nevada	Monitor range	A. Triple	...do			
351. Pinus albicaulis	992	British Columbia	Silver Mountain valley, Fraser river.	G. Engelmann and C. S. Sargent.		0.494	50	160
352. Pinus reflexa *White Pine.*	597	Arizona	Santa Rita mountains.	...do	Rocky			
	602	New Mexico	Pinos Altos mountains.	E. L. Greene				
	661	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.				
353. Pinus Parryana *Piñon. Nut Pine.*	656	California	San Diego county	G. R. Vasey				
354. Pinus cembroides *Nut Pine.*	1220	Arizona	Santa Catalina mountains.	C. G. Pringle				
355. Pinus edulis *Piñon. Nut Pine.*	397	Colorado	Cañon City	E. Weston	Gravelly	0.284	30	70
356. Pinus monophylla *Piñon. Nut Pine.*	823	Eastern Arizona	San Francisco mountains.	E. L. Greene	...do			
	882	Utah	Lewiston	M. E. Jones	Rocky	0.164	19	66
	891	Eastern Arizona	San Francisco mountains.	E. L. Greene				
	900	California		Department of Agriculture.				
	915	Nevada	Danville	A. Triple	Gravelly			
357. Pinus Balfouriana	577	California	Scott mountains	G. Engelmann and C. S. Sargent.	Rocky	0.368	75	309
	631							
357. Pinus Balfouriana, *var.* aristata *Foxtail Pine. Hickory Pine.*	821	Colorado	Forest City	T. S. Brandegee		0.450	44	136
	914	Nevada	Prospect mountain	A. Triple	Rocky			
358. Pinus resinosa *Red Pine. Norway Pine.*	194	Michigan	Barney & Smith Manufacturing Co.	E. E. Barney				

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.3991	0.3970	....	0.3980	0.20	....	0.20	....	....	788
0.3624	0.3463	....	0.3543	0.19	0.19	0.10	....	....	789
0.3905	0.3725	....	0.3815	0.21	0.22	0.21	....	....	797
0.3503	0.3513	0.3438	0.3485	0.10	0.13	0.12	....	....	1044
			0.3854			0.19	24.02		
0.4291	0.4102	....	0.4197	0.26	0.28	0.27	....	....	975
0.3684	0.3554	....	0.3619	0.15	0.21	0.18	....	Cut at 3,800 feet elevation........	987
			0.3908			0.23	24.35		
0.4066	0.4014	....	0.4040	0.17	0.16	0.17	....	....	638
0.3782	0.3889	....	0.3835	0.29	0.25	0.27	....	....	668
0.3153	0.3201	....	0.3177	0.22	0.24	0.23	....	....	730
			0.3684			0.22	22.96		
0.4965	0.4031	0.4526	0.4507	0.20	0.20	0.20	....	Second sp. gr. determination made on sap-wood. Cut at elevation of 10,000 feet.	819
0.4200	....	....	0.4209	0.35	....	0.35	....	All sap-wood........	913
			0.4358			0.28	27.16		
0.4233	0.4097	....	0.4165	0.30	0.23	0.27	25.96	....	992
0.4729	0.5253	0.5052	0.4971	0.24	0.24	0.24	....	First sp. gr. determination made on sap-wood	597
0.4986	0.4961	0.4847		0.27	0.20				602
0.4869	0.4696	....	0.4783	0.30	0.27	0.28	....	....	661
			0.4877			0.26	30.39		
0.5628	0.5721	....	0.5675	0.54	....	0.54	35.37	....	656
0.6695	0.6330	....	0.6512	0.88	0.92	0.90	40.58	....	1220
0.5813	0.6963	....	0.6388	0.57	0.68	0.62	39.81	Second sp. gr. specimen contained a knot	397
0.6000	0.5563	....	0.5781	0.78	0.65	0.71	....	....	823
0.4499	0.4644	....	0.4572	0.67	0.77	0.72	....	....	882
0.6140	0.7617	....	0.6878	0.72	0.72	0.72	....	Second sp. gr. specimen was very resinous	891
0.5715	0.5230	....	0.5473	0.89	0.76	0.83	....	....	900
0.5585	....	....	0.5585	0.41	....	0.41	....	....	915
			0.5658			0.68	35.26		
0.5434	0.5409	0.5273	0.5434	0.41	0.41	0.40	33.86	One tree	577
0.5580	0.5476	....		0.38	0.42				631
0.4997	0.5319	0.4671	0.4996	0.18	0.18	0.18	....	Third sp. gr. determination made on sap-wood........	821
0.6149	....	....	0.6149	0.42	....	0.42	....	0.75 sap-wood	914
			0.5572			0.30	34 72		
0.4872	0.4838	....	0.4855	0.23	0.18	0.20	....	....	194

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
358. Pinus resinosa—continued	315	Michigan	Hersey	W. J. Beal				
	413	Vermont	Charlotte	C. G. Pringle	Clay			
	779	New Brunswick		Intercolonial railway.				
	785	do	Bridgeton	Ed. Sinclair				
	1074	Vermont	Charlotte	C. G. Pringle				
	1075	do	do	do				
	1076	do	do	do				
359. Pinus Torreyana	996	California	San Diego county	G. Engelmann	Sandy	0.234	82	8
360. Pinus Arizonica *Yellow Pine.*	1144	Arizona	Santa Rita mountains.	C. G. Pringle	Rocky			
	1154	do	do	do	do			
	1155	do	do	do	do			
	1156	do	do	do	do			
361. Pinus ponderosa *Yellow Pine. Bull Pine.*	619	Dakota	Deadwood	Robert Douglas	Gravelly			
	620	Oregon	Saw-mill, Ashland	G. Engelmann and C. S. Sargent.				
	630	California	Strawberry valley	do	Low, wet, swampy			
	632	do	do	do				
	636	Oregon	Saw-mill, Ashland	do				
	689	California	Saw-mill, San Bernardino.	W. G. Wright				
	718	Montana	Saw-mill, Missoula	S. Watson				
	731	California	Lassen's peak	Sierra Lumber Company.				
	907	Colorado	Cañon City	E. Weston				
	910	do	do	do				
	1007	California	Saw-mill, San Bernardino.	W. G. Wright				
362. Pinus Jeffreyi *Bull Pine. Black Pine.*	578	do	Scott mountains	G. Engelmann and C. S. Sargent.	Dry, gravelly			
	633	do	do	do	do			
	667	California	Saw-mill, San Bernardino.	W. G. Wright				
363. Pinus Chihuahuana	593	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, gravelly	0.510	102	53
	664	do	do	do	do			
364. Pinus contorta *Scrub Pine.*	997	British Columbia	Vancouver's Island	G. Engelmann and C. S. Sargent.	do			
365. Pinus Murrayana *Tamarack. Black Pine. Lodge-pole Pine. Spruce Pine.*	293	Colorado	Forest City	T. S. Brandegee	Moist, sandy loam.	0.269	43	23
	563	do	do	C. S. Sargent	do			
	625	California	Scott mountains	G. Engelmann and C. S. Sargent.	do			
366. Pinus Sabiniana *Digger Pine. Bull Pine.*	571	do	Jolon	G. R. Vasey				
	644	do	Contra Costa county	do	Gravelly	0.312	43	

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations. First.	Second.	Third.	Average.	Ash determinations. First.	Second.	Average.	Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
0.5450	0.5416		0.5433	0.20	0.24	0.22			315
0.5121	0.4537		0.4829	0.24	0.24	0.24		All sap-wood	413
0.4555	0.4911		0.4733	0.28	0.29	0.29		All sap-wood	779
0.4250	0.4631		0.4441	0.39	0.34	0.37			785
0.4627	0.4752	0.5227	0.4869	0.28	0.27	0.27		All sap-wood	1074
0.4931	0.4922	0.4845	0.4899	0.26	0.29	0.28		First and third sp. gr. determinations made on 0.5 sap-wood; second sp. gr. determination made on sap-wood.	1075
0.4892	0.4582	0.4858	0.4777	0.24	0.31	0.28		Second sp. gr. determination made on 0.5 sap-wood; third sp. gr. determination made on sap-wood.	1076
			0.4854			0.27	30.25		
0.4659	0.5119	0.4860	0.4879	0.38	0.33	0.35	30.40	First and second sp. gr. determinations made on sap-wood	996
0.5360	0.5079		0.5220	0.14	0.15	0.14			1144
0.5066	0.7844		0.6455	0.21	0.20	0.20		Second sp. gr. specimen very resinous	1154
0.4567	0.4204	0.4611	0.4461	0.19	0.26	0.23			1155
0.4168	0.3864		0.4016	0.25	0.24	0.24			1156
			0.5038			0.20	31.40		
0.4877	0.4813		0.4845	0.27	0.26	0.27			619
0.4552	0.4419		0.4485	0.38	0.41	0.40		All sap-wood	626
0.4571	0.4152		0.4362	0.38	0.36	0.37		All sap-wood	630
0.5264	0.5350		0.5307	0.31	0.30	0.30		All sap-wood	632
0.4184	0.4240		0.4212	0.34	0.43	0.39		All sap-wood	636
0.5144	0.5265		0.5204	0.23	0.23	0.23			689
0.3972	0.4479		0.4225	0.40	0.36	0.38			718
0.4284	0.4437		0.4360	0.28	0.25	0.27		All sap-wood	731
0.4676	0.5305		0.4990	0.58	0.40	0.49		All sap-wood	907
0.4376	0.4459		0.4417	0.45	0.45	0.45		All sap-wood	910
0.5521	0.5412		0.5466	0.30	0.33	0.32		All sap-wood	1007
			0.4715			0.35	29.45		
0.4561	0.4520			0.22	0.20			One tree. Fourth sp. gr. determination made on 0.5 sap-wood.	578
0.4985	0.5075		0.4785	0.23	0.36	0.25			633
0.5082	0.5274		0.5628	0.29	0.24	0.27		All sap-wood	667
			0.5206			0.26	32.44		
0.5584	0.5780		0.5457	0.37	0.37	0.39	34.01	One tree	593
0.5226	0.5239			0.41	0.40				664
0.5709	0.5985	0.5750	0.5815	0.21	0.16	0.19	36.24		997
0.3550	0.3551		0.3551	0.36	0.29	0.33			293
0.4291	0.4267		0.4279	0.26	0.25	0.26			563
0.4204	0.4711		0.4457	0.37	0.37	0.37			625
			0.4096			0.32	25.53		
0.4528	0.4531		0.4530	0.43	0.41	0.42		All sap-wood	571
0.4988	0.5312		0.5150	0.40	0.35	0.37		All sap-wood	644
			0.4840			0.40	30.16		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
367. Pinus Coulteri	1157	California	San Bernardino	W. G. Wright	Dry, gravelly			
368. Pinus insignis *Monterey Pine.*	676	....do	Monterey	G. R. Vasey	Gravelly loam	0.544	35	
	896	....do		Department of Agriculture.				
369. Pinus tuberculata *Knob-cone Pine.*	576	....do	Mount Shasta	G. Engelmann and C. S. Sargent.	Gravelly	0.418	35	18
370. Pinus Tæda *Loblolly Pine. Old-field Pine. Rosemary Pine.*	82	Florida	Duval county	A. H. Curtiss	Moist, sandy	0.034	27	6
	355	Alabama	Cottage Hill	C. Mohr	Low, rich			
	388	North Carolina	Wilmington	Edward Kidder	Loam			
	389	....do	....do	....do	....do			
371. Pinus rigida *Pitch Pine.*	13	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.267	21	15
	1046	....do	North Reading	J. Robinson	....do	0.230	26	8
372. Pinus serotina *Pond Pine.*	83	Florida	Duval county	A. H. Curtiss	Moist, sandy loam.	0.812	33	19
373. Pinus inops *Jersey Pine. Scrub Pine.*	621	South Carolina	Aiken	H. W. Ravenel	Dry, sandy	0.206	8	42
	622	....do	....do	....do	....do	0.164	28	34
	1169	Indiana	New Albany	M. J. Robinson				
	1172	New Jersey	Mount Holly	S. P. Sharples				
374. Pinus clausa *Sand Pine. Scrub Pine. Spruce Pine.*	279	Florida	Apalachicola	A. H. Curtiss	Dry, sandy barrens	0.238	6	36
375. Pinus pungens *Table-mountain Pine. Hickory Pine.*	321	Virginia	Wytheville	H. Shriver	Clay	0.264	20	35
	396	Pennsylvania	Colerain Forge	J. R. Lowrie	Slate	0.010	14	
376. Pinus muricata *Obispo Pine. Bishop's Pine.*	671	California	Marin county	G. R. Vasey	Gravelly	0.243	29	
377. Pinus mitis *Yellow Pine. Short-leaved Pine. Spruce Pine. Bull Pine.*	278	Florida	Chattahoochee	A. H. Curtiss	Clay	0.015	33	
	319	Louisiana	Amite	C. Mohr	Sandy loam			
	557	Arkansas	Texarkana	F. L. Harvey	....do			
	558	....do	....do	....do	....do			
	559	....do	....do	....do	....do			
378. Pinus glabra *Cedar Pine. Spruce Pine. White Pine.*	142	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich upland			
	544	Mississippi	Gainesville	C. Mohr	Low, sandy			
	764	Florida	Chattahoochee	A. H. Curtiss	Low, wet			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.4272	0.3994		0.4133	0.34	0.40	0.37	25.76	All sap-wood	1157
0.4952	0.5244		0.5098	0.25	0.20	0.23			676
0.4082	0.4018		0.4050	0.34	0.37	0.36			896
			0.4574			0.30	28.50		
0.3469	0.3529		0.3499	0.36	0.30	0.33	21.81		576
0.5610	0.5609		0.5609	0.26	0.29	0.27		All sap-wood	82
0.5788	0.5466		0.5627	0.25	0.26	0.26		All sap-wood	355
0.5458	0.5654		0.5556	0.28	0.26	0.27		Rosemary pino	388
0.5045	0.4896		0.4971	0.27	0.23	0.25		All sap-wood	380
			0.5441			0.26	33.91		
0.5597	0.5669		0.5633	0.19	0.21	0.20		All sap-wood	13
0.4065 0.4131	0.4154 0.6323		0.4668	0.32 0.19		0.26		First sp. gr. determination made on sap-wood; second and third sp. gr. determinations mado on 0.5 sap-wood. Fourth sp. gr. specimen very resinous.	1046
			0.5151			0.23	32.10		
0.7904	0.7931	0.7990	0.7942	0.15	0.18	0.17	49.49		83
0.4905	0.4830		0.4867	0.24	0.27	0.26		All sap-wood	621
0.5571	0.5680		0.5626	0.32	0.31	0.32			022
0.5149	0.4603		0.4876	0.32	0.23	0.28		All sap-wood	1169
0.5778	0.5841	0.5991	0.5870	0.29	0.34	0.32			1172
			0.5309			0.30	33.09		
0.4696	0.6456		0.5576	0.30	0.31	0.31	34.75		279
0.5235	0.5050		0.5143	0.30	0.30	0.30			321
0.4851	0.4602		0.4727	0.24	0.22	0.23			306
			0.4935			0.27	30.75		
0.5054	0.4831		0.4942	0.26	0.25	0.26	30.80	Second sp. gr. determination made on sap-wood	671
0.5730	0.4550		0.5144	0.35	0.35	0.35		All sap-wood	278
0.7098	0.7569		0.7333	0.22	0.22	0.22		0.5 sap-wood	310
0 6086	0.6129		0.6107	0.23	0.17	0.20			557
0.7262	0.7232		0.7247	0.33	0.31	0.32			558
0.4689	0.4689		0.4689	0.32	0.41	0.37		All sap-wood	550
			0.6104			0.29	38.04		
0.4358	0.4235		0.4297	0.40	0.61	0.50		Second sp. gr. determination made on sap-wood	142
0.3232	0.3741		0.3487	0.53	0.44	0.49		All sap-wood	544
0.4018	0.4002		0.4010	0.35	0.35	0.35		All sap-wood	764
			0.3031			0.45	24.50		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH.	
							Sap-wood.	Heart-wood.
379. Pinus Banksiana	394	Michigan	Baldwin	W. J. Beal	Low, sandy			
Gray Pine. Scrub Pine. Prince's Pine.	780	New Brunswick		Intercolonial railway.				
	879	....do		....do				
380. Pinus palustris	81	Florida	Duval county	A. H. Curtiss	Sandy loam	0.353	25	119
Long-leaved Pine. Southern Pine. Georgia Pine. Yellow Pine. Hard Pine.	85	....do	....do	....do	Moist, sandy	0.355	46	51
	172	Mississippi	Barney & Smith Manufacturing Co	E. E. Barney				
	243	Florida	Saw-mill, Saint John's river.	A. H. Curtiss				
	302	South Carolina	Aiken	H. W. Ravenel	Sandy loam			
	357	Alabama	Cottage Hill	C. Mohr	....do			
	358	... do	Citronelle	....do	....do			
	359	....do	Chunchula	....do	....do			
	360	....do	... do	....do	....do			
	361	....do	... do	....do	....do			
	384	Florida	Saw-mill, Cedar Keys.	A. H. Curtiss				
	385	....do	....do	....do				
	390	North Carolina	Wilmington	E. Kidder				
	562	Texas	Sabine county	G. W. Letterman				
	1096	Alabama	Mobile	C. Mohr				
381. Pinus Cubensis	84	Florida	Duval county	A. H. Curtiss	Moist, sandy	0.326	58	50
Slash Pine. Swamp Pine. Bastard Pine. Meadow Pine.	356	Alabama	Cottage Hill	C. Mohr	....do			
	493	Florida	Bay Biscayne	A. H. Curtiss	Coral			
382. Picea nigra	109	Vermont	Charlotte	C. G. Pringle	Gravelly			
Black Spruce.	231	....do	....do	....do	Cold, peaty			
	373	.. do	Huntingdon	....do	Gravelly			
	770	New Brunswick	Bay of Fundy	Intercolonial railway.				
	794	Province Quebec	Danville	Grand Trunk railway.				
	880	New Brunswick	Bridgeton	Ed. Sinclair				
383. Picea alba	513	New Hampshire	Stratford	C. G. Pringle		0.186	16	22
White Spruce.	620	Dakota	Terry's peak	Robert Douglas	Gravelly			
	773	New Brunswick	Bay of Fundy	Intercolonial railway.				
	784	....do	Bridgeton	Ed. Sinclair				
	791	Province of Quebec.	Amqui	A. Grant				
384. Picea Engelmanni	292	Colorado	Forest City	T. S. Brandegee	Damp	0.320	8	76
White Spruce.	575	....do	....do	C. S. Sargent	Peaty			
	822	....do	....do	T. S. Brandegee	....do	0.318	45	71
	899	....do		Department of Agriculture.				
	905	Utah		... do				

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

SPECIFIC GRAVITY DETERMINATIONS.				ASH DETERMINATIONS.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.4622	0.4965		0.4794	0.28	0.33	0.30			394
	0.4588		0.4588	0.20	0.19	0.20		Sap-wood	780
0.4778	0.5065	0.4857	0.4900	0.19	0.18	0.19			879
			0.4761			0.23	29.67		
0.7551	0.7284		0.7418	0.26	0.26	0.26			81
0.7117			0.7117	0.16	0.17	0.17			85
0.6927	0.6974		0.6950	0.26	0.26	0.26			172
0.7569	0.6829		0.7199	0.28	0.21	0.25			243
0.6139	0.5191		0.5665	0.39	0.24	0.31			302
0.6602	0.6616		0.6609	0.27	0.27	0.27			357
0.8652	0.9325		0.8989	0.28	0.20	0.24		Boxed for turpentine, 1852; chipped 10 years; abandoned, 1861.	358
0.8509	0.8450		0.8479	0.15	0.16	0.16		Boxed for turpentine, 1876; chipped 4 years; specimen taken along chip.	359
0.6673	0.7914		0.7294	0.21		0.21		Boxed for turpentine, 1876; chipped 4 years; specimen taken above chip.	360
0.7590	0.7736		0.7663	0.23	0.23	0.23		Boxed for turpentine, 1878; chipped 2 years	361
0.6163	0.5714		0.5938	0.32	0.32	0.32			384
0.6549	0.5924		0.6236	0.28	0.28	0.28			385
0.4602	0.6186	0.6413	0.5734	0.29	0.34	0.32			390
0.7744	0.6745		0.7245	0.17	0.18	0.18			562
0.6415	0.6490		0.6453	0.19	0.26	0.22		Tree boxed for turpentine 18 or 20 years ago	1096
			0.6999			0.25	43.62		
0.6533	0.6506		0.6520	0.31	0.31	0.31			84
0.7881	0.7340		0.7611	0.16	0.15	0.16			356
0.8529	0.8389	0.8220	0.8379	0.30	0.31	0.31			493
			0.7504			0.26	46.76		
0.4576	0.4715		0.4646	0.23	0.17	0.20		[P. rubra]	109
0.5289	0.5256		0.5272	0.25	0.27	0.26			231
0.4285	0.4486		0.4386	0.29	0.29	0.29		[P. rubra]	373
0.4730	0.4593		0.4662	0.29	0.27	0.28			776
0.4065	0.4290	0.3907	0.4087	0.29	0.25	0.27			794
0.4830	0.4098	0.4425	0.4451	0.38	0.28	0.33			880
			0.4584			0.27	28.57		
0.4074	0.4194		0.4134	0.26	0.21	0.24			513
0.3848	0.4034		0.3941	0.42	0.38	0.40			020
0.4231	0.4375		0.4303	0.34	0.38	0.36			773
0.3809	0.4188		0.3999	0.32	0.31	0.32			784
0.3737	0.4020		0.3879	0.24	0.29	0.27			791
			0.4051			0.32	25.25		
0.3550	0.3551		0.3551	0.36	0.29	0.33			292
0.3365	0.3217		0.3291	0.35	0.35	0.35			575
0.3507	0.3528		0.3518	0.29	0.24	0.27		Tree with gray bark	822
0.3717	0.3725		0.3721	0.32	0.33	0.33			899
0.3195	0.3137		0.3166	0.43	0.26	0.34			905
			0.3449			0.32	21.40		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth.	
							Sap-wood.	Heart-wood.
385. Picea pungens. *White Spruce. Blue Spruce.*	269	Colorado	Alpine	T. S. Brandegee	Damp			
	270	....do	....do	....do	....do			
	901	....do		Department of Agriculture.				
	906	Utah		....do				
386. Picea Sitchensis. *Tide-land Spruce.*	970	Alaska	Sitka	Paul Schultze				
	977	British Columbia	Saw-mill, Burrard inlet.	G. Engelmann and C. S. Sargent.				
	1015	Oregon	Weidler's mill, Portland.	....do				
	1019	....do	Saw-mill, Astoria	....do				
	1026	....do	Portland Furniture Company.	....do				
387. Tsuga Canadensis. *Hemlock.*	5	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.382	37	57
	219	Vermont	Charlotte	C. G. Pringle	Gravelly			
	726	Pennsylvania	Williamsport	....do	Damp			
	772	New Brunswick		Intercolonial railway.				
	775	....do	Bay of Fundy	....do				
	778	....do		....do				
	787	....do	Bridgeton	Ed. Sinclair				
	793	Province Quebec	Danville	Grand Trunk railway.				
	817	West Virginia	Grafton	C. G. Pringle				
	1040	Massachusetts	Danvers	J. Robinson	Moist, loam	0.230	26	92
	1042	....do	North Reading	....do		0.260	16	32
388. Tsuga Caroliniana. *Hemlock.*	623	North Carolina	Hendersonville	A. H. Curtiss	Dry, rocky	0.228	51	14
389. Tsuga Mertensiana. *Hemlock.*	971	Washington territory.	Wilkeson	G. Engelmann and C. S. Sargent.	Rich loam			
	995	Alaska	Sitka	Paul Schultze				
390. Tsuga Pattoniana	930	British Columbia	Silver peak, near Fraser river.	G. Engelmann and C. S. Sargent.	Gravelly loam			
391. Pseudotsuga Douglasii. *Red Fir. Yellow Fir. Oregon Pine. Douglas Fir.*	271	Colorado	Alpine	T. S. Brandegee	Moist	0.276	40	155
	627	California	Saw-mill, Strawberry valley.	G. Engelmann and C. S. Sargent.				
	702	Oregon	Saw-mill, Marshfield	....do				
	704	....do	....do	....do				
	705	....do	E. B. Dean's saw-mill, Marshfield.	....do				
	706	....do	....do	....do				
	708	....do	....do	....do				
	709	....do	....do	....do				
	720	Montana	Saw-mill, Missoula	S. Watson				
	732	California	Lassen's peak	Sierra Lumber Company.				
	881	Utah	Salt Lake	M. E. Jones	Rocky			
	973	British Columbia	Saw-mill, Burrard inlet.	C. S. Sargent				
	974	....do	....do	....do				
	986	....do	Saw-mill, Victoria	G. Engelmann and C. S. Sargent.				
	980	Oregon	Saw-mill, Portland	....do				

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic feet, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average			
0.3480			0.3480	0.22		0.22			269
0.3540	0.3558		0.3549	0.32	0.29	0.31			270
0.4309	0.4274		0.4292	0.49	0.51	0.50			901
0.3764	0.3517		0.3641	0.69	0.28	0.48			906
			0.3740			0.38	23.31		
0.6029	0.6485		0.6257	0.23	0.24	0.24			970
0.3658	0.3974		0.3810	0.16	0.17	0.17			077
0.4280			0.4280	0.16	0.13	0.15			1015
0.3520	0.3423	0.3446	0.3463	0.22	0.13	0.18			1019
0.3661	0.3570		0.3619	0.13	0.12	0.13			1026
			0.4287			0.17	26.72		
0.3880	0.3896		0.3888	0.24	0.25	0.25			5
0.4633	0.4624		0.4629	0.73	0.67	0.70			219
0.3817	0.3823		0.3820	0.43	0.36	0.40			726
0.3963	0.4704		0.4333	0.45	0.46	0.46		Red hemlock	772
0.4839	0.4707		0.4773	0.34	0.42	0.38		White hemlock	775
0.3418	0.3343		0.3381	0.54	0.56	0.55			778
0.4538	0.4538		0.4538	0.44	0.48	0.46			787
0.5033	0.5191		0.5112	0.46	0.46	0.46			793
0.3719	0.3500		0.3610	0.45	0.51	0.48			817
0.4213	0.4554	0.4561	0.4443	0.51	0.60	0.56			1040
0.4112	0.4080	0.4098	0.4097	0.52	0.31	0.42			1042
			0.4239			0.46	26.42		
0.4289	0.4260		0.4275	0.39	0.41	0.40	26.64		623
0.5671	0.4833		0.5252	0.41	0.45	0.43			971
0.4981	0.4975	0.5411	0.6122	0.43	0.39	0.41			995
			0.5182			0.42	32.29		
0.4462	0.4396	0.4503	0.4454	0.34	0.53	0.44	27.76		986
0.4461	0.4674		0.4568	0.16		0.16			271
0.5570	0.5653		0.5612	0.10	0.06	0.08			627
0.4063	0.4364		0.4214	0.08	0.07	0.08		Coarse-grained	702
0.6332	0.6769		0.6551	0.02	0.03	0.03		Grown near the ocean	704
0.5215	0.5256		0.5233	0.03	0.01	0.02		Coarse-grained best quality	705
0.5493	0.5937		0.5715	0.10	0.06	0.08		Fine-grained best quality	706
0.6189	0.5785		0.5087	0.02	0.03	0.03		Coast fir	708
0.4254	0.3859		0.4057	0.04	0.03	0.04		20 miles from coast, clear yellow	709
0.5269	0.5215		0.5242	0.09	0.12	0.11			720
0.4896	0.4941		0.4918	0.12	0.13	0.13			732
0.5251	0.5855		0.5553	0.18	0.18	0.18			881
0.4800	0.4679		0.4744	0.05	0.06	0.06		Red fir	973
0.5028	0.4848		0.4988	0.05	0.04	0.05		Yellow fir	974
0.4511	0.4504		0.4508	0.10	0.08	0.09			980
0.5990	0.5922		0.5950	0.10	0.11	0.11			989

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	Layers of growth. Sap-wood.	Layers of growth. Heart-wood.
391. Pseudotsuga Douglasii—continued	1008	British Columbia	Saw-mill, Burrard inlet.	G. Engelmann and C. S. Sargent.				
	1011	Oregon	Oregon Railway and Navigation Co.	do				
	1010	do	Weidler's saw-mill, Portland.	do				
	1018	do	Saw-mill, Astoria	do				
	1020	do	Portland Furniture Company.	do				
	1022	do	Portland Furniture Company.	do				
391. Pseudotsuga Douglasii, *var.* macrocarpa. *Hemlock.*	642	California	Saw-mill, San Bernardino.	W. G. Wright				
392. Abies Fraseri *Balsam. She Balsam.*	523	North Carolina	Roan mountain	Walcott Gibbs	Peaty loam	0.180	46	
393. Abies balsamea *Balsam Fir. Balm of Gilead Fir.*	107	Vermont	Green mountains	C. G. Pringle	Cold, gravelly loam			
	377	do	Monkton	do	Peaty			
394. Abies subalpina *Balsam.*	449[1]	Colorado	Forest City	T. S. Brandegee	Moist, sandy loam			
	449[2]	do	do	do	do			
	820	do	do	do	do	0.344	17	155
395. Abies grandis *White Fir.*	959, 1009, 1010	Oregon	Portland	G. Engelmann and C. S. Sargent.	Rich, alluvial	0.735	56	43
396. Abies concolor *White Fir. Balsam Fir.*	529	Colorado	Engelmann's cañon	Robert Douglas	Rocky	0.196	29	
	580	California	Strawberry valley	G. Engelmann and C. S. Sargent.	Alluvial			
	639	do	do	do	do			
	733	do	Lassen's peak	Sierra Lumber Company.				
397. Abies bracteata	572	do	Santa Lucia mountains.	G. R. Vasey				
398. Abies amabilis	1004	British Columbia	Silver peak, near Fraser river.	G. Engelmann and C. S. Sargent.	Rich, sandy loam	0.584	50	120
399. Abies nobilis *Red Fir.*	965	Oregon	Cascade mountains	do	Rich			
400. Abies magnifica *Red Fir.*	647	California	Soda Springs	do	Gravelly loam	1.324	71	267
401. Larix Americana *Larch. Black Larch. Tamarack. Hackmatack.*	226[1]	Vermont	Charlotte	C. G. Pringle	Cold, swampy			
	226[2]	do	do	do	do			
	226[3]	do	do	do	do			
	774	New Brunswick	Bay of Fundy	Intercolonial railway.				
	781	do		do				
	786	do	Bridgeton	Ed. Sinclair				
	795	do	Danville	Grand Trunk railway.				
	840	Massachusetts	Wenham	J. Robinson	Swampy			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.5266	....	....	0.5266	0.03	0.04	0.04	....	....	1008
0.4902	0.4867	....	0.4885	0.03	0.03	0.03	....	Railroad tie.	1011
0.5831	0.5599	....	0.5715	0.11	0.07	0.09	....	....	1016
0.5660	0.5725	....	0.5692	0.05	0.04	0.05	....	....	1018
0.4331	0.4422	....	0.4377	0.07	0.11	0.09	....	....	1020
0.4562	0.4588	....	0.4575	0.06	0.07	0.07	....	....	1022
			0.5157			0.08	32.14		
0.4664	0.4463	....	0.4563	0.08	0.08	0.08	28.44	....	042
0.3699	0.3431	....	0.3565	0.47	0.60	0.54	22.22	....	523
0.3386	0.3342	....	0.3364	0.63	0.49	0.56	....	....	107
0.4248	0.4299	....	0.4273	0.33	0.35	0.34	....	....	377
			0.3819			0.45	23.80		
0.3446	0.3515	....	0.3481	0.66	....	0.66	....	....	449[1]
0.3442	0.3641	....	0.3541	0.33	....	0.33	....	....	449[2]
0.3475	0.3397	0.3342	0.3405	0.34	0.33	0.34	....	....	820
			0.3476			0.44	21.66		
0.3416	0.3371	....		0.38	0.32				959
0.3643	0.3842	0.3531	0.3545	0.63	0.57	0.49	21.97	One tree	1009
0.3390	0.3625	....		0.56	0.47				1010
0.3613	0.3717	....	0.3665	0.87	0.89	0.88	....	....	529
0.3059	0.2910	....	0.2085	1.12	1.12	1.12	....	....	580
0.3286	0.3780	....	0.3533	0.56	0.48	0.52	....	....	639
0.4242	0.4500	....	0.4371	0.70	1.04	0.87	....	....	733
			0.3638			0.85	22.67		
0.7082	0.6483	....	0.6783	2.09	1.99	2.04	42.27	....	572
0.4297	0.4159	....	0.4228	0.25	0.21	0.23	26.35	....	1004
0.4625	0.4497	....	0.4561	0.27	0.41	0.34	28.42	....	965
0.4752	0.4614	0.4738	0.4701	0.30	0.30	0.30	29.30	....	647
0.6973	0.7075	....	0.7024	0.26	....	0.26	....	....	226[1]
0.6945	0.7779	....	0.7362	0.27	....	0.27	....	....	226[2]
0.6835	0.6069	....	0.6452	0.32	....	0.32	....	....	226[3]
0.5975	0.5765	....	0.5870	0.30	0.27	0.28	....	....	774
0.5925	0.5740	....	0.5833	0.47	0.49	0.48	....	....	781
0.5389	0.5570	....	0.5470	0.35	0.30	0.33	....	....	786
0.5882	0.5864	....	0.5873	0.36	0.32	0.34	....	....	795
....	....	0.6000	0.6000	0.27	0.48	0.38	....	....	840
			0.6236			0.33	38.86		

TABLE I.—SPECIFIC GRAVITY, ASH, AND WEIGHT PER CUBIC FOOT

Species.	Office number.	State.	Locality.	Collector.	Soil.	Diameter of tree, in meters.	LAYERS OF GROWTH. Sap-wood.	Heart-wood.
402. Larix occidentalis *Tamarack.*	719	Montana	Missoula	S. Watson				
	984	Washington territory.	Fulda	William N. Siksdorf	Moist			
	1006	...do	...do	...do				
PALMACEÆ.								
404. Sabal Palmetto *Cabbage Tree. Cabbage Palmetto.*	242	Florida	Sister island	A. H. Curtiss	Shell			
405. Washingtonia filifera *Fan-leaf Palm.*	1159	California	Agua Caliente	W. G. Wright	Dry, gravelly			
406. Thrinax parviflora *Silk-top Palmetto.*	504	Florida	Long Key	A. H Curtiss	Coral			
	1107	...do	Bahia Honda Key	...do	...do			
407. Thrinax argentea *Silver-top Palmetto. Brickley Thatch. Brittle Thatch.*	506	...do	Sugar-loaf Sound	...do	...do			
	1116	...do	No-Name Key	...do	...do			
408. Oreodoxa regia *Royal Palm.*	565	...do	Big Cypress	...do	Rich humus			
	1119	...do	Lost Man's river	...do	...do			
LILIACEÆ.								
409. Yucca canaliculata *Spanish Bayonet.*	1063	Texas	Matagorda	C. Mohr	Sandy, saline			
410. Yucca brevifolia *The Joshua. Joshua Tree.*	695	California	Mohave	G. Engelmann and C. S. Sargent.	Dry, gravelly			
	696	...do	...do	...do	...do			
411. Yucca elata *Spanish Bayonet.*	699	Arizona	Tucson	...do	...do			
412. Yucca baccata *Spanish Bayonet. Mexican Banana.*	1003	California	San Diego	G. Engelmann	...do			

OF DRY SPECIMENS OF THE WOODS OF THE UNITED STATES—Continued.

Specific gravity determinations.				Ash determinations.			Weight, per cubic foot, in pounds (average).	Remarks.	Office number.
First.	Second.	Third.	Average.	First.	Second.	Average.			
0.6063	0.5897	....	0.6280	0.08	0.09	0.09	....	....	719
0.7717	0.7839	....	0.7778	0.09	0.09	0.09	....	....	984
0.8340	9.7984	....	0.8162	0.07	0.12	0.09	....	....	1006
			0.7407			0.09	46.10		
0.5002	0.4020	0.4191	0.4404	7.51	7.80	7.66	27.44	....	242
0.5597	0.4942	....	0.5173	1.80	1.98	1.89	32.24	....	1159
0.4700	0.5453								
0.7014	0.7258	....	0.7136	2.65	2.79	2.72	....	....	504
0.4539	0.4957	0.5039	0.4845	5.73	4.81	5.27	....	....	1107
			0.5991			3.99	37.34		
0.7357	0.7468	....	0.7412	1.71	2.19	1.95	....	....	586
0.6775	0.6907	0.7118	0.6933	3.90	4.25	4.07	....	....	1116
			0.7172			3.01	44.70		
0.2370	0.1887	....	0.2128	2.96	2.52	2.74	....	Pith.. One tree	565
0.8178	0.8807	....	0.8492	1.31	1.14	1.23	....	Rind..	
0.7451	0.7513	....	0.7482	2.79	2.53	2.66	....	Rind	1119
			0.6034			2.21	37.60		
0.7162	0.5875	0.6994	0.6677	7.03	5.52	6.27	41.61	....	1063
0.3473	0.3472	....	0.3472	5.53	4.75	5.14	....	....	695
0.4002	0.4002	....	0.4002	2.66	3.08	2.87	....	....	696
			0.3737			4.00	23.29		
0.2327	0.6511	0.4572	0.4470	8.50	10.06	0.28	27.86	....	609
0.1990	0.3458	....	0.2724	8.94	....	8.94	16.97	....	1003

TABLE II.—ACTUAL FUEL VALUE OF SOME OF THE

Office number.	Catalogue number.	Botanical name.	Common name.	Region.	FUEL VALUE. Per cubic decimeter.	Per kilogram.
165	8	Liriodendron Tulipifera	Tulip Tree. Yellow Poplar. White Wood	Atlantic	1425.57	3744.61
903	29	Bursera gummifera	Gum Elemi. Gumbo Limbo. West Indian Birch	Semi-tropical Florida	997.32	2913.58
452	31	Swietenia Mahogoni	Mahogany. Madeira	...do	2769.31	3802.95
274	64	Acer saccharinum, *var.* nigrum	Black Sugar Maple	Atlantic	3091.37	4345.48
845	77	Robinia Pseudacacia	Locust. Black Locust. Yellow Locust	...do	2822.99	3890.02
927	93	Prosopis juliflora	Mesquit. Algaroba. Honey Locust. Honey Pod.	Mexican boundary	3291.21	4352.30
883	115	Cercocarpus ledifolius	Mountain Mahogany	Interior Pacific	4234.06	4052.90
1182	139	Liquidambar Styraciflua	Sweet Gum. Star-leaved Gum. Liquidamber. Red Gum. Bilsted.	Atlantic	2255.24	4016.46
128	155	Nyssa uniflora	Large Tupelo. Cotton Gum. Tupelo Gum	Southern Atlantic	2332.41	4131.83
1084	184	Diospyros Virginiana	Persimmon	Atlantic	2970.45	3781.61
227	192	Fraxinus Americana	White Ash	...do	2652.34	4217.42
180	207	Catalpa speciosa	Western Catalpa	...do	1582.42	3936.38
533	224	Ulmus Americana	White Elm. American Elm. Water Elm	...do	3247.02	4191.87
126	235	Platanus occidentalis	Sycamore. Button Wood. Button-ball Tree. Water Beech.	...do	2406.89	4071.83
209	239	Juglans nigra	Black Walnut	...do	1984.56	3857.26
322	241	Carya olivæformis	Pecan. Illinois Nut	...do	2768.72	3954.75
29	242	Carya alba	Shell-bark Hickory. Shag-bark Hickory	...do	3851.17	4078.76
539					3319.79	3811.48
72	244	Carya tomentosa	Mocker Nut. Black Hickory. Bull Nut. Big-bud Hickory. White-heart Hickory. King Nut.	...do	3380.57	3904.11
1051	245	Carya porcina	Pig Nut. Brown Hickory. Black Hickory. Switch-bud Hickory.	...do	3392.12	3922.89
838	•246	Carya amara	Bitter Nut. Swamp Hickory	...do	2863.42	3903.25
237	247	Carya myristicæformis	Nutmeg Hickory	Southern Atlantic	3108.27	3877.58
362	248	Carya aquatica	Water Hickory. Swamp Hickory. Bitter Pecan	...do	3140.33	4073.59
1050	251	Quercus alba	White Oak	Atlantic	3197.41	4187.83
988	253	Quercus Garryana	...do	Northern Pacific	2594.31	3667.39
424	257	Quercus lyrata	Over-cup Oak. Swamp Post Oak. Water White Oak.	Southern Atlantic	3268.92	4105.65
31	260	Quercus Prinus	Chestnut Oak. Rock Chestnut Oak	...do	2843.69	3997.32
92	272	Quercus rubra	Red Oak. Black Oak	Atlantic	3062.08	4075.16
247	274	Quercus tinctoria	Black Oak. Yellow-bark Oak. Quercitron Oak. Yellow Oak.	...do	2505.04	3774.60
339	276	Quercus nigra	Black Jack. Jack Oak	...do	2692.51	3713.81
548	277	Quercus falcata	Spanish Oak. Red Oak	Southern Atlantic	3103.28	4055.48
511	280	Quercus aquatica	Water Oak. Duck Oak. Possum Oak. Punk Oak	...do	2655.82	3718.07
868	290	Castanea vulgaris, *var.* Americana	Chestnut	Atlantic	1868.25	4042.96
55	291	Fagus ferruginea	Beech	...do	2795.34	3895.04
848	294	Betula alba, *var.* populifolia	White Birch. Old-field Birch. Gray Birch	Northern Atlantic	2509.00	4073.05
225	295	Betula papyrifera	Canoe Birch. White Birch. Paper Birch	...do	2582.66	4101.41
272	318	Populus tremuloides	Aspen. Quaking Asp	Atlantic and Pacific	1624.64	4292.31
754	324	Populus monilifera	Cottonwood. Necklace Poplar. Carolina Poplar. Big Cottonwood.	Atlantic	1906.42	4242.15
874	327	Thuya occidentalis	White Cedar. Arbor-vitæ	Northern Atlantic	1411.57	3917.77
701	331	Chamæcyparis Lawsoniana	Port Orford Cedar. Oregon Cedar. White Cedar. Lawson's Cypress. Ginger Pine.	Northern Pacific	2327.52	5263.50
527	338	Juniperus occidentalis, *var.* monosperma.	Juniper	Pacific	3143.57	4587.81
923	340	Taxodium distichum	Bald Cypress. Black Cypress. Red Cypress. White Cypress. Deciduous Cypress.	Southern Atlantic	1935.71	4739.73
711	342	Sequoia sempervirens	Redwood	California coast	1985.50	4191.47
1044	347	Pinus Strobus	White Pine. Weymouth Pine	Northern Atlantic	1489.03	4272.69
638	349	Pinus Lambertiana	Sugar Pine	Pacific	1785.40	4419.31
900	356	Pinus monophylla	Piñon. Nut Pine	Interior Pacific	2248.13	4107.68
194	358	Pinus resinosa	Red Pine. Norway Pine	Northern Atlantic	2051.75	4226.05
632	361	Pinus ponderosa	Yellow Pine. Bull Pine	Pacific	2141.24	4600.04
625	365	Pinus Murrayana	Tamarack. Black Pine. Lodge-pole Pine. Spruce Pine.	...do	1701.32	4019.12
571	366	Pinus Sabiniana	Digger Pine. Bull pine	California	1804.29	3982.97
389	370	Pinus Tæda	Loblolly Pine. Old-field Pine. Rosemary Pine	Southern Atlantic	2031.75	4067.20
1046	371	Pinus rigida	Pitch Pine	Atlantic coast	3472.26	5491.47
83	372	Pinus serotina	Pond Pine	Southern Atlantic	3980.96	5012.54
621	373	Pinus inops	Jersey Pine. Scrub Pine	Atlantic	2008.20	4126.15
321	375	Pinus pungens	Table-mountain Pine. Hickory Pine	Alleghany	2054.78	3995.30
557	377	Pinus mitis	Yellow Pine. Short-leaved Pine. Spruce Pine. Bull Pine.	Atlantic	3091.82	5062.75

MORE IMPORTANT WOODS OF THE UNITED STATES.

RELATIVE FUEL VALUE.		PERCENTAGE IN DRY WOOD.						Specific gravity.	Weight of cubic foot, in pounds.	Office number.
By volume.	By weight.	Ash.	Hydrogen.	Carbon.	Oxygen.	Hydrogen combined with oxygen.	Excess of hydrogen.			
67	66	0.27	6.43	47.29	46.01	5.75	0.68	0.3807	23.72	165
69	70	2.09	6.02	40.80	51.09	6.39	0.36	0.3423	21.33	903
32	62	1.09	6.69	46.76	45.46	5.68	1.01	0.7282	45.38	452
23	19	0.56	6.61	51.55	41.28	5.16	1.45	0.7114	44.32	274
29	58	0.23	6.17	49.19	44.41	5.55	0.62	0.7257	45.22	845
14	18	2.05	6.61	51.08	40.26	5.03	1.58	0.7562	47.12	927
3	42	1.20	5.45	52.14	41.21	5.15	0.30	1.0447	65.10	883
45	46	0.48	5.85	50.99	42.68	5.33	0.52	0.5615	34.99	1182
43	30	0.74	6.97	48.78	43.51	5.44	1.53	0.5645	35.17	128
25	63	0.77	6.44	47.37	45.42	5.67	0.77	0.7855	48.95	1084
36	24	0.30	6.93	49.73	43.04	5.38	1.55	0.6289	39.19	227
65	52	0.47	6.92	47.44	45.17	5.65	1.27	0.4020	25.05	180
16	26	0.74	6.57	50.35	42.34	5.29	1.28	0.7746	48.27	533
42	40	0.57	5.83	51.45	42.15	5.27	0.56	0.5011	36.83	120
53	60	0.56	0.00	49.28	44.16	5.52	0.48	0.5145	32.06	209
33	50	0.95	6.15	49.51	43.39	5.42	0.73	0.7001	43.63	322
7	36	0.73	6.49	49.67	43.12	5.39	1.10	0.9442	58.84	29
13	61	0.83	6.13	48.45	44.59	5.57	0.56	0.8710	54.28	539
11	55	1.04	5.93	49.69	43.34	5.42	0.51	0.8659	53.95	72
10	53	0.74	6.28	48.98	44.00	5.50	0.78	0.8647	53.88	1051
27	56	1.03	5.91	49.71	43.29	5.41	0.50	0.7336	45.71	838
21	59	1.06	6.37	48.26	44.31	5.54	0.83	0.8016	49.95	237
20	38	1.19	6.60	49.16	43.05	5.38	1.22	0.7709	48.04	362
17	28	0.24	6.59	50.44	42.73	5.34	1.25	0.7635	46.58	1050
38	69	0.33	5.73	48.56	45.38	5.67	0.06	0.7074	44.08	988
15	33	0.58	6.75	49.22	43.45	5.43	1.32	0.7962	49.61	424
28	47	0.34	6.33	49.59	43.74	5.47	0.86	0.7114	44.32	31
24	37	0.15	6.62	49.49	43.74	5.47	1.15	0.7514	46.72	92
37	64	0.15	6.09	48.78	44.98	5.62	0.37	0.6875	43.84	247
34	68	1.37	5.73	48.58	44.32	5.54	0.19	0.7250	45.18	339
18	41	0.29	6.14	50.58	42.99	5.37	0.77	0.7874	49.07	548
35	67	0.83	5.75	48.73	44.69	5.58	0.17	0.7143	44.51	511
56	43	0.13	5.70	51.74	42.43	5.30	0.40	0.4621	28.80	868
31	57	0.54	6.11	49.27	44.08	5.51	0.60	0.7175	44.71	55
40	39	0.29	6.49	49.77	43.45	5.43	1.06	0.6160	38.05	848
39	34	0.23	7.12	48.28	44.37	5.54	1.58	0.6297	39.24	225
63	20	0.74	6.58	51.13	41.55	5.19	1.39	0.3785	23.59	272
55	22	0.65	6.26	51.64	41.45	5.18	1.08	0.4494	28.00	754
68	54	0.37	6.37	48.80	44.40	5.56	0.81	0.3603	22.45	874
44	3	0.10	6.28	60.07	33.65	4.21	2.07	0.4422	27.56	701
19	11	0.88	6.03	54.97	38.12	4.76	1.27	0.6852	42.70	527
54	8	0.40	6.54	54.98	38.08	4.76	1.78	0.4084	24.45	923
52	27	0.13	6.01	52.10	41.70	5.22	0.79	0.4737	29.52	711
66	21	0.12	0.08	52.55	41.25	5.15	0.93	0.3485	21.72	1044
59	13	0.19	6.40	52.85	40.56	5.07	1.33	0.4040	25.18	638
46	32	0.83	6.39	50.48	43.30	5.41	0.98	0.5473	34.11	900
49	23	0.20	6.07	52.18	41.55	5.19	0.88	0.4855	30.26	194
41	9	0.31	7.02	52.60	40.07	5.01	2.01	0.5307	33.07	632
58	45	0.37	6.22	50.05	43.36	5.42	0.80	0.4457	27.78	625
57	49	0.42	6.04	50.22	43.32	5.41	0.63	0.4530	28.28	571
50	35	0.25	6.23	50.60	42.92	6.36	0.87	0.4971	30.98	389
9	1	1.12	7.10	59.00	32.68	4.08	3.11	0.6323	39.40	1046
6	6	0.17	6.80	56.55	30.48	4.56	2.24	0.7942	49.49	83
51	31	0.26	6.30	50.74	42.70	5.34	0.96	0.4867	30.33	32[illegible]
48	48	0.30	5.78	51.07	42.85	5.35	0.43	0.5143	32.05	321
22	5	0.20	6.91	56.64	36.25	4.53	2.38	0.6107	38.06	557

TABLE II.—ACTUAL FUEL VALUE OF SOME OF THE

Office number.	Catalogue number.	Botanical name.	Common name.	Region.	Fuel value. Per cubic decimeter.	Fuel value. Per kilogram.
879	379	Pinus Banksiana	Gray Pine. Scrub Pine. Prince's Pine	Northern Atlantic	2152.66	4393.18
a 359	380	Pinus palustris	Long-leaved Pine. Southern Pine. Georgia Pine. Yellow Pine. Hard Pine.	South Atlantic coast	4346.88	5120.64
81					4064.77	5480.35
385					2810.20	4506.42
b 358					4129.95	4594.97
358					4319.67	4806.05
356	381	Pinus Cubensis	Slash Pine. Swamp Pine. Bastard Pine. Meadow Pine.	do	3363.40	4418.55
794	382	Picea nigra	Black Spruce	Northern Atlantic	1614.11	3949.37
1042	387	Tsuga Canadensis	Hemlock	do	1724.25	4298.58
709	391	Pseudotsuga Douglasii	Red Fir. Yellow Fir. Oregon Pine. Douglas Fir.	Pacific	1766.32	4354.84
226	401	Larix Americana	Larch. Black Larch. Tamarack. Hackmatack.	Northern Atlantic	2937.40	4182.04
242	404	Sabal Palmetto	Cabbage Tree. Cabbage Palmetto	South Atlantic coast	1653.35	3754.21
c 565	408	Oreodoxa regia	Royal Palm	Semi-tropical Florida	859.07	4037.01
d 565					3708.48	4367.03

a Boxed for turpentine 1876; chipped 4 years; specimen taken along chip.
b Boxed for turpentine 1852; chipped 10 years; abandoned 1861.
c Pith.
d Rind.

MORE IMPORTANT WOODS OF THE UNITED STATES—Continued.

Relative fuel value.		Percentage in dry wood.						Specific gravity.	Weight of cubic foot, in pounds.	Office number.
By volume.	By weight.	Ash.	Hydrogen.	Carbon.	Oxygen.	Hydrogen combined with oxygen.	Excess of hydrogen.			
47	15	0.19	6.29	52.93	40.59	5.07	1.22	0.4900	30.54	879
1	4	0.15	7.26	56.19	36.30	4.54	2.72	0.8479	52.84	359
5	2	0.26	7.41	58.61	33.72	4.21	3.20	0.7417	46.22	81
30	12	0.28	6.70	52.70	40.32	5.04	1.66	0.6236	38.80	385
4	10	0.28	6.85	52.99	39.88	4.99	1.86	0.8988	55.96	358
2	7	0.24	6.83	54.78	38.15	4.77	2.06	0.8988	55.06	358
12	14	0.16	6.22	53.33	40.29	5.03	1.19	0.7612	47.44	356
64	51	0.30	6.58	48.45	44.67	5.58	1.00	0.4087	25.47	794
61	25	0.48	5.91	52.38	41.23	5.15	0.76	0.4097	25.53	1042
60	17	0.03	6.42	52.32	41.23	5.15	1.27	0.4056	25.28	709
26	29	0.27	6.03	51.91	41.79	5.22	0.81	0.7024	43.77	226
62	65	7.66	7.06	43.35	41.93	5.24	1.82	0.4404	27.45	242
70	44	2.74	6.82	47.73	42.71	5.34	1.48	0.2128	13.26	565
8	16	1.24	6.98	50.46	41.32	5.16	1.82	0.8492	52.92	565

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
MAGNOLIACEÆ.										
1. Magnolia grandiflora. *Big Laurel. Bull Bay.*	346	Alabama	Cottage Hill	C. Mohr	Rich loam	0.7051		1061	957	820
	346	...do	...do	...do	...do	0.7006		887	849	761
2. Magnolia glauca. *Sweet Bay. White Bay. Beaver Tree. White Laurel. Swamp Laurel.*	354	...do	...do	...do	Swampy	0.5222		976	930	732
	354	...do	...do	...do	...do	0.5028		976	896	717
3. Magnolia acuminata. *Cucumber Tree. Mountain Magnolia.*	246	Virginia	Wytheville	H. Shriver	Clay limestone	0.5000		904	1061	703
	246	...do	...do	...do	...do	0.4755		939	921	665
	261[1]	...do	Fancy Gap	...do	Rich, light	0.4862		788	734	574
	261[1]	...do	...do	...do	...do	0.4564		729	723	525
	534	Mississippi	Selvers' mill	C. Mohr	...do	0.5682		1061	1050	717
	534	...do	...do	...do	...do	0.5852		1109	1085	839
4. Magnolia cordata. *Cucumber Tree.*	1178	Alabama	Winston county	...do		0.4318		888	864	564
	1178	...do	...do	...do		0.4625		976	1017	637
5. Magnolia macrophylla. *Large-leaved Cucumber Tree.*	532	Mississippi	Quitman	...do	Rich, low	0.5807		1191	1085	516
	532	...do	...do	...do	...do	0.5580		1252	1252	876
6. Magnolia Umbrella. *Umbrella Tree. Elk Wood.*	266[1]	Virginia	Wytheville	H. Shriver		0.4170		800	814	653
	266[2]	...do	...do	...do		0.5051		669	673	612
7. Magnolia Fraseri. *Long-leaved Cucumber Tree.*	260	...do	Fancy Gap	...do	Damp	0.5688		939	976	811
	260[1]	...do	...do	...do	...do	0.5103		887	012	602
8. Liriodendron Tulipifera. *Tulip Tree. Yellow Poplar. White Wood.*	305	Michigan	Lansing	W. J. Beal		0.4174		610	610	473
	818	West Virginia	Grafton	C. G. Pringle		0.4930		1085	1176	756
	818	...do	...do	...do		0.4809		1085	1050	675
	1231	Pennsylvania	Chester county	P. P. Sharples		0.4704		976	076	743
	1231	...do	...do	...do		0.4911		921	1007	820
	1231	...do	...do	...do		0.4610		976	957	755
	1232	...do	...do	...do		0.4381		976	848	457
	1232	...do	...do	...do		0.4511		976	1028	722
	1232	...do	...do	...do		0.4550		904	921	661
	1236	Tennessee	Saw-mill at Nashville.	A. E. Baird		0.4614		888	834	694
	1236	...do	...do	...do		0.4697		872	888	645
	1236	...do	...do	...do		0.4591		888	849	584
	1237	...do	...do	...do		0.4386		857	849	584
	1238	...do	...do	...do		0.4463		976	976	635
ANONACEÆ.										
9. Asimina triloba. *Papaw. Custard Apple.*	211	Missouri	Meramec river, Jefferson county.	G. W. Letterman	Alluvial	0.3034		444	407	312
	211	...do	...do	...do	...do	9.3575		362	315	288
	332	Tennessee	Cumberland river	A. Gattinger	...do	0.4323		008	723	574
10. Anona laurifolia. *Pond Apple.*	479	Florida	Bay Biscayne	A. H. Curtiss	Swampy	0.5705		542	514	628
	479	...do	...do	...do	...do	0.5794		530	488	586
CANELLACEÆ.										
12. Canella alba. *White Wood. Cinnamon Bark. Wild Cinnamon.*	1131	...do	Elliott's Key	...do	Coral	1.1286		1085	1085	905
	1131	...do	...do	...do	...do	1.0857		1085	1148	1148
TERNSTRŒMIACEÆ.										
14. Gordonia Lasianthus. *Loblolly Bay. Tan Bay.*	236	South Carolina	Bonneau's Depot	H. W. Ravenel	Wet pine-barren	0.4844		718	723	499
	236	...do	...do	...do	...do	0.4729		787	763	071
	414	...do	Aiken	...do	Swampy	0.5470		888	921	773
	414	...do	...do	...do	...do	0.5605		751	769	729

UNITED STATES UNDER TRANSVERSE STRAIN.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
4.6	10.2	16.0	22.8	1.6	22.5	30.5	39.5	54.6					350	Broke suddenly with long splinters	346
5.5	11.5	16.7	23.4	2.0	23.6	31.2	40.5						325	do	346
5.0	10.5	16.0	21.7	1.0	22.0	30.0	44.5						321	Crushed at center bearing; broke suddenly and squarely, splitting to the end.	354
5.0	10.9	16.7	24.0	2.3	24.0	31.5	50.8						306	do	354
5.4	9.2	14.5	20.0	1.0	20.0	28.8	46.0						300	Crushed at center bearing; broke with fine splinters	246
5.2	10.6	17.0	24.0	1.9	25.0	33.7							284	do	246
6.2	13.3	21.0	34.3	4.8	35.0								245	do	261[1]
6.7	13.5	21.0	31.8	3.4	33.0								224	do	261[1]
4.6	9.3	14.5	20.0	1.0	20.0	27.0							306	do	534
4.4	9.0	13.7	19.2	0.7	19.2	26.0	35.0	54.0					358	do	534
5.5	11.3	17.3	26.1	2.0	27.0								240	Crushed at center bearing; square break	1178
5.0	9.6	15.2	22.0	1.4	23.0	32.4							272	Crushed at center bearing; splintered break	1178
4.1	9.0	13.8	19.2	1.0	19.5								220	Specimen cross-grained; started at knot	532
3.9	7.8	11.6	15.8	0.3	15.8	20.8	28.5	40.0					374	Broke with fine splinters	632
6.1	12.0	19.4	30.8	4.5	32.4								236	Splinters started at small knots	266[1]
7.3	14.5	23.0	34.8	4.0	36.2	66.0							261	do	266[2]
5.2	10.0	14.4	19.6	1.0	20.0	26.3	37.2						346	Crushed at center bearing; broke with fine splinters	260
5.5	10.7	16.4	24.7	2.0	25.5	36.8							257	Specimen cross-grained; broke with long splinters	260[1]
8.0	16.0	20.0											202	Square break	395
4.5	8.3	12.0	16.8	0.4	16.9	24.5	34.0						322	Broke with long splinters	818
4.5	9.3	14.3	20.0	0.7	20.2	28.8							288	Crushed at center bearing; broke with long splinters	818
5.0	10.0	15.0	20.6	0.5	20.7	28.0	37.7						317	Crushed at center bearing; broke with large splinters	1231
5.3	9.7	14.4	20.0	0.5	20.5	25.8	34.2	50.0					350	do	1231
5.0	10.2	15.2	20.6	0.5	20.6	27.0	37.7						322	Crushed at center bearing; square break	1231
5.0	11.5	18.0											195	Crushed at center bearing; square break at large knot	1232
5.0	9.5	14.0	19.2	0.5	19.4	25.4	36.0						308	Crushed at center bearing; broke with fine splinters	1232
5.4	10.0	15.7	21.5	0.0	22.0	30.0							282	Crushed at center bearing; broke with long splinters at knot	1232
6.0	11.7	16.0	22.0	1.0	22.4	31.5							296	Square break on tension side, splitting in axis	1236
5.6	11.0	16.0	23.0	1.4	23.5	33.0							275	Specimen cross-grained; broke with the grain	1236
5.5	11.5	17.5	26.6	2.0	27.0								249	Specimen cross-grained; started at the angle of two faces	1236
5.7	11.5	17.2	27.0	2.5	28.0								249	Square break	1237
5.0	10.0	15.2	22.2	1.5	22.4	31.6							271	do	1238
11.0	24.0												133	Broke with large splinters	211
13.5	31.0												123	do	211
7.0	13.5	21.6	31.0	2.9	33.3								245	Broke with splinters at knot	332
9.0	19.0	31.0	50.5	10.0	55.4	94.0							268	Crushed at center bearing; broke with splinters	479
9.2	20.0	32.5	51.5	10.0	54.3	83.0							250	Square break	479
4.5	9.0	13.7	18.5	1.0	19.5	25.0	31.0	38.0					386	Specimen defective, 0.75 sap-wood; square break	1131
4.5	8.5	12.5	17.5	0.8	17.8	22.0	28.0	34.0	42.0	50.0			490	0.75 sap-wood; broke with long, coarse splinters	1131
6.8	13.5	21.5	32.0	3.0	32.5								213	Sap-wood; broke at knot with large splinters	236
6.2	12.8	20.0	29.2	2.5	30.0	40.0							290	Crushed at center bearing; broke with long, fine splinters	236
5.5	10.6	16.3	23.5	1.2	23.7	31.0	44.0						330	do	414
6.5	12.7	19.5	27.0	2.0	28.2	37.0	58.0						311	Broke with long, coarse splinters	414

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY.		Modulus of rupture.
								First deflection.	Second deflection.	
TILIACEÆ.										
17. Tilia Americana *Lime Tree. Bass Wood. American Linden. Lin. Bee Tree.*	2	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.4601		814	781	560
	252	Missouri	Allenton	G. W. Letterman	Alluvial	0.4668		976	976	616
	252	...do	...do	...do	...do	0.5496		1038	1027	801
	316	Michigan	Hersey	W. J. Beal	Rich loam	0.4517		888	888	525
	1039	Massachusetts	Danvers	J. Robinson	Moist gravel	0.4492		698	729	553
	1039	...do	...do	...do	...do	0.4237		668	638	469
17. Tilia Americana, *var.* pubescens	745	Georgia	Bainbridge	A. H. Curtiss	Low	0.4702		842	831	569
	745	...do	...do	...do	...do	0.4555		814	788	548
18. Tilia heterophylla *White Bass Wood. Wahoo.*	285[1]	Kentucky	Cliffs Kentucky river	W. M. Linney	Limestone	0.4017		697	634	403
	285[2]	...do	Mercer county	...do	...do	0.3944		751	723	525
	285[3]	...do	...do	...do	...do	0.3926		827	814	541
	320	Tennessee	Cumberland river	A. Gattinger	Alluvial	0.4750		1085	1085	703
	320	...do	...do	...do	...do	0.4924		976	976	712
MALPIGHIACEÆ.										
19. Byrsonima lucida *Tallowberry. Glamberry.*	1113	Florida	No-Name Key	A. H. Curtiss	Coral	0.6510		542	525	424
ZYGOPHYLLACEÆ.										
20. Guaiacum sanctum *Lignum-vitæ.*	470	...do	Upper Metacombe Key.	...do	...do	1.1430		800	814	628
	1133	...do	Elliott's Key	...do	...do	1.1582		856	912	947
RUTACEÆ.										
23. Xanthoxylum Clava-Herculis *Toothache Tree. Prickly Ash. Sea Ash. Pepper Wood. Wild Orange.*	735	...do	Chattahoochee	...do	Dry, sandy	0.5240		651	698	628
	735	...do	...do	...do	...do	0.5353		669	688	708
	1086	Texas	Palestine	C. Mohr	Damp, sandy	0.5898		857	888	757
	1086	...do	...do	...do	...do	0.5545		659	680	469
24. Xanthoxylum Caribæum *Satin Wood.*	1140	Florida	Bahia Honda Key	A. H. Curtiss	Coral	0.9833		814	814	820
	1140	...do	...do	...do	...do	0.9545		814	921	687
SIMARUBEÆ.										
28. Simaruba glauca *Paradise Tree.*	487	...do	Bay Biscayne	...do	...do	0.4560		888	888	586
	487	...do	...do	...do	...do	0.4104		1061	976	544
BURSERACEÆ.										
29. Bursera gummifera *Gum Elemi. Gumbo Limbo. West Indian Birch.*	462	...do	Upper Metacombe Key.	...do	...do	0.3060		417	....	183
	462	...do	...do	...do	...do	0.3096		....	....	112
30. Amyris sylvatica *Torch Wood.*	475	...do	...do	...do	...do	1.1140		1038	1085	1244
	475	...do	...do	...do	...do	1.1273		970	1085	1366
MELIACEÆ.										
31. Swietenia Mahogoni *Mahogany. Madeira.*	452	...do	...do	...do	...do	0.8364		976	976	895
	452	...do	...do	...do	...do	0.8221		1109	1143	1111
ILICINEÆ.										
33. Ilex opaca *American Holly.*	280	South Carolina	Waverly Mills	W. St. J. Mazyck	Sandy loam	0.6990		651	622	703
	280	...do	...do	...do	...do	0.7018		707	664	670
34. Ilex Dahoon *Dahoon. Dahoon Holly.*	484	Florida	Bay Biscayne	A. H. Curtiss	Low, damp	0.5307		610	610	580
	484	...do	...do	...do	...do	0.5323		697	673	538
CYRILLACEÆ.										
37. Cyrilla racemiflora *Iron Wood.*	341	Alabama	Chunchula	C. Mohr	Damp, sandy	0.6916		465	488	314
38. Cliftonia ligustrina *Titi. Iron Wood. Buckwheat Tree.*	338	...do	Cottage Hill	...do	Wet	0.6062		698	751	574
	338	...do	...do	...do	...do	0.6762		814	814	478

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
6.0	12.5	20.3	32.0	4.0	34.0	......	......	......	......	......	......	......	243	Crushed at center bearing; broke with fine splinters	2
5.0	10.0	16.5	24.2	2.2	25.5	37.0	......	......	......	......	......	......	263	......do	252
4.7	9.5	14.0	19.4	1.0	19.8	25.9	33.5	......	......	......	......	......	343	......do	252
5.5	11.0	17.3	27.0	3.5	29.5	......	......	......	......	......	......	......	224	Crushed at center bearing; broke suddenly	316
7.0	13.4	22.3	34.3	4.0	36.0	......	......	......	......	......	......	......	236	Broke suddenly with large splinters	1039
7.3	15.3	26.4	50.5	18.0	......	......	......	......	......	......	......	......	200	Broke, on reloading, with large splinters	1039
5.8	11.7	18.5	28.6	3.5	30.6	......	......	......	......	......	......	......	243	Crushed at center bearing; square break	745
6.0	12.4	18.8	28.5	3.0	30.1	......	......	......	......	......	......	......	234	......do	745
7.0	15.4	24.6	......	......	......	......	......	......	......	......	......	......	172	......do	285[1]
0.5	13.5	20.3	31.0	3.5	33.6	......	......	......	......	......	......	......	224	......do	285[2]
5.9	12.0	18.4	29.6	3.5	31.3	......	......	......	......	......	......	......	231	......do	285[3]
4.5	9.0	13.7	19.0	0.7	10.5	26.0	39.5	......	......	......	......	......	300	......do	320
5.0	10.0	15.3	21.2	1.5	22.0	29.0	41.0	......	......	......	......	......	304	......do	320
9.0	18.6	31.0	......	......	......	......	......	......	......	......	......	......	181	Specimen cross-grained; split with the grain	1113
6.1	12.0	18.0	25.0	1.2	25.7	33.0	......	......	......	......	......	......	268	......do	476
5.7	10.7	15.0	21.2	1.0	22.0	27.6	34.0	41.2	49.0	......	......	......	404	......do	1133
7.5	14.0	21.0	31.0	3.0	32.3	43.0	......	......	......	......	......	......	268	Long fracture with one large splinter	735
7.3	14.2	22.5	31.5	2.5	33.0	43.5	70.5	......	......	......	......	......	302	Long fracture with two large splinters	735
5.7	11.0	17.5	25.5	2.3	27.0	36.0	58.0	......	......	......	......	......	323	......do	1086
7.4	15.5	23.8	35.5	......	......	......	......	......	......	......	......	......	200	Specimen cross-grained; square break	1086
0.0	12.0	18.0	24.0	1.3	24.5	31.0	39.0	......	......	......	......	......	350	Broke in three pieces	1140
6.0	10.6	15.5	21.2	1.0	21.7	28.0	......	......	......	......	......	......	293	Square break on tension side with large flake on compression side; broke at knot.	1140
5.5	11.0	18.0	26.5	4.0	28.0	......	......	......	......	......	......	......	250	Square break with large splinters	487
4.6	10.0	15.5	21.7	2.0	23.5	......	......	......	......	......	......	......	232	Square break, the ends splitting	487
11.7	......	......	......	......	......	......	......	......	......	......	......	......	78	Square break	462
......	......	......	......	......	......	......	......	......	......	......	......	......	48	......do	462
4.7	9.0	13.3	18.0	0.3	18.2	22.7	28.0	33.2	38.3	40.3	53.0	......	531	Broke with long splinters	475
5.0	9.0	13.6	18.0	0.3	18.2	23.0	27.7	32.0	38.0	44.0	51.0	61.0	583	Broke with long splinters on compression side	475
5.0	10.0	14.6	20.4	1.0	22.0	27.0	32.0	39.0	......	......	......	......	382	Broke suddenly; stick shattered	452
4.4	8.5	13.2	18.4	0.9	18.6	24.1	30.0	35.5	41.4	50.5	......	......	474	......do	452
7.5	15.7	25.0	40.0	5.0	42.0	58.0	84.5	......	......	......	......	......	300	Specimen cross-grained; broke with long split	280
6.9	14.7	24.0	37.7	5.3	39.0	57.1	......	......	......	......	......	......	286	Square break	280
8.0	16.0	26.0	39.2	5.5	41.0	......	......	......	......	......	......	......	250	Specimen cross-grained; broke with long split	484
7.0	14.5	23.5	34.3	5.0	36.3	......	......	......	......	......	......	......	238	Square break on tension side with large flake on compression side	484
10.5	20.0	......	......	......	......	......	......	......	......	......	......	......	134	Specimen cross-grained; broke through small knots	341
7.0	13.0	20.0	28.8	2.3	30.0	......	......	......	......	......	......	......	245	Broke at knot	338
6.0	12.0	19.8	27.9	2.5	28.8	......	......	......	......	......	......	......	204	Specimen cross-grained; oblique fracture	338

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
RHAMNACEÆ.										
42. Reynosia latifolia. *Red Iron Wood. Darling Plum.*	454	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	1.2612		976	1050	820
43. Condalia ferrea. *Black Iron Wood.*	460	....do	....do	....do	....do	1.3546		1191	1109	1127
	460	....do	....do	....do	....do	1.3430		1191	1176	680
45. Rhamnus Caroliniana. *Indian Cherry.*	803	....do	Saint John's river	....do.	Rich hummock	0.5369		814	794	518
	1094	Arkansas	Jonesboro'	T. B. Kitchens		0.5066		718	687	616
47. Rhamnus Purshiana. *Bearberry. Bear Wood. Shittim Wood.*	993	Oregon	Portland	G. Engelmann and C. S. Sargent.	Rich, alluvial	0.5943		775	912	750
49. Colubrina reclinata. *Naked Wood.*	1139	Florida	Umbrella Key	A. H. Curtiss	Coral	0.8721		921	976	1216
SAPINDACEÆ.										
50. Æsculus glabra. *Ohio Buckeye. Fetid Buckeye.*	297	Missouri	Allenton	G. W. Letterman.	Rich, moist	0.4053		751	707	468
	297	....do	....do	....do	....do	0.4602		687	651	468
	427	Tennessee	Nashville	A. Gattinger	Rich, moist	0.4970		610	574	549
52. Æsculus Californica. *California Buckeye.*	684	California	Marin county	G. R. Vasey	Rich upland	0.5034		697	669	548
	684	....do	....do	....do	....do	0.5228		678	698	640
54. Sapindus marginatus. *Wild China. Soapberry.*	307	Texas	Dallas	J. Reverchon	Rich, damp	0.7681		868	888	663
	307	....do	....do	....do	....do	0.7784		857	948	949
	928	....do	Austin	C. Mohr	Limestone	0.5243		842	814	820
	928	....do	....do	....do	....do	0.5310		688	697	703
56. Hypelate paniculata. *Ink Wood. Iron Wood.*	463	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	1.0405		1135	1206	1201
	463	....do	....do	....do	....do	1.0123		939	1017	1118
60. Acer macrophyllum. *Broad-leaved Maple.*	982	Oregon	Portland	G. Engelmann and C. S. Sargent.	Rich, alluvial	0.5445		697	734	696
	982	....do	....do	... do	....do	0.5341		751	751	696
	1023	....do	Portland Furniture Company.	....do		0.4907		697	842	691
	1023	....do	....do	....do		0.5053		729	794	656
61. Acer circinatum. *Vine Maple.*	1013	... do	Portland	....do	Moist, alluvial	0.6928		626	713	712
	1014	Washington territory.	Wilkeson	....do	....do	0.7001		634	723	818
64. Acer saccharinum. *Sugar Maple. Sugar Tree. Hard Maple. Rock Maple.*	299	Missouri	Allenton	G. W. Letterman	Rich upland	0.6381		1528	1457	1219
	376	Vermont	Charlotte	C. G. Pringle	Gravelly	0.6852		888	976	816
	409	New England	Charlestown Navy-yard.	S. H. Pook		0.6775		783	930	675
	1233	Vermont	Charlotte	F. H. Horsford		0.7447		1683	1953	1404
	1233	....do	....do	....do		0.6986		1878	1808	1289
	1234	... do	....do	....do		0.7068		1220	1395	1235
	1234	....do	....do	....do		0.7108		1395	1480	1284
	1235	....do	....do	....do		0.7137		1628	1575	1242
	1235	....do	....do	....do		0.7189		1436	1575	1104
64. Acer saccharinum, *var.* nigrum. *Black Sugar Maple.*	213	....do	....do	C. G. Pringle	Clay	0.7241		1039	1149	1055
	2741	Missouri	Allenton	G. W. Letterman	Low, alluvial	0.7355		1085	1221	1055
	440	Tennessee	Nashville	A. Gattinger	Rich	0.6973		888	1149	1024
	757	Florida	Chattahoochee	A. H. Curtiss	Clay	0.6970		857	930	933
	757	... do	....do	... do	... do	0.6824		610	688	743
65. Acer dasycarpum. *Soft Maple. White Maple. Silver Maple.*	1052	Massachusetts	Topsfield	J. Robinson	Low meadow	0.6041		970	1100	1019
66. Acer rubrum. *Red Maple. Swamp Maple. Soft Maple. Water Maple.*	20	....do	Arnold Arboretum	C. S. Sargent	Drift	0.7148		827	864	738
	530	Mississippi	Kemper's mill	C. Mohr	Rich, swampy	0.6136		871	1030	820

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
5.0	9.3	13.5	18.0	0.5	19.0	23.0	30.0	......	......	......	......	......	350	Specimen cross-grained	454
4.1	8.8	11.5	15.5	0.5	16.0	20.0	24.5	30.0	33.7	40.0	......	......	481	Long, shattered break	460
4.1	8.3	12.1	16.0	0.5	17.0	21.2	......	......	......	......	......	......	290	Specimen cross-grained	460
6.0	12.3	18.0	26.5	2.4	27.5	......	......	......	......	......	......	......	221	Long break, starting at small knot	803
6.8	14.2	22.1	33.0	2.5	34.0	......	......	......	......	......	......	......	263	Shattered	1094
6.3	10.7	16.5	22.0	1.0	23.0	28.0	36.6	......	......	......	......	......	320	Long, shattered break with large splinters	993
5.3	10.0	15.0	19.6	0.5	19.5	24.5	29.0	34.5	48.0	57.0	......	......	519	Specimen cross-grained; shattered	1139
6.5	13.8	22.4	......	......	......	......	......	......	......	......	......	......	109	Crushed at center bearing	297
7.1	15.0	24.0	41.5	......	......	......	......	......	......	......	......	......	200	......do	297
8.0	17.0	27.6	44.0	7.5	48.6	......	......	......	......	......	......	......	234	Crushod at center bearing; broke at knot on tension side	427
7.0	14.6	23.0	31.5	1.8	32.0	44.0	......	......	......	......	......	......	265	Long fracture; large splinters	684
7.2	14.0	21.7	30.3	2.3	31.8	44.2	......	......	......	......	......	......	277	Long fracture	684
5.5	11.0	16.6	23.5	1.5	24.5	32.0	42.0	59.0	......	......	......	......	383	Long, splintered fracture	307
5.7	10.3	15.5	22.4	1.5	23.4	30.7	42.0	58.0	90.0	......	......	......	405	Splintered fracture	307
5.8	12.0	19.0	29.0	3.0	29.7	37.0	53.0	......	......	......	......	......	350	......do	928
7.1	14.0	22.0	32.0	4.2	34.2	45.0	......	......	......	......	......	......	300	Long, splintered fracture	928
4.3	8.1	12.0	16.5	0.7	17.0	21.5	27.0	33.2	39.5	48.5	62.0	......	538	Shattered	463
5.2	0.6	14.5	19.0	1.0	19.0	24.0	30.5	36.5	44.5	56.0	......	......	477	......do	463
7.0	13.3	21.0	30.5	3.4	32.0	43.0	......	......	......	......	......	......	297	Short break, splitting in axis of stick	982
6.5	13.0	19.8	29.5	3.0	31.0	42.0	......	......	......	......	......	......	297	Slightly crushed at center bearing	982
7.0	11.6	17.8	25.0	2.0	26.0	35.0	......	......	......	......	......	......	205	Slightly crushed at center bearing; splintered	1023
6.7	12.3	19.4	29.0	2.5	30.0	41.0	......	......	......	......	......	......	280	Short break with long, large splinter	1023
7.8	13.7	21.5	30.5	2.0	31.4	40.3	......	......	......	......	......	......	304	Long, shattered break	1013
7.7	13.5	21.0	29.5	2.0	30.0	39.0	50.5	......	......	......	......	......	349	......do	1014
3.2	6.7	10.2	13.5	0.3	13.8	17.0	21.5	25.8	32.0	39.0	50.5	......	551	Long splinter on angle of two faces	299
5.5	10.0	15.0	20.0	0.7	20.3	26.0	35.0	......	......	......	......	......	348	Splintered	376
6.4	10.5	15.5	20.5	0.8	21.3	27.0	......	......	......	......	......	......	288	Specimen cross-grained; split with grain	409
2.9	5.0	7.7	10.2	0.0	10.2	12.6	15.2	18.2	21.7	25.4	31.4	38.3	599	Broke with fine splinters on back	1233
2.6	5.4	8.4	11.2	0.0	11.2	14.0	17.0	20.2	25.3	30.0	39.0	50.0	550	......do	1233
4.0	7.0	10.2	13.6	0.2	13.6	16.6	20.2	24.6	30.0	36.0	47.0	......	527	Square break on tension side, splitting in axis	1234
3.5	6.6	10.0	13.0	0.2	13.0	16.0	19.5	23.4	27.7	33.0	42.0	......	548	......do	1234
3.0	6.2	9.6	13.0	0.0	13.0	15.8	19.7	24.7	30.0	36.8	50.0	......	530	......do	1235
3.4	6.2	9.1	12.2	0.0	12.5	15.4	10.0	22.6	27.6	34.5	......	......	471	Specimen cross-grained; shattered on angle of two faces	1235
4.7	8.5	13.5	18.2	0.5	18.0	23.5	30.6	38.0	49.5	65.0	......	......	450	Broke with long splinters	213
4.5	8.0	12.0	15.5	0.5	16.3	20.0	26.0	32.0	43.5	......	......	......	450	Crushed slightly at center bearing; broke with fine splinters	274[1]
5.5	8.5	13.0	17.0	0.6	18.0	22.5	29.5	37.0	52.0	......	......	......	437	Broke with fine splinters	440
5.7	10.5	16.5	23.0	1.5	24.0	30.7	41.5	53.0	......	......	......	......	398	Splintered on angle, starting at small knot	757
8.0	14.2	21.0	30.0	2.0	30.7	40.4	54.0	......	......	......	......	......	317	Broke with long, fine splinters	757
5.0	8.8	14.0	10.0	1.3	10.2	25.0	32.0	41.0	55.0	......	......	......	435	Broke with long, fine splinters	1052
5.9	11.3	17.2	24.5	1.6	26.0	35.0	46.5	......	......	......	......	......	315	Specimen sap-wood, cross-grained; broko at knot	20
5.6	9.4	14.2	19.5	1.2	20.0	28.0	30.5	58.0	......	......	......	......	350	Crushed at center bearing; broko with fine splinters	530

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
66. Acer rubrum—continued	530	Mississippi	Kemper's mill	C. Mohr	Rich, swampy	0.5909		976	1028	809
	743	Georgia	Bainbridge	A. H. Curtiss	Low	0.5524		888	930	600
	743	do	do	do	do	0.5509		976	1085	797
	878	Massachusetts	Danvers	J. Robinson	do	0.6818		888	888	937
	878	do	do	do	do	0.7102		775	835	839
	1048	do	North Reading	do	do	0.6699		888	904	820
	1048	do	do	do	do	0.6710		842	913	937
67. Negundo aceroides *Box Elder. Ash-leaved Maple.*	290	Missouri	Allenton	G. W. Letterman	Rich bottom	0.4750		610	618	443
	290	do	do	do	do	0.4585		626	897	572
	311	Texas	Dallas	J. Reverchon	do	0.4773		452	478	509
	311	do	do	do	do	0.4614		514	536	591
68. Negundo Californicum *Box Elder.*	645	California	Contra Costa county	G. R. Vasey	Rich, moist	0.5227		930	086	785
	645	do	do	do	do	0.5227		921	904	809
ANACARDIACEÆ.										
71. Rhus copallina *Dwarf Sumach.*	736	Florida	Chattahoochee	A. H. Curtiss	Dry clay	0.4888		634	638	694
	736	do	do	do	do	0.5054		763	835	633
73. Rhus Metopium *Poison Wood. Coral Sumach. Mountain Manchineel. Bum Wood. Hog Plum. Doctor Gum.*	467	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	0.7967		921	1050	616
	467	do	do	do	do	0.8105		921	1050	694
LEGUMINOSÆ.										
77. Robinia Pseudacacia *Locust. Black Locust. Yellow Locust.*	405		Charlestown Navy-yard.	S. H. Pook				1395	1302	1481
	405		do	do		0.8205		857	1302	1362
	405		do	do		0.8148		1221	1268	1514
	815	West Virginia	Grafton	C. G. Pringle		0.6433		1039	1050	1041
	815	do	do	do		0.6433		814	970	851
	1247	New York	Long Island	M. C. Beedle		0.7956		1526	1627	1387
	1247	do	do	do		0.7769		1627	1627	1355
	1248	do	do	do		0.8069		976	1123	1069
	1248	do	do	do		0.8456		1320	1436	1397
79. Robinia Neo-Mexicana *Locust.*	1031	Colorado	Trinidad	W. B. Strong	Low, moist	0.8019		1061	1149	909
80. Olneya Tesota *Iron Wood. Arbol de Hierro.*	650	California	Lower Colorado valley.	G. Engelmann and C. S. Sargent.	Dry, gravelly	0.9841		970	1039	942
	650	do	do	do	do	1.1966		659	697	558
81. Piscidia Erythrina *Jamaica Dogwood.*	564	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	1.0398		740	814	820
	564	do	do	do	do	0.9466		812	888	675
82. Cladrastis tinctoria *Yellow Wood. Yellow Ash. Gopher Wood.*	33	Kentucky	Mercer county	W. M. Linney	Limestone	0.7852		888	976	989
	33	do	do	do	do	0.6444		957	1028	813
84. Sophora affinis	329	Texas	Dallas	J. Reverchon	Dry, calcareous	0.8697		842	857	820
	932	do	Austin	C. Mohr	do	0.9594		1150	1097	799
85. Gymnocladus Canadensis *Kentucky Coffee Tree. Coffee Nut.*	519	Tennessee	Nashville	A. Gattinger	Limestone	0.7143		872	849	703
	1241	Missouri	Allenton	G. W. Letterman	Alluvial	0.6966		1061	1110	813
	1242	do	do	do	do	0.6875		1221	1149	769
	1243	do	do	do	do	0.6670		976	1085	802
86. Gleditschia triacanthos *Honey Locust. Black Locust. Three-thorned Acacia. Sweet Locust. Honey Shucks.*	53^{1}	do	do	do	Low, rich	0.6250		976	1149	968
	53^{2}	do	do	do	do	0.6381		1164	1221	907
	444	Tennessee	Nashville	A. Gattinger	Dry, sandy barrens	0.6969		888	888	893

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
5.0	9.5	14.5	19.0	0.5	19.2	25.0	35.5	......	......	......	......	......	345	Broke with long splinters	530
5.5	10.5	16.5	23.5	2.0	24.5	32.0	......	......	......	......	......	......	256	Specimen 0.75 sap-wood; cross-grained	743
5.0	9.0	14.5	20.0	0.7	20.5	27.0	39.0	......	......	......	......	......	340	Sap-wood; crushed at center bearing; broke with fine splinters	743
5.5	11.0	17.0	24.0	1.2	25.0	33.0	42.0	61.0	......	......	......	......	400	...... do	878
6.3	11.7	18.3	28.0	3.0	28.4	37.5	52.5	90.0	......	......	......	......	358	Sap-wood; broke with long, large splinters	878
5.5	10.8	16.0	22.0	1.1	23.0	31.5	42.0	......	......	......	......	......	350	......do	1048
5.8	10.7	15.5	21.5	1.0	21.8	28.0	37.0	50.0	......	......	......	......	400	...... do	1048
8.0	15.8	26.3	......	......	......	......	......	......	......	......	......	......	189	Broke at knot near center bearing	290
7.8	14.0	22.0	33.5	3.8	35.0	......	......	......	......	......	......	......	244	Crushed at center bearing; square break	290
10.8	20.6	31.0	41.5	5.0	47.0	......	......	......	......	......	......	......	217	Square break at knot	311
9.5	18.2	30.0	42.0	3.5	44.0	71.0	......	......	......	......	......	......	252	Flaked on tension side; broke at small knot	311
5.2	9.9	14.2	21.2	1.0	21.2	28.0	37.5	......	......	......	......	......	335	Crushed at center bearing; broke into long splinters	645
5.3	10.8	15.8	21.0	0.5	22.0	28.0	36.5	......	......	......	......	......	345	Crushed at center bearing; broke into long, fine splinters	645
7.7	15.3	23.2	32.3	2.6	33.5	43.5	......	......	......	......	......	......	206	Shattered, splitting to the end	736
6.4	11.7	18.0	27.0	3.1	28.0	37.3	......	......	......	......	......	......	270	......do	736
5.3	9.3	14.5	21.3	1.6	23.0	30.5	......	......	......	......	......	......	263	Square break	467
5.3	9.3	14.5	21.3	1.5	23.0	30.5	......	......	......	......	......	......	296	......do	467
3.5	8.0	11.0	14.5	0.8	14.7	18.0	22.0	25.8	30.2	35.6	41.5	47.8	632	60.2 millimeters deflection with 600 kilograms; specimen cross-grained.	405
5.7	7.5	12.0	15.5	0.3	15.8	19.0	23.5	28.7	35.0	40.0	47.0	55.0	581	Broke with fine splinters	405
4.0	7.7	11.5	15.6	0.2	15.3	19.0	23.9	28.0	32.0	37.0	44.5	51.8	646	64.3 millimeters deflection with 600 kilograms; broke with fine splinters.	405
4.7	9.3	13.8	19.1	0.3	19.0	23.7	30.0	38.0	47.7	......	......	......	444	Broke with coarse splinters	815
6.0	10.0	14.5	19.0	0.5	19.5	24.0	30.0	42.0	......	......	......	......	363	......do	815
3.2	6.0	9.0	12.0	0.0	12.0	15.0	18.0	21.0	24.9	29.3	34.7	42.5	592	Splintered on corners	1247
3.0	6.0	9.0	11.6	0.2	11.8	14.5	17.8	21.2	25.4	31.2	38.0	46.5	578	Broke with fine splinters	1247
5.0	8.7	12.5	16.6	0.4	16.8	20.8	25.5	31.0	36.5	45.6	......	......	456	Broke with large splinters on corners	1248
3.7	6.8	10.0	13.2	0.5	13.5	16.4	20.1	24.3	28.0	33.5	39.0	46.4	596	......do	1248
4.6	8.5	12.4	16.2	0.4	10.7	20.6	25.0	31.0	......	......	......	......	388	Broke with long splinters	1031
5.0	0.4	14.2	19.5	0.5	20.0	26.5	33.7	42.0	54.3	......	......	......	402	Cross-grained; split with grain	650
7.4	14.0	21.0	29.9	1.4	31.0	......	......	......	......	......	......	......	238	Square break	650
6.6	12.0	19.5	26.0	1.8	27.1	33.5	43.0	51.0	......	......	......	......	354	Broke with long, large splinters	564
5.8	11.0	17.3	24.0	1.4	24.5	30.5	......	......	......	......	......	......	288	......do	564
5.5	10.0	15.8	21.6	1.1	22.5	20.0	37.0	47.0	68.0	......	......	......	422	Long, large splinters on angle of two faces	33
5.1	9.5	14.5	20.2	1.0	20.5	28.0	......	......	......	......	......	......	347	Started at small knot; long, oblique fracture	33
5.8	11.4	17.0	23.0	1.5	25.0	33.0	42.0	......	......	......	......	......	350	Broke at large knot with long splinters	329
4.4	8.0	13.0	18.2	1.2	18.7	24.0	31.0	......	......	......	......	......	341	Long, oblique break	932
5.6	11.5	18.5	29.9	3.0	29.0	37.3	52.0	......	......	......	......	......	300	Square break on tension side, splitting in axis of the stick	519
4.6	8.8	13.0	18.4	0.9	18.8	26.0	37.5	......	......	......	......	......	347	Splintered on angle of two faces	1241
4.0	8.5	14.0	10.2	1.5	20.0	23.7	46.5	......	......	......	......	......	328	Broke with fine splinter	1242
5.0	0.0	13.7	20.0	1.4	20.5	28.3	44.0	......	......	......	......	......	342	......do	1243
5.0	8.5	12.6	16.8	0.6	18.0	24.0	31.0	41.0	57.0	......	......	......	413	Crushed at center bearing; broke with fine splinter	531
4.2	8.0	12.9	17.6	1.0	18.7	25.0	33.0	47.0	......	......	......	......	387	Broke with fine splinter	532
5.5	11.0	16.4	22.5	1.0	23.5	31.7	39.5	55.5	......	......	......	....	381	Broke with long splinter	444

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
87. Gleditschia monosperma .... *Water Locust.*	760	Florida	Chattahoochee......	A. H. Curtiss	Alluvial	0.7628		1061	1149	1073
	760	....do	....do	....do	....do	0.7748		1221	1191	982
88. Parkinsonia Torreyana............. *Green-bark Acacia. Palo Verde.*	678	Arizona	Lower Colorado river.	G. Engelmann and C. S. Sargent.	Sandy	0.6705		514	514	511
	678	....do	....do	....do	....do	0.6727		568	602	570
91. Cercis Canadensis .... *Redbud. Judas Tree.*	436	Tennessee	Nashville..........	A. Gattinger......	Limestone	0.7323		814	904	1003
	1089	Missouri..........	Allenton...........	G. W. Letterman..	Rich..............	0.6341		588	610	734
	1090	....do	....do	... do	....do	0.6584		452	514	649
	1091	....do	... do	....do	....do	0.6250		651	723	516
93. Prosopis juliflora.................. *Mesquit. Algaroba. Honey Locust. Honey Pod.*	680	Arizona	Tucson	C. S. Sargent......	....	0.7818		542	618	469
	680	....do	....do	....do	....	0.7614		596	630	574
	927	Texas	Austin	C. Mohr	Rich, calcareous ..	0.7750		509	501	412
94. Prosopis pubescens .... *Screw Bean. Screw-pod Mesquit. Tornilla.*	658	California........	Fort Yuma	G. Engelmann and C. S. Sargent.	Sandy	0.8068		814	835	902
	658	....do	....do	....do	....	0.8568		787	814	886
98. Acacia Greggii .... *Cat's Claw.*	697	Arizona	Santa Rita mountains.	....do	Dry, gravelly.....	0.8714		1039	1085	792
100. Lysiloma latisiliqua .... *Wild Tamarind.*	509	Florida	Boca Chica Key ...	A. H. Curtiss	Coral	0.5670		488	401	553
ROSACEÆ.										
102. Chrysobalanus Icaco .... *Cocoa Plum.*	480	....do	Bay Biscayne......	....do	Swampy	0.7753		957	1110	961
103. Prunus Americana .... *Wild Plum. Canada Plum. Horse Plum.*	68	Missouri..........	Allenton...........	G. W. Letterman..	Rich upland	0.6003		814	769	649
	68	.. do	....do	....do	....do	0.5916		651	734	703
	334	Texas	Dallas	J. Revorchon	Rich..............	0.8045		921	976	1240
104. Prunus angustifolia .... *Chickasaw Plum. Hog Plum.*	435	Tennessee	Nashville..........	A. Gattinger......	River bluff	0.6538		634	603	469
107. Prunus emarginata, *var.* mollis	968	Washington territory.	Wilkeson..........	G. Engelmann and C. S. Sargent.	Low, rich	0.4699		751	849	687
	968	....do	....do	....do	....do	0.4750		751	872	670
108. Prunus serotina .... *Wild Black Cherry. Rum Cherry.*	15	Massachusetts	Roxbury...........	C. S. Sargent......	Gravelly	0.7438		775	849	1171
	15	... do	....do	... do	....do	0.7386		1017	888	1084
	115[1]	Michigan..........	Lansing	W. J. Beal	....do	0.5315		651	673	579
	115[2]	....do	Dansville	....do	....do	0.5048		814	849	724
	127	Missouri..........	Allenton...........	G. W. Letterman .	Rich loam	0.6790		976	976	965
	127	....do	....do	....do	....do	0.6670		1221	1028	996
	148	Illinois	Waukegan	R. Douglas	Gravelly..........	0.6471		976	930	937
	317	Michigan..........	Hersey	W. J. Beal	Rich..............	0.5315		775	800	689
	317	....do	....do	....do	....do	0.5403		842	828	691
	368	Vermont..........	Charlotte..........	C. G. Pringle......	Gravelly..........	0.5648		764	857	769
	406	Virginia or Middle States.	Charlestown Navy-yard.	S. H. Pook	....	0.5028		651	718	042
	763	Florida	Chattahoochee......	A. H. Curtiss	Clay	0.6105		976	958	797
	763	....do	....do	....do	....do	0.6244		888	976	792
	1053	Massachusetts....	Topsfield	J. Robinson.......	Gravelly..........	0.6751		740	760	820
	1053	....do	....do	....do	....do	0.6716		608	775	820
110. Prunus demissa .... *Wild Cherry.*	637	California........	Strawberry valley ..	G. Engelmann and C. S. Sargent.	Low, rich	0.7636		814	769	691
111. Prunus Caroliniana................ *Wild Orange. Mock Orange. Wild Peach.*	1032	Florida	Jacksonville.......	A. H. Curtiss	Sandy	0.8785		697	718	586
	1062	Texas	Victoria	C. Mohr	Rich, moist	0.8698		1191	1097	1266
	1062	....do	....do	....do	....do	0.8481		976	996	930

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (sot.)	200	250	300	350	400	450	500	550			
4.6	8.5	13.3	43.[illegible]	0.6	18.0	23.5	29.0	......	42.0	......	......	......	458	0.66 sap-wood; broke with long, fine splinters	760
4.0	8.2	12.8	18.5	1.0	19.5	25.5	33.0	40.5	52.5	......	......	......	419	Specimen cross-grained; split with grain	760
9.5	10.0	28.4	43.2	6.4	46.0	......	......	......	......	......	......	......	218	Specimen cross-grained; broke at knot	678
8.6	16.2	25.4	35.2	3.0	37.7	......	......	......	......	......	......	......	247	Long, oblique fracture	678
6.0	10.8	15.8	22.9	1.6	22.7	29.7	38.0	50.0	68.0	......	......	......	428	Broke with long, large splinters	436
8.3	16.0	24.5	35.0	2.5	37.0	48.0	74.5	......	......	......	......	......	313	......do	1089
10.8	19.0	29.7	43.0	6.0	45.5	61.0	......	......	......	......	......	......	277	......do	1090
7.5	13.5	20.0	28.4	1.5	30.0	......	......	......	......	......	......	......	220	Broke at knot near support	1091
9.0	15.8	23.0	......	......	......	......	......	......	......	......	......	......	200	Specimen cross-grained; short, oblique fracture	680
8.2	15.5	22.5	30.7	1.6	31.7	......	......	......	......	......	......	......	245	......do	680
9.6	19.5	31.5	......	......	......	......	......	......	......	......	......	......	176	Specimen cross-grained; shattered	927
6.0	11.7	17.7	24.3	1.3	25.0	32.0	41.0	......	......	......	......	......	385	Specimen cross-grained; short, oblique fracture	658
6.2	12.0	17.3	24.5	2.2	25.5	33.5	42.0	53.0	......	......	......	......	378	......do	658
4.7	9.0	14.0	18.1	0.6	18.6	24.0	29.0	......	......	......	......	......	338	Broke at knot near the end	697
10.0	21.2	32.7	51.3	8.0	55.3	......	......	......	......	......	......	......	236	Specimen cross-grained	509
5.1	8.8	13.0	17.8	0.9	18.0	23.0	31.5	40.0	66.6	......	......	......	410	Broke with long splinters, starting at knot	480
6.0	12.7	19.3	27.4	1.7	28.0	37.0	......	......	......	......	......	......	277	Broke with long splinters	68
7.5	13.3	21.0	28.9	1.6	29.0	36.5	......	......	......	......	......	......	300	Broke with long, large splinters	68
5.3	10.0	14.9	20.7	0.5	20.6	27.0	34.0	41.0	50.0	61.5	84.0	......	529	Broke with fine splinters	334
7.7	16.2	20.0	38.5	4.5	......	......	......	......	......	......	......	......	200	Specimen cross-grained, defective; square break on tension side	435
6.5	11.5	17.7	25.2	1.5	26.0	36.0	......	......	......	......	......	......	293	Broke with long, coarse splinters	968
6.5	11.2	17.0	24.7	1.7	20.0	36.5	......	......	......	......	......	......	286	Shattered	968
6.3	11.5	17.8	23.6	1.0	24.2	30.0	38.5	46.5	57.5	73.0	......	......	500	......do	15
4.8	11.0	15.9	22.0	0.6	22.0	28.0	35.7	44.0	55.0	......	......	......	467	Broke with fine splinters	15
7.5	14.5	21.7	32.0	1.0	32.5	......	......	......	......	......	......	......	247	Long, oblique fracture	115
6.0	11.5	17.6	24.6	1.0	25.0	32.5	45.0	......	......	......	......	......	309	......do	115
5.0	10.0	15.2	21.5	1.3	22.0	28.5	36.5	47.0	......	......	......	......	386	Broke with long splinters	127
4.0	9.5	15.0	21.0	1.2	22.0	28.0	36.0	45.0	57.5	......	......	......	425	Shattered; long splinters	127
5.0	10.5	16.0	21.5	1.0	22.5	28.0	36.5	45.5	......	......	......	......	400	Broke with fine splinters	148
6.3	12.2	19.0	26.8	1.1	27.5	36.0	......	......	......	......	......	......	204	Shattered; long splinters on corner	317
5.8	11.8	16.7	23.0	0.6	24.0	30.0	......	......	......	......	......	......	295	Broke with long splinters on corner	317
6.4	11.4	16.7	22.6	1.0	23.0	30.0	40.5	......	......	......	......	......	328	Broke with coarse splinters	368
7.5	13.6	21.5	30.7	1.7	31.6	43.5	......	......	......	......	......	......	274	Specimen cross-grained; single fracture	406
5.0	10.2	15.2	21.0	0.6	21.8	26.5	34.0	......	......	......	......	......	340	Broke with fine splinters	763
5.5	10.0	15.5	20.8	1.0	21.5	27.0	35.0	......	......	......	......	......	338	Broke with long, large splinters	763
6.6	12.7	19.5	27.0	1.5	28.0	36.0	46.0	62.5	......	......	......	......	350	Specimen cross-grained; long fracture	1053
7.0	12.6	19.5	26.5	1.5	27.0	34.0	46.0	59.5	......	......	......	......	350	......do	1053
6.0	12.7	19.5	28.4	1.6	28.3	36.5	......	......	......	......	......	......	295	Specimen cross-grained; split with the grain	637
7.0	13.6	22.0	32.3	4.0	34.0	73.0	......	......	......	......	......	......	250	Specimen cross-grained	1032
4.1	8.9	13.5	18.4	0.2	19.0	23.5	29.2	35.7	41.7	53.0	74.0	......	540	......do	1062
5.0	9.8	14.0	18.5	0.6	19.0	24.5	32.0	37.5	......	......	......	......	307	Specimen cross-grained; shattered	1062

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
113. Prunus ilicifolia	1158	California	Santa Cruz	C. L. Anderson		0.9734		751	751	820
Islay.	1158	...do	...do	...do		0.9678		697	712	745
117. Pyrus coronaria	1087	Pennsylvania	Nazareth	J. Henry	Moist	0.7357		751	751	441
American Crab. Sweet-scented Crab.	1087	...do	...do	...do	...do	0.7228		729	723	422
	1088	...do	...do	...do	...do	0.7340		508	405	452
	1088	...do	...do	...do	...do	0.7382		651	630	623
121. Pyrus sambucifolia *Mountain Ash.*	410	Vermont	Mount Mansfield	C. G. Pringle	Gravelly	0.5727		575	626	445
125. Cratægus arborescens	607	Georgia	Ogeechee	A. H. Curtiss	Low	0.6818		814	814	799
	607	...do	...do	...do	...do	0.7126		788	763	443
126. Cratægus Crus-galli	328	Massachusetts	Brookline	J. Robinson	Loam	0.6946		543	575	619
Cockspur Thorn. Newcastle Thorn.	328	...do	...do	...do	...do	0.7166		508	514	586
	1093	Missouri	Allenton	G. W. Letterman	Low, wet	0.7767		751	775	703
	1093	...do	...do	...do	...do	0.7946		751	794	708
128. Cratægus subvillosa	949	Texas	Victoria	C. Mohr	Alluvial	0.7565		921	913	860
Scarlet Haw.	1081	Missouri	Saint Louis	H. Eggert		0.8670		842	888	616
120. Cratægus tomentosa	426	Tennessee	Nashville	A. Gattinger	Limestone	0.7166		740	740	098
Black Thorn. Pear Haw.	426	...do	...do	...do	...do	0.7527		651	723	720
132. Cratægus spathulata *Small-fruited Haw.*	926	Louisiana	Webster parish	C. Mohr	Clay	0.7102		718	674	506
134. Cratægus æstivalis *May Haw. Apple Haw.*	239	South Carolina	Bonneau's Depot	H. W. Ravenel	Damp, rich	0.7239		595	592	712
135. Cratægus flava, *var.* pubescens *Summer Haw. Red Haw.*	767	Florida	Aspalaga	A. H. Curtiss	Dry clay	0.7973		740	708	724
137. Amelanchier Canadensis	241	Kentucky	Bromfield Station	W. M. Linney	Waverly shale	0.8312		1191	1221	1256
Juneberry. Shad Bush. Service Tree. May Cherry.	849	Massachusetts	Danvers	J. Robinson	Loam	0.8472		1085	1149	1085
	849	...do	...do	...do	...do	0.8410		1163	1221	1054
HAMAMELACEÆ.										
139. Liquidambar Styraciflua	546	Alabama	Kemper's mill	C. Mohr	Rich, alluvial	0.5448		603	610	520
Sweet Gum. Star-leaved Gum. Liquidamber. Red Gum. Bilsted.	546	...do	...do	...do	...do	0.5796		688	674	663
	1095	Arkansas	Little Rock	G. W. Letterman		0.6012		888	930	776
	1095	...do	...do	...do		0.5765		976	996	703
	1173	New Jersey	Mount Holly	S. P. Sharples	Clay	0.6080		751	769	750
	1173	...do	...do	...do	...do	0.6477		697	496	738
	1181	Mississippi	Yazoo River bottom	R. Abbey	Alluvial	0.5864		751	781	553
	1181	...do	...do	...do	...do	0.6001		787	849	544
	1182	...do	...do	...do	...do	0.6250		076	1017	670
	1182	...do	...do	...do	...do	0.6375		1163	1061	614
	1183	...do	...do	...do	...do	0.5409		814	888	061
	1183	...do	...do	...do	...do	0.6159		1017	976	616
RHIZOPHORACEÆ.										
140. Rhizophora Mangle	485	Florida	Bay Biscayne	A. H. Curtiss	Salt-marsh	1.1480		1627	1627	1308
Mangrove.	485	...do	...do	...do	...do	1.1335		1627	1684	1106
COMBRETACEÆ.										
141. Conocarpus erecta	489	...do	...do	...do	...do	1.0240		814	913	830
Button Wood.	489	...do	...do	...do	...do	1.0292		1062	1130	1055
142. Laguncularia racemosa	507	...do	Sugar-Loaf Sound	...do	...do	0.7384		698	634	272
White Button Wood. White Mangrove.	507	...do	...do	...do	...do	0.7230		775	814	761

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
6.5	13.0	20.0	29.0	3.0	30.0	38.0	56.0	00.0	.....	.....	.....	.....	350	Broke with large splinters	1158
7.0	13.7	22.3	32.5	4.5	35.0	48.0	67.0	.....	.....	.....	.....	.....	318	Broke with long splinters	1158
6.5	13.0	21.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	188	Broke at knot	1087
6.7	13.5	21.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	180	Specimen cross-grained	1087
9.6	21.0	33.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	193	Specimen cross-grained; defective	1088
7.5	15.5	24.6	36.5	4.8	37.0	51.5	.....	.....	.....	.....	.....	.....	266	Specimen cross-grained	1088
8.5	15.6	25.5	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	190	Broke at knots	410
6.0	12.0	18.3	26.5	1.5	27.1	35.0	47.0	.....	.....	.....	.....	.....	341	Specimen cross-grained; broke with one long splinter	607
6.2	12.8	20.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	189	Broke at knot	607
9.0	17.0	28.0	39.0	4.9	41.0	58.0	.....	.....	.....	.....	.....	.....	264	Broke with long splinters	328
9.6	19.0	28.5	42.3	5.0	44.0	.....	.....	.....	.....	.....	.....	.....	250	Specimen cross-grained; split with grain	328
6.5	12.6	20.0	29.0	2.1	29.0	38.0	.....	.....	.....	.....	.....	.....	300	Square break	1093
6.5	12.3	18.1	26.0	2.0	26.5	34.2	46.5	.....	.....	.....	.....	.....	302	Broke at knots	1093
5.3	10.7	16.0	22.0	1.0	23.0	29.0	37.0	49.5	.....	.....	.....	.....	367	Specimen cross-grained; split with grain	949
5.8	11.0	16.6	25.5	2.1	26.0	34.0	.....	.....	.....	.....	.....	.....	263	Broke at knot	1081
6.6	13.2	20.2	29.0	2.2	30.5	39.2	.....	.....	.....	.....	.....	.....	298	Broke with a long splinter, starting at knot	426
7.5	13.5	21.0	30.3	3.0	32.0	41.0	59.0	.....	.....	.....	.....	.....	307	Broke at knot	426
6.8	14.5	22.5	33.0	2.5	34.0	.....	.....	.....	.....	.....	.....	.....	210	......do	928
8.2	16.5	28.0	39.0	5.0	41.7	57.0	83.0	.....	.....	.....	.....	.....	304	......do	239
6.6	13.8	23.5	34.0	4.3	35.0	44.5	70.0	.....	.....	.....	.....	.....	309	Broke at knot with a large splinter	767
4.1	8.0	11.5	14.6	0.0	14.0	18.5	22.3	28.0	32.5	40.5	51.5	.....	536	Broke with fine splinters	241
4.5	8.5	12.6	17.0	0.8	17.4	22.0	29.0	36.0	47.5	.....	.....	.....	463	......do	840
4.2	8.0	12.4	17.0	0.7	17.7	23.0	30.0	37.0	57.0	.....	.....	.....	450	......do	849
8.1	16.0	24.5	30.2	3.4	37.0	.....	.....	.....	.....	.....	.....	.....	222	Sap-wood; split lengthwise without breaking	546
7.1	14.5	23.5	34.5	4.5	36.2	62.5	.....	.....	.....	.....	.....	.....	283	Sap-wood; crushed and splintered	546
5.5	10.5	16.0	22.5	1.0	23.2	30.2	45.0	.....	.....	.....	.....	.....	331	Long, shattered break	1095
5.0	9.8	14.5	20.6	0.9	21.0	28.5	.....	.....	.....	.....	.....	.....	300	......do	1095
6.5	12.7	20.5	31.0	3.5	32.0	45.0	79.0	.....	.....	.....	.....	.....	320	Sap-wood; broke with fine splinters	1173
7.0	12.0	19.7	29.0	2.7	30.4	42.0	67.0	.....	.....	.....	.....	.....	315	......do	1173
6.5	12.5	19.0	32.2	3.6	35.0	.....	.....	.....	.....	.....	.....	.....	236	Broke with long splinters	1181
6.2	11.5	17.6	28.7	4.0	31.0	.....	.....	.....	.....	.....	.....	.....	232	......do	1181
5.0	9.0	14.6	20.4	1.0	21.2	29.2	.....	.....	.....	.....	.....	.....	286	Crushed at center bearing; broke with one long splinter	1182
4.2	9.2	14.7	22.0	1.2	23.0	36.0	.....	.....	.....	.....	.....	.....	262	Broke with long, coarse splinters	1182
6.0	11.0	17.6	25.0	1.4	25.6	35.0	.....	.....	.....	.....	.....	.....	282	Crushed at center bearing; shattered	1183
4.8	10.0	15.5	23.7	2.4	26.0	40.0	.....	.....	.....	.....	.....	.....	263	......do	1183
3.0	6.0	8.4	11.0	0.2	11.0	13.5	17.0	20.0	24.0	28.0	32.2	38.3	558	Broke with coarse splinters	485
3.0	5.8	8.5	11.5	0.2	11.5	14.5	18.0	21.6	25.7	29.0	.....	.....	472	......do	485
6.0	10.7	16.0	21.6	0.9	22.5	28.3	35.5	47.5	.....	.....	.....	.....	354	Specimen cross-grained; split with grain	489
4.6	8.6	12.7	17.5	0.6	17.5	22.0	28.5	35.0	45.0	.....	.....	.....	450	Splintered	480
7.0	15.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	110	Broke at knot	507
6.3	12.0	19.5	25.7	1.2	26.5	36.0	51.0	.....	.....	.....	.....	.....	320	Shattered	507

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
MYRTACEÆ.										
141. Eugenia buxifolia. *Gurgeon Stopper. Spanish Stopper.*	1118	Florida	Lost Man's river	A. H. Curtiss	Humus and coral	1.0635		1627	1575	1055
146. Eugenia monticola. *Stopper. White Stopper.*	1135	...do	Umbrella Key	...do	Coral	0.9405		1017	1085	1172
148. Eugenia procera. *Red Stopper.*	1127	...do	Miami	...do	...do	0.9966		1101	1206	1179
	1127	...do	...do	...do	...do	1.0023		1163	1177	1172
CORNACEÆ.										
151. Cornus florida. *Flowering Dogwood. Box Wood.*	67	Missouri	Allenton	G. W. Letterman	Upland	0.8937		787	814	872
	67	...do	...do	...do	...do	0.8904		787	840	1012
	761	Florida	Chattahoochee	A. H. Curtiss	Calcareous	0.7795		787	794	820
	812	West Virginia	Grafton	C. G. Pringle	Dry	0.7980		787	849	951
	812	...do	...do	...do	...do	0.7947		763	814	886
	1077	Missouri	Allenton	G. W. Letterman	Gravelly	0.8647		827	849	1015
	1077	...do	...do	...do	...do	0.8490		888	957	966
	1092	...do	...do	...do	Flinty	0.8387		610	647	710
152. Cornus Nuttallii. *Flowering Dogwood.*	960	Oregon	Portland	G. Engelmann and C. S. Sargent.		0.7763		814	976	930
	960	...do	...do	...do		0.7807		976	1085	1052
153. Nyssa capitata. *Ogeechee Lime. Sour Tupelo. Gopher Plum.*	605	Georgia	Ogeechee river	A. H. Curtiss	Swampy	0.5739		610	638	694
	605	...do	...do	...do	...do	0.6170		697	723	668
154. Nyssa sylvatica. *Tupelo. Sour Gum. Pepperidge. Black Gum.*	235	South Carolina	Bonneau's Depot	H. W. Ravenel	Muck	0.5966		687	781	783
	235	...do	...do	...do	...do	0.5735		888	849	745
	517	Tennessee	Cumberland river	A. Gattinger		0.5979		814	814	689
	750	Florida	Chattahoochee	A. H. Curtiss	Clay	0.7885		800	849	996
	750	...do	...do	...do	...do	0.7936		763	781	952
	813	West Virginia	Grafton	C. G. Pringle		0.6222		939	888	763
	813	...do	...do	...do		0.6447		888	1039	899
	833	Massachusetts	West Newbury	J. Robinson	Rich	0.7364		740	769	912
	833	...do	...do	...do	...do	0.7534		651	814	736
	834	...do	...do	...do	...do	0.7233		660	713	827
	834	...do	...do	...do	...do	0.6800		814	872	924
	835	...do	Chebacco pond	...do		0.7914		642	651	717
155. Nyssa uniflora. *Large Tupelo. Cotton Gum. Tupelo Gum.*	128	South Carolina	Bonneau's Depot	H. W. Ravenel	Swampy	0.6648		542	592	701
	128	...do	...do	...do	...do	0.6135		561	564	724
	550	Alabama	Stockton	C. Mohr	Alluvial	0.5455		444	471	628
	550	...do	...do	...do	...do	0.5228		595	585	687
	604	Georgia	Ogeechee river	A. H. Curtiss	Swampy	0.5730		456	444	635
	604	...do	...do	...do	...do	0.5841		488	444	553
CAPRIFOLIACEÆ.										
156. Sambucus glauca. *Elder.*	681	California	Contra Costa county.	G. R. Vasey	Gravelly	0.5216		348	305	370
159. Viburnum prunifolium. *Black Haw. Stag Bush.*	110[2]	Kentucky	Mercer county	W. M. Linney	Hudson River shale.	0.8352		976	957	729
	110[4]	...do	...do	...do	Trenton limestone	0.9034		904	1028	1228
	730	Georgia	Bainbridge	A. H. Curtiss	Clay	0.8270		708	734	898
RUBIACEÆ.										
160. Exostemma Caribæum.	466	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	0.9554		1136	1085	956
	466	...do	...do	...do	...do	0.9524		1221	1302	1055
161. Pinckneya pubens. *Georgia Bark.*	381	South Carolina	Bluffton	J. H. Mellichamp	Sandy swamp	0.5425		660	683	405

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
3.0	6.2	9.5	12.5	0.3	13.0	16.5	21.0	26.0	32.0	43.5	......	......	450	Shattered	1118
4.8	9.0	13.5	18.5	0.7	18.5	23.5	30.3	37.0	46.5	61.5	......	......	500	Splintered	1135
4.1	8.1	12.5	17.0	0.9	17.9	23.0	28.5	36.0	46.5	62.0	......	......	503	Specimen cross-grained; splintered	1127
4.2	8.3	12.5	16.8	0.6	17.5	22.4	29.0	35.0	46.0	61.5	......	......	500	Broke with coarse splinters	1127
6.2	12.0	18.2	26.9	2.2	27.6	36.0	50.0	70.0	......	......	......	......	372	Broke at knot	67
6.2	11.5	17.0	24.5	2.0	25.5	32.7	43.1	58.2	84.5	......	......	......	432	Maximum deflection, 120 millimeters; broke with large splinters	67
6.2	12.3	20.0	29.0	3.5	31.2	40.5	56.0	......	......	......	......	......	350	Broke with large splinters	761
6.2	11.5	18.2	26.7	2.2	28.5	36.5	52.0	68.0	110.0	......	......	......	406	Square break on tension side with large flakes	812
6.4	12.0	18.7	27.0	2.5	28.6	39.0	55.0	87.0	......	......	......	......	378	Square break on tension side with long splinters	812
5.9	11.5	16.7	23.6	1.5	24.5	32.0	43.0	60.5	81.5	......	......	......	433	Broke with long, coarse splinters	1077
5.5	10.2	16.3	24.0	1.6	24.6	32.0	42.5	57.0	......	......	......	......	412	Shattered one end	1077
8.0	15.2	24.5	35.3	3.6	37.0	48.5	76.0	......	......	......	......	......	303	Specimen cross-grained; broke with large splinters	1092
6.0	10.0	14.5	20.3	0.9	20.3	25.5	32.0	42.5	......	......	......	......	397	Broke with long splinters	960
5.0	9.0	13.2	17.5	0.4	18.0	23.0	29.0	34.0	43.0	......	......	......	449	......do	960
8.0	15.3	25.0	37.3	3.3	38.0	52.0	......	......	......	......	......	......	296	Broke short and split in axis	605
7.0	13.5	20.3	29.5	2.2	30.5	41.0	......	......	......	......	......	......	285	Shattered	605
7.1	12.5	19.6	27.5	1.6	28.2	37.5	51.0	......	......	......	......	......	334	......do	235
5.5	11.5	18.0	25.5	1.5	26.3	34.7	54.5	......	......	......	......	......	318	......do	235
6.0	12.0	19.5	28.7	2.4	29.5	38.0	......	......	......	......	......	......	294	Long split at one end	517
6.1	11.5	17.7	25.7	2.0	26.0	34.0	46.0	63.0	93.0	......	......	......	425	Broke into fine splinters	750
6.4	12.5	19.0	26.5	2.0	27.5	37.0	48.5	74.0	120.0	......	......	......	406	Deflected 150 millimeters and slipped from the bearing	750
5.2	11.0	16.2	22.5	0.4	23.0	29.0	38.0	......	......	......	......	......	334	Shattered	813
5.5	9.4	13.5	18.0	0.4	18.2	22.0	27.5	35.0	......	......	......	......	388	......do	813
6.6	12.7	19.7	28.7	2.3	29.7	38.0	53.0	84.0	......	......	......	......	380	Sap-wood; broke with fine splinters	833
7.5	12.0	10.0	29.0	3.0	30.0	42.0	57.5	95.0	......	......	......	......	377	......do	833
7.4	13.7	21.6	32.0	3.5	33.5	45.0	66.0	116.0	......	......	......	......	353	......do	834
6.0	11.2	17.0	25.0	2.2	25.2	32.5	44.0	64.0	......	......	......	......	394	Failed from small splinter on corner	834
7.6	15.0	26.0	38.5	5.5	40.6	58.0	100.0	......	......	......	......	......	306	Crumpled on compression side at knot; square break with fine splinters.	835
9.0	16.5	29.0	44.5	7.2	46.0	60.0	......	......	......	......	......	......	299	Broke with long splinters	128
8.7	17.3	28.7	43.0	7.5	45.5	66.2	108.0	......	......	......	......	......	309	Shattered at the end	128
11.0	20.7	33.0	48.5	8.5	53.0	82.0	......	......	......	......	......	......	268	Crushed at center bearing; broke with long splinters	550
8.2	16.7	26.7	39.0	5.0	40.8	59.5	......	......	......	......	......	......	293	......do	550
10.7	22.0	36.5	57.5	11.6	62.5	108.0	......	......	......	......	......	......	271	Failed from large splinter on corner	604
10.0	22.0	36.5	58.0	12.2	60.5	......	......	......	......	......	......	......	236	......do	604
14.0	32.0	55.0	......	......	......	......	......	......	......	......	......	......	158	Broke at knot	681
5.0	10.2	14.7	20.6	3.5	21.0	27.0	34.0	......	......	......	......	......	311	......do	110[2]
5.4	9.5	14.6	19.7	0.9	21.0	26.0	33.5	41.0	51.0	68.5	02.0	......	524	Broke at knot with one large splinter	110[4]
6.9	13.3	20.7	29.0	3.0	31.0	40.0	53.0	71.0	......	......	......	......	383	Shattered	739
4.3	9.0	11.5	15.5	0.4	15.7	20.0	23.7	28.0	33.5	......	......	......	408	Specimen cross-grained; split with grain	466
4.0	7.5	11.4	15.2	0.5	15.4	19.0	23.0	28.5	33.0	38.0	......	......	450	Broke with fine splinters	466
7.4	14.3	22.2	......	......	......	......	......	......	......	......	......	......	173	Broke at knot with large splinters	381

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
ERICACEÆ.										
165. Andromeda ferruginea	1033	Florida	Jacksonville	A. H. Curtiss	Hummock	0.7273		814	814	680
166. Arbutus Menziesii *Madroña.*	643	California	Contra Costa county	G. R. Vasey	Gravelly	0.7200		740	794	893
	643	do	do	do	do	0.7000		610	626	827
	670	do	Marin county	do	do	0.7454		970	1002	1015
	679	do	do	do	do	0.7546		842	872	898
167. Arbutus Xalapensis	683	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.		0.7670		651	683	689
	683	do	do	do		0.7501		531	549	546
169. Oxydendrum arboreum *Sorrel Tree. Sour Wood.*	353	Alabama	Cottage Hill	C. Mohr	Light, rich	0.7386		787	800	469
	353	do	do	do	do	0.7501		939	976	979
170. Kalmia latifolia *Laurel. Calico Bush. Spoon Wood. Ivy.*	262[2]	Virginia	Fancy Gap	H. Shriver	Moist	0.7642		651	670	696
	262[3]	do	do	do	do	0.6901		465	500	584
171. Rhododendron maximum *Great Laurel. Rose Bay.*	263[1]	do	do	do	do	0.6216		651	673	691
	263[2]	do	do	do	do	0.6403		610	618	633
SAPOTACEÆ.										
175. Chrysophyllum oliviforme	492	Florida	Bay Biscayne	A. H. Curtiss	Coral	0.9663		1136	1252	947
	492	do	do	do	do	0.9583		921	996	1237
176. Sideroxylon Mastichodendron *Mastic.*	461	do	Upper Metacombe Key.	do	do	0.9872		976	1149	919
	461	do	do	do	do	0.9827		976	1050	1022
177. Dipholis salicifolia *Bustic. Cassada.*	488	do	Bay Biscayne	do	do	0.9602		1356	1430	1263
	488	do	do	do	do	0.9173		1395	1395	1171
	500	do	Umbrella Key	do	do	0.8823		1191	1177	1008
178. Bumelia tenax	746	Georgia	Bainbridge	do	Low	0.7914		751	761	673
179. Bumelia lanuginosa *Gum Elastic. Shittim Wood.*	930	Texas	Austin	C. Mohr	Limestone	0.5847		488	496	567
	930	do	do	do	do	0.5903		478	432	265
	1083	Missouri	Allenton	G. W. Letterman	do	0.7148		488	522	330
181. Bumelia lycioides *Iron Wood. Southern Buckthorn.*	333	Tennessee	Nashville	A. Gattinger	Alluvial	0.8061		607	781	662
182. Bumelia cuneata *Ants' Wood. Downward Plum. Saffron Plum.*	1124	Florida	Boca Chica Key	A. H. Curtiss	Coral	0.8630		660	603	616
183. Mimusops Sieberi *Wild Dilly.*	458	do	Upper Metacomba Key.	do	do	1.0780		996	1028	952
	458	do	do	do	do	1.0191		939	976	874
EBENACEÆ.										
184. Diospyros Virginiana *Persimmon.*	61	Missouri	Allenton	G. W. Letterman	Rich upland	0.7633		814	794	483
	81	do	do	do	do	0.7362		751	751	818
	425	Tennessee	Nashville	A. Gattinger	Rich loam	0.8716		1395	1337	1289
	811	West Virginia	Grafton	C. G. Pringle		0.8176		610	622	895
	811	do	do	do		0.8110		610	603	883
	1084	Missouri	Allenton	G. W. Letterman	Rich upland	0.8125		751	814	932
	1084	do	do	do	do	0.8410		574	603	846
	1102	do	do	do	Rich	0.8240		607	784	883
STYRACACEÆ.										
186. Symplocos tinctoria *Horse Sugar. Sweet Leaf.*	347	Alabama	Cottage Hill	C. Mohr	Sandy	0.5580		610	622	619
187. Halesia diptera *Snow-drop Tree. Silver-bell Tree.*	738	Georgia	Bainbridge	A. H. Curtiss	Low	0.6704		642	673	881
	738	do	do	do	do	0.6577		660	697	832

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
6.0	12.0	18.5	26.0	2.0	27.5	35.0	......	......	......	......	......	......	290	Broke at knot	1033
6.6	12.3	19.5	27.0	1.8	28.0	35.0	47.5	62.5	......	......	......	......	381	Specimen cross-grained	643
8.0	15.6	24.0	33.2	2.8	35.0	44.5	59.0	......	......	......	......	......	353	......do	643
5.0	9.2	14.0	19.0	0.6	20.0	25.5	32.5	41.5	53.0	......	......	......	433	Square break	679
5.8	11.2	16.3	22.5	1.0	23.5	30.0	38.2	51.0	......	......	......	......	383	Threw off large flakes on tension side	679
7.5	14.3	22.0	31.5	2.5	32.8	43.0	......	......	......	......	......	......	294	Large flake on tension side	683
9.1	17.8	29.0	43.5	5.5	46.0	......	......	......	......	......	......	......	233	Broke at knot; flake on compression side	683
6.2	12.2	19.0	31.5	......	......	......	......	......	......	......	......	......	200	Specimen cross-grained; splinter started at large knot	353
5.2	10.0	15.0	21.0	1.2	21.5	28.0	36.0	47.0	65.0	......	......	......	422	Crushed at center bearing; broke with fine splinters	353
7.5	14.6	22.4	31.2	2.6	33.6	44.5	......	......	......	......	......	......	297	Broke at knot	262[2]
10.5	19.5	31.0	44.0	4.8	47.0	......	......	......	......	......	......	......	249	Specimen cross-grained; shattered; long split with grain	262[3]
7.5	14.5	22.8	32.5	2.3	33.5	44.0	......	......	......	......	......	......	205	Threw off flake from tension side	263[1]
8.0	15.8	25.0	34.2	2.8	35.5	46.0	......	......	......	......	......	......	270	Broke at knot	263[2]
4.3	7.8	12.0	16.4	0.9	17.4	21.8	28.2	35.0	46.0	......	......	......	404	Specimen cross-grained	492
5.3	9.8	15.5	21.0	1.6	22.0	38.5	37.2	......	......	......	......	......	328	......do	492
5.0	8.5	12.8	17.5	0.6	18.0	24.0	30.0	41.0	......	......	......	......	392	Broke with large splinters	461
5.0	9.3	13.6	18.3	0.9	19.0	23.5	30.0	38.0	49.0	......	......	......	436	Broke with coarse splinters	461
3.6	6.8	10.0	13.0	0.3	13.7	17.0	20.0	25.0	30.0	37.0	45.0	......	539	Broke with long, coarse splinters	488
3.5	7.0	10.6	14.0	0.3	14.5	18.0	22.0	27.0	31.5	37.5	49.0	......	500	......do	488
4.1	8.3	12.3	16.6	0.4	17.0	21.5	27.0	33.5	40.0	......	......	......	430	Broke at knot with long, coarse splinters	500
6.5	13.0	20.0	29.5	2.8	31.5	41.6	......	......	......	......	......	......	287	Specimen cross-grained; broke at knot	746
10.0	19.7	31.5	46.0	7.0	49.2	......	......	......	......	......	......	......	242	Broke with a large splinter	930
10.2	22.6	......	......	......	......	......	......	......	......	......	......	......	113	Broke with large splinter at knot	930
10.0	18.7	......	......	......	......	......	......	......	......	......	......	......	141	Defective specimen; broke at knot	1083
7.0	12.5	19.5	28.5	2.4	29.7	......	......	......	......	......	......	......	240	Broke at knot with one large splinter	333
7.4	16.2	26.7	40.6	7.5	43.5	......	......	......	......	......	......	......	220	Specimen cross-grained; large flake on compression side	1124
4.9	9.5	14.7	19.7	1.0	20.0	25.2	32.0	39.7	48.7	......	......	......	406	Specimen cross-grained; broke at knot	458
5.2	10.0	15.0	20.2	0.8	21.0	26.5	33.2	42.5	......	......	......	......	373	Specimen cross-grained; large flake from compression side	458
6.0	12.3	18.0	26.2	2.0	28.0	36.0	51.0	......	......	......	......	......	206	Specimen cross-grained; short break on tension side, flake from compression side.	61
6.5	13.0	10.4	29.0	3.2	29.7	39.0	55.0	......	......	......	......	......	349	Short break on tension side; flake from compression side	61
3.5	7.3	11.0	15.0	0.2	15.0	19.0	24.2	30.0	35.2	43.0	56.0	75.0	550	Broke with fine splinters	425
8.0	15.7	24.8	35.3	4.0	37.9	50.0	70.6	111.5	......	......	......	......	382	......do	811
8.0	10.2	25.7	38.0	4.5	39.0	52.5	79.0	115.5	......	......	......	......	377	Deflected 170 millimeters before breaking; broke with fine splinters	811
6.5	12.0	19.3	28.5	2.5	30.0	38.0	52.0	73.0	......	......	......	......	398	Square break on tension side, large flake on compression side	1084
8.5	16.2	26.0	38.0	5.2	40.2	55.0	78.0	135.0	......	......	......	......	361	......do	1084
7.0	13.3	21.0	30.4	3.0	31.8	40.5	58.0	78.0	......	......	......	......	377	......do	1162
8.0	15.7	25.6	40.0	5.5	42.0	63.0	......	......	......	......	......	......	264	Specimen cross-grained	347
7.6	14.5	23.0	32.0	2.5	33.0	44.0	59.0	82.0	......	......	......	......	376	Shattered at one end	738
7.4	14.0	22.5	32.0	2.0	33.0	43.0	60.0	96.5	......	......	......	......	355	Broke with large splinters	738

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
196. Fraxinus quadrangulata—cont'd ..	286[1]	Kentucky	Mercer county......	W. M. Linney....	Limestone	0.7969		976	1028	1101
	286[2]	... do	...do	...do	...do	0.7914		697	697	715
	291	Missouri	Allenton...........	G. W. Letterman..	Sandy loam	0.6080		651	697	734
	518	Tennessee	Nashville..........	A. Gattinger.....	Rich limestone ...	0.7923		610	651	731
197. Fraxinus Oregana................	964	Oregon	Portland...........	G. Engelmann and C. S. Sargent.	Low, wet	0.6182		939	948	820
Oregon Ash.	964	...do	...do	...do	..do	0.6057		842	939	757
	1001	...do	Weidler's saw-mill..	...do	....	0.6285		888	913	803
	1001	... do	...do	...do	....	0.6001		740	781	729
	1024	... do	Portland Furniture Company.	... do	....	0.4894		478	474	349
	1024	...do	... do	...do	....	0.4832		425	425	351
	1030	...do	...do	...do	....	0.6430		1062	1085	738
	1030	...do	...do	...do	....	0.6419		1220	1220	766
198. Fraxinus sambucifolia............	122	Michigan.........	Dansville..........	W. J. Beal	Wet, peaty........	0.5215		814	814	612
Black Ash. Hoop Ash. Ground Ash.	147	Illinois	Waukegan..........	Robert Douglas...	Low, wet..........	0.7371		976	1062	977
	839	Massachusetts ...	Danvers	J. Robinson......	Rich, loamy.......	0.7365		888	849	820
	839	... do	... do	...do	...do	0.7575		814	763	811
199. Forestiera acuminata.............	737	Georgia..........	Bainbridge.........	A. H. Curtiss.....	....	0.5875		610	592	698
Privet.	737	...do	...do	...do		0.5814		872	814	734
201. Osmanthus Americanus	283	Louisiana.........	Amite	C. Mohr..........	Rich, alluvial	0.8762		1221	1328	1202
Devil Wood.	283	...do	...do	...do	...do	0.8455		1062	1221	1015
	584	Florida	Saint John's river ..	A. H. Curtiss.....	Sandy loam.......	0.7330		1085	1130	937
BORRAGINACEÆ.										
204. Bourreria Havanensia .... *Strong Bark.*	1137	...do	Key Largo..........	...do	Coral	0.7084		888	996	945
205. Ehretia elliptica................. *Knackaway. Anaqua.*	942	Texas	New Braunfels	C. Mohr..........	Rich, alluvial	0.6649		425	397	722
BIGNONIACEÆ.										
206. Catalpa bignonioides	540	Alabama	Stockton...........	...do	Low, wet..........	0.4810		669	697	682
Catalpa. Catawba. Bean Tree. Cigar Tree. Indian Bean.	744	Georgia..........	Bainbridge	A. H. Curtiss	Clay	0.4413		574	610	523
	744	... do	...do	...do	...do	0.4352		567	531	469
	744	... do	...do	...do	...do	0.4585		814	888	691
207. Catalpa speciosa......	38	Missouri.........	Charleston.........	C. S. Sargent	Wet clay	0.4915		787	849	673
Western Catalpa.	38	...do	...do	...do	...do	0.4915		763	794	595
208. Chilopsis saligna	682	Arizona	Tuscon	G. Engelmann and C. S. Sargent.	Moist, gravelly ...	0.6193		514	514	469
Desert Willow.	682	... do	...do	...do	...do	0.5716		555	574	689
VERBENACEÆ.										
210. Citharexylum villosum	490	Florida	Bay Biscayne......	A. H. Curtiss	Coral	1.0323		1163	1177	703
Fiddle Wood.	490	... do	...do	... do	...do	1.0360		1320	1338	1170
NYCTAGINACEÆ.										
212. Pisonia obtusata .... *Pigeon Wood. Beef Wood. Cork Wood. Pork Wood.*	474	... do	Upper Metacombe Key.	...do	...do	0.6884		465	465	298
POLYGONACEÆ.										
213. Coccoloba Floridana	473	...do	... do	... do	... do	0.9718		1163	1221	937
Pigeon Plum.	473	... do	...do	...do	...do	0.9752		1017	1050	898
LAURACEÆ.										
215. Persea Carolinensis	585	... do	Saint John's river ..	...do	Sandy loam	0.6427		814	864	921
Red Bay.	585	... do	...do	...do	...do	0.6480		814	814	883
215. Persea Carolinensis, var. palustris.	340	Alabama	Mobile county......	C. Mohr	Damp, sandy......	0.6216		814	839	820

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
5.0	9.5	14.3	19.5	0.6	20.0	25.0	31.2	38.0	47.0	61.0	......	......	471	Specimen cross-grained; split	286[1]
7.0	14.0	21.0	29.6	2.7	32.0	44.2	66.0	......	......	......	......	......	305	Failed at knot	286[2]
7.5	14.0	21.4	30.6	2.3	32.0	41.0	59.0	......	......	......	......	......	313	Broke with coarse splinters; shattered	291
8.0	15 0	23.4	33.0	3.5	35.0	46.5	66.5	......	......	......	......	......	312	Shattered	518
5.2	10.3	15.0	20 8	0.7	21.5	28.0	39.0	......	......	......	......	......	350	Square break on tension side with split in axis.	964
5.8	10.4	16.0	22.0	0.9	22.5	30.0	41.0	......	......	......	......	......	323	Shattered	964
5.5	10.7	16.2	21.6	0.5	22.5	28.0	36.0	......	......	......	......	......	343	Specimen cross-grained; square break on tension side, flake on compression side.	1001
6.6	12.5	18.7	25.7	1.0	26.0	34.0	45.5	......	......	......	......	......	311	Specimen cross-grained	1001
10.2	20.6	......	......	......	......	......	......	......	......	......	......	......	149	......do	1024
11.5	23.0	......	......	......	......	......	......	......	......	......	......	......	150	Specimen cross-grained; flake on tension sido	1024
4.6	9.0	13.0	18.0	0.6	18.5	23.5	30.2	......	......	......	......	......	315	Specimen cross-grained; break started at knot	1030
4.0	8.0	12.5	17.0	0.4	17.3	21.8	......	......	......	......	......	......	327	......do	1030
6.0	12.0	19.0	26.5	1.6	28.7	39.0	......	......	......	......	......	......	261	Squaro break on tension sido with coarse splinters	122
5.0	9.2	14.0	20.6	1.7	21.0	28.0	36.0	49.0	74.0	......	......	......	417	Square break with two large splinters	147
5.5	11.5	18.0	26.0	2.5	27.5	35.7	53.0	81.5	......	......	......	......	350	Square break on tension side with coarse splinters	839
6.0	12.8	22.0	31.2	3.9	34.0	48.0	71.0	......	......	......	......	......	346	......do	839
8.0	16.5	26.5	38.7	4.5	42.0	61.0	......	......	......	......	......	......	298	Squaro break on tension side; shattered	737
5.6	12.0	18.0	27.0	2.0	28.2	38.0	64.5	......	......	......	......	......	313	......do	737
4.0	7.3	11.2	15.3	0.4	17.7	20.0	24.5	31.0	37.0	46.0	60.5	......	513	Square break on tension sido, splitting in the axis with fine splinters.	283
4.6	8.0	12.7	17.8	1.0	18.0	23.5	30.0	37.0	48.0	......	......	......	433	Sap-wood; specimen cross-grained; broke with long splinters	283
4.5	8.6	13.0	18.0	1.0	18.2	23.5	30.0	39.5	55.0	......	......	......	400	......do	584
5.5	9.8	14.6	19.8	0.5	20.0	25.0	32.0	40.0	50.0	......	......	......	403	Specimen cross-grained; splintored	1137
11.5	24.6	36.0	53.0	6.9	56.0	77.5	131.0	......	......	......	......	......	308	Specimen cross-grained; sqoaru break on tension side; split in axis.	942
7.3	14.0	21.5	31.0	2.4	32.5	41.0	......	......	......	......	......	......	291	Broko with coarse splinters	540
8.5	16.0	26.0	37.6	4.5	41.0	......	......	......	......	......	......	......	223	Crushed at center hearing; broke with coarse splinters	744
8.6	18.4	31.0	63.0	17.5	......	......	......	......	......	......	......	......	200	......do	744
6.0	11.0	18.0	25.2	1.4	26.0	35.0	......	......	......	......	......	......	295	......do	744
6.2	11.5	17.0	23.5	1.2	24.3	33.2	......	......	......	......	......	......	287	Crushed at center bearing; splintered	38
6.4	12.3	20.4	30.0	2.6	30.7	53.0	......	......	......	......	......	......	254	......do	38
9.5	19.0	31.6	50.5	6.0	......	......	......	......	......	......	......	......	200	Splintered on corner	682
8.8	17.0	26.0	37.0	3.0	38.0	54.0	......	......	......	......	......	......	294	Specimen cross-grained	682
4.2	8.3	12.5	17.5	0.7	18.0	23.0	......	......	......	......	......	......	300	Specimen cross-grained; broke at knots	490
3.7	7.3	11.4	15.0	0.4	15.7	20.0	25.0	30.0	37.0	46.0	......	......	499	Broke with fine splinters	490
10.5	21.0	......	....	......	......	......	......	......	......	......	......	......	127	Specimen cross-grained; failed from large splinters on corner	474
4.2	8.0	12.4	16.8	0.4	17.5	21.5	26.5	32.0	......	......	......	......	400	Shattered; large flakes on tension sido	473
4.8	9.3	13.5	19.0	0.8	18.7	24.0	31.0	30.0	......	......	......	......	383	Broke with coarse splinters	473
6.0	11.3	18.0	24.3	1.0	25.0	31.0	40.0	50.0	......	......	......	......	303	Shattered	585
6.0	12.0	17.6	24.3	1.2	24.2	30.2	40.0	51.0	......	......	......	......	377	......do	585
6.0	11.5	16.6	23.6	1.3	24.0	32.0	42.0	57.5	......	......	......	......	350	Broke with coarse splintors	340

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
217. Sassafras officinale .... *Sassafras.*	71	Missouri..........	Allenton...........	G. W. Letterman..	Low, rich	0.5286		507	561	886
	71	... do	... do	... do	....do	0.4569		574	626	708
	387	....do	... do	....do	Alluvial	0.4546		443	465	361
	387	....do	....do	....do	....do	0.4818		610	651	703
	446	Tennessee	Nashville...........	A. Gattinger......	Rich	0.4824		051	673	658
	814	West Virginia....	Grafton.............	C. G. Pringle......	....	0.5849		567	542	660
	814	....do	....do	....do	....	0.5828		488	501	673
	854	Massachusetts....	Danvers	J. Robinson.......	Rich loam	0.4829		348	337	368
	854	....do	....do	....do	....do	0.5034		325	315	464
218. Umbellularia Californica .... *Mountain Laurel. California Laurel. Spice Tree. Cajiput. California Olive. California Bay Tree.*	703	Oregon	Coos bay............	G. Engelmann and C. S. Sargent.	....	0.6813		1085	1149	937
	703	... do	... do	....do	....	0.6755		888	986	675
EUPHORBIACEÆ.										
219. Drypetes crocea .... *Guiana Plum. White Wood.*	468	Florida	Upper Metacombo Key.	A. H. Curtiss	Coral	0.9304		076	1039	797
219. Drypetes crocea, *var.* latifolia.....	459	... do	....do	....do	....do	0.9391		842	872	591
	459	... do	....do	....do	.... do	0.9218		751	800	825
URTICACEÆ.										
222. Ulmus crassifolia.................. *Cedar Elm.*	324	Texas	Dallas	J. Reverchon	Rich loam	0.6706		751	781	809
	324	....do	... do	....do	....do	0.7348		814	888	733
	929	....do	Austin..............	C. Mohr...........	....do	0.8375		626	610	787
	929	... do	....do	....do	.... do	0.8682		519	531	762
223. Ulmus fulva......................... *Red Elm. Slippery Elm. Moose Elm.*	30[1]	Kentucky	Mercer county	W. M. Linney.....	Limestone	0.5875		976	976	783
	134	Missouri..........	Allenton............	G. W. Letterman..	Rich, alluvial	0.7200		888	030	937
	134	.. do	....do	....do	....do	0.6933		1017	1062	937
	369	Vermont...........	Charlotte	C. G. Pringle......	Gravelly...........	0.6767		814	939	973
	429	Tennessee	Nashville...........	A. Gattinger......	Clay	0.6821		814	857	712
224. Ulmus Americana................ *White Elm. American Elm. Water Elm.*	19	Massachusetts	Arnold Arboretum .	C. S. Sargent	Drift	0.6920		076	976	989
	19	... do	....do	... do	....do	0.7080		921	939	1050
	281	Missouri	Allenton	G. W. Letterman..	Alluvial	0.6477		718	718	794
	958	Texas	Colorado river	C. Mohr	Alluvial	0.6596		751	800	813
	958	....do	....do	....do	....do	0.6168		729	835	895
	1036	Massachusetts....	Danvers	J. Robinson.......	Gravelly...........	0.7370		400	391	574
	1036	.. do	....do	....do	....do	0.7350		542	514	649
	1049	....do	North Reading	....do	....do	0.7660		828	849	1010
	1049	....do	....do	....do	....do	0.7159		814	857	023
225. Ulmus racemosa................... *Rock Elm. Cork Elm. Hickory Elm. White Elm. Cliff Elm.*	116[1]	Michigan	Danaville	W. J. Beal	... do	0.8562		1136	1190	1361
	116[2]	....do	Big Rapids	... do	....do	0.6245		814	921	886
	116[3]	....do	....do	....do	Low, gravelly	0.6839		1136	1221	1055
	116[5]	....do	Hudson..............	....do	Alluvial	0.7461		996	1073	1094
	314	....do	Hersey	....do	Rich loam	0.7677		1220	1302	1165
	314	....do	...do	....do	....do	0.7460		1163	1268	1036
	428	Tennessee	Nashville	A. Gattinger......	....do	0.7442		651	697	869
226. Ulmus alata......................... *Wahoo. Winged Elm.*	133	South Carolina ...	Bonneau's Depot ...	H. W. Ravenel	....do	0.8768		452	479	745
	380	Tennessee	Davidson county ...	A. Gattinger......	Loam	0.6615		574	568	703
	533	Mississippi	Kemper's Mill	C. Mohr	Alluvial	0.8243		610	651	820
	533	....do	....do	....do	....do	0.7883		697	687	900

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
8.6	17.4	28.0	40.7	4.5	44.0	66.0	.....	.....	.....	.....	.....	.....	378	Broke short and split	71
8.5	15.6	23.4	33.8	2.7	35.5	47.5	80.0	.....	.....	.....	.....	.....	302	Broke with fine splinters	71
11.0	21.0	35.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	154	Shattered	387
8.0	15.0	23.2	34.0	3.1	36.0	.....	.....	.....	.....	.....	.....	.....	300	......do	387
7.5	14.5	22.0	32.5	2.0	34.0	47.0	.....	.....	.....	.....	.....	.....	281	Coarse splinters	446
8.6	18.0	29.6	45.0	6.2	46.0	74.0	.....	.....	.....	.....	.....	.....	256	Shattered	814
10.0	19.5	30.0	42.0	4.9	45.7	63.0	.....	.....	.....	.....	.....	.....	287	......do	814
14.0	29.0	47.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	157	Square break on tension side with large flake on compression side	854
15.0	31.0	52.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	198	......do	854
4.5	8.5	12.5	17.0	0.6	18.0	22.5	29.5	37.0	.....	.....	.....	.....	400	Specimen cross-grained; split	703
5.5	9.9	15.7	21.0	1.1	21.5	27.5	.....	.....	.....	.....	.....	.....	288	......do	703
5.0	0.4	14.6	20.0	1.5	20.6	26.0	33.6	.....	.....	.....	.....	.....	340	Shattered	468
5.8	11.2	17.3	24.5	1.6	25.0	32.5	.....	.....	.....	.....	.....	.....	252	Sap-wood; shattered	459
6.5	12.2	10.0	27.2	2.0	27.5	36.5	46.5	61.0	.....	.....	.....	.....	352	Specimen cross-grained; sap-wood; shattered	459
6.5	12.5	20.0	29.0	2.2	30.0	42.0	56.0	.....	.....	.....	.....	.....	345	Broke with coarse splinters	324
6.0	11.9	10.8	23.5	1.3	24.5	31.0	30.2	.....	.....	.....	.....	.....	313	Short break on tension side	324
7.8	16.0	27.5	40.5	6.0	42.0	57.0	84.0	.....	.....	.....	.....	.....	330	Sap-wood; shattered	929
9.4	18.2	31.0	44.0	6.5	47.0	65.0	97.0	.....	.....	.....	.....	.....	325	......do	929
5.0	10.0	15.2	23.3	1.7	23.6	30.5	47.0	.....	.....	.....	.....	.....	334	Crushed at center bearing; bent and splintered without breaking	30[1]
5.5	10.5	16.0	22.8	1.6	23.5	31.5	43.0	59.2	112.0	.....	.....	.....	400	......do	134
4.8	9.2	14.0	20.0	1.0	20.8	27.0	36.0	51.2	86.0	.....	.....	.....	400	......do	134
6.0	10.4	15.5	20.3	1.0	20.3	26.9	35.0	47.5	60.0	.....	.....	.....	415	Thin scale on tension side	369
6.0	11.4	17.0	24.2	1.2	25.2	32.6	50.0	.....	.....	.....	.....	.....	304	Broke with coarse splinters; started at knot	429
5.0	10.0	15.0	20.8	1.0	21.3	26.5	35.0	45.8	64.0	.....	.....	.....	422	0.5 sap-wood; splintered on corners	19
5.3	10.4	14.7	20.4	0.5	21.0	27.0	34.7	45.7	60.0	.....	.....	.....	448	......do	19
6.8	13.6	21.2	31.0	3.1	31.0	41.0	60.0	.....	.....	.....	.....	.....	339	Broke with coarse splinters	281
6.8	13.0	21.0	30.0	3.0	31.0	41.8	61.5	.....	.....	.....	.....	.....	344	......do	281
6.5	12.2	19.5	28.0	3.0	29.0	40.0	56.6	.....	.....	.....	.....	.....	347	Broke with fine splinters	958
0.7	11.7	17.0	25.0	2.2	25.6	34.5	47.7	69.5	.....	.....	.....	.....	382	Square break on tension side, splitting in axis	958
12.2	25.0	41.5	69.2	14.4	73.0	.....	.....	.....	.....	.....	.....	.....	245	Specimen cross-grained	1036
9.0	19.0	31.0	46.2	6.2	49.2	71.3	.....	.....	.....	.....	.....	.....	277	Broke with fine splinters	1036
5.9	11.5	17.5	25.5	2.0	26.2	33.2	45.6	63.0	98.2	.....	.....	.....	431	......do	1049
6.0	11.4	17.5	24.0	1.9	24.0	31.5	44.0	60.0	.....	.....	.....	.....	394	Buckled on compression side; fine splinters	1049
4.3	8.2	12.0	16.7	0.5	17.0	22.0	26.5	31.0	40.8	49.0	64.0	85.0	581	Broke with fine splinters	116[1]
6.0	10.6	16.1	22.0	0.6	23.0	29.0	38.5	53.5	.....	.....	.....	.....	378	Crushed at center bearing; broke with fine splinters	116[2]
4.3	8.0	12.2	16.5	0.4	16.7	21.0	20.5	34.0	46.0	65.0	.....	.....	450	Broke with fine splinters	116[3]
4.9	9.1	13.7	18.2	0.7	18.4	23.0	30.0	38.0	48.5	67.0	.....	.....	467	.... do	116[5]
4.0	7.5	11.0	14.9	0.5	15.0	19.0	24.0	29.4	38.7	52.0	.....	.....	497	......do	314
4.2	7.7	11.7	15.8	0.5	16.0	20.3	26.0	32.0	44.0	.....	.....	.....	442	......do	314
7.5	14.0	22.4	33.2	3.5	35.0	45.0	64.0	91.5	.....	.....	.....	.....	371	......do	428
10.8	20.4	32.0	45.6	5.5	47.0	64.5	94.0	.....	.....	.....	.....	.....	318	Sap-wood; failed at knot	133
8.5	17.2	28.8	43.5	7.2	45.5	59.3	85.5	.....	.....	.....	.....	.....	300	0.75 heart wood; splintered at corners	380
8.0	15.6	23.7	34.0	3.3	35.3	48.0	61.0	96.0	.....	.....	.....	.....	350	Broke with coarse splinters	533
7.0	14.2	23.0	32.3	2.4	33.5	44.5	64.0	97.0	.....	.....	.....	.....	384	Slipped from bearings; buckled large splinter on corner	533

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
227. Planera aquatica	758	Florida	Chattahoochee	A. H. Curtiss	Rich, alluvial	0.5761		509	488	574
	758	do	do	do	do	0.5926		697	751	820
	018	do	do	C. Mohr	do	0.5113		407	415	469
228. Celtis occidentalis. *Sugarberry. Hackberry.*	75	Missouri	Allenton	G. W. Letterman	Low, rich	0.5887		610	665	712
	75	do	do	do	Alluvial	0.6023		787	849	808
	306	Texas	Dallas	J. Reverchon	do	0.7239		555	552	738
	306	do	do	do	do	0.7558		478	528	755
	306	do	do	do	do	0.7706		751	697	846
	873	Massachusetts	Salem	J. Robinson	Loam	0.7727		542	564	771
	873	do	do	do	do	0.7920		626	610	762
	1111	Missouri	Saint Louis	Henry Eggert	Moist loam	0.7613		787	763	891
	1111	do	do	do	do	0.7154		976	939	820
228. Celtis occidentalis, *var.* reticulata. *Hackberry. Palo Blanco.*	652	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry	0.7920		669	651	586
	652	do	do	do	do	0.7882		976	1085	1024
229. Ficus aurea	486	Florida	Bay Biscayne	A. H. Curtiss	Coral	0.3215		317	257	278
	486	do	do	do	do	0.3061		222	....	199
231. Ficus pedunculata. *Wild Fig. India-rubber Tree.*	508	do	Boca Chica Key	do	do	0.5085		407	....	230
232. Morus rubra. *Red Mulberry.*	132	Missouri	Allenton	G. W. Letterman	Rich loam	0.6876		1039	1062	937
	132	do	do	do	do	0.6784		814	904	848
	1244	do	do	do	Upland	0.6516		939	888	766
	1245	do	do	do	do	0.6506		718	814	738
	1246	do	do	do	do	0.6312		697	723	696
	1255	do	do	do	Rich	0.6875		751	697	745
	1255	do	do	do	do	0.6646		634	678	698
234. Maclura aurantiaca. *Osage Orange. Bois d'Arc.*	253	Texas	Dallas	J. Reverchon	Bottom	0.8011		857	930	1111
	253	do	do	do	do	0.7927		939	957	1150
PLATANACEÆ.										
235. Platanus occidentalis. *Sycamore. Button Wood. Button-ball Tree. Water Beech.*	21	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.5724		407	454	468
	126	Missouri	Allenton	G. W. Letterman	Rich, alluvial	0.6125		888	976	792
	126	do	do	do	do	0.6295		1136	1190	642
230. Platanus racemosa. *Sycamore. Button Wood.*	686	California	Carmel river	G. R. Vasey	Clay	0.5170		626	622	586
	686	do	do	do	do	0.4812		595	626	537
237. Platanus Wrightii. *Sycamore.*	648	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Rich, gravelly	0.5170		407	425	468
	648	do	do	do	do	0.5369		531	488	387
JUGLANDACEÆ.										
238. Juglans cinerea. *Butternut. White Walnut.*	16	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.4829		634	651	368
	16	do	do	do	do	0.4579		763	787	668
	76	Missouri	Allenton	G. W. Letterman	Moist, alluvial	0.4318		814	888	687
	76	do	do	do	do	0.4375		976	1017	649
	76^2	do	do	do	Rich, moist upland.	0.4943		1136	1221	606
	123	Michigan	Dansville	W. J. Beal	Gravelly clay	0.3864		607	697	560
	393	Michigan	Lansing	do	Gravelly loam	0.3205		488	424	328
	1057	Massachusetts	Topsfield	J. Robinson	Drift	0.5284		814	814	818
230. Juglans nigra. *Black Walnut.*	112	Missouri	Allenton	G. W. Letterman	Alluvial	0.5852		904	1030	1029
	117	Michigan	Dansville	W. J. Beal	Gravelly	0.5852		904	976	766
	149	Illinois	Waukegan	Robert Douglas	Loam	0.6031		872	976	726

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
9.6	20.0	33.5	48.5	6.0	49.6								245	Sap-wood; broke through knot	758
7.0	13.0	19.9	27.2	1.7	29.5	37.2	51.0	80.0					350	Specimen cross-grained	758
12.0	23.5	39.0											200	Broke with large splinters; shattered	918
8.0	14.7	23.0	33.0	3.0	34.4	45.5	78.0						304	Broke with coarse splinters	75
6.2	11.5	17.5	25.3	1.9	25.0	33.5	48.0						345	Failed by bending; fine splinters	75
8.8	17.7	27.5	40.5	4.5	41.5	56.0	82.0						315	Specimen cross-grained; splinters on corners at knots	306
10.2	18.5	29.5	42.7	5.5	44.5	60.0	87.0						322	Broke with large splinters	306
6.5	14.0	21.5	30.0	2.5	32.0	42.0	57.5	87.0					361	Broke with large scale	306
9.0	17.3	29.0	42.0	5.7	44.0	58.8	91.6						329	Square break on tension side with coarse splinters	873
7.8	16.0	25.2	37.6	4.8	39.0	53.0	82.5						325	Broke with coarse splinters	873
6.2	12.8	20.0	28.0	2.3	29.0	37.3	51.0	74.0					380	Shattered; large, coarse splinters	1111
5.0	10.4	16.0	21.7	1.1	22.3	30.0	38.2						350	Broke at knot; coarse splinters	1111
7.3	15.0	25.0	37.0	5.3	38.0								250	Specimen cross-grained; split with grain	652
5.0	9.0	14.3	20.0	1.5	20.2	26.5	35.4	50.0	70.5				437	Specimen cross-grained; broke with large splinters	652
15.4	38.0												119	Square break	486
22.0													85	do	486
12.0													98	Specimen cross-grained; split with grain	508
4.7	9.2	14.0	20.5	1.3	20.7	28.0	40.0	55.0					400	Broke with coarse splinters	132
6.0	10.8	16.4	23.0	1.0	23.5	31.0	43.0	61.0					362	do	132
5.2	11.0	15.8	22.6	2.0	23.5	32.3	46.0						327	Broke with thin flakes	1244
6.8	12.0	18.5	26.6	2.3	27.0	38.2	57.0						315	Failed from splinters on the corner	1245
7.0	13.5	20.0	29.0	2.6	30.3	42.0							297	Failed from thin scales on tension side	1246
6.5	14.0	21.4	32.4	2.6	32.2	43.2	70.0						318	Broke with large splinters	1255
7.7	14.4	22.2	32.5	3.0	33.5	44.3							298	do	1255
5.7	10.5	15.2	20.2	0.7	20.6	27.0	31.5	38.5	47.0	56.4			474	Broke with fine splinters	253
5.2	10.2	15.2	20.4	0.4	21.0	26.4	32.0	38.5	47.8	58.0			491	do	253
12.0	23.0	38.0	55.7	9.2									200	Specimen cross-grained; split with grain	21
5.5	10.0	14.5	19.6	1.0	20.8	25.0	33.0						338	Square break with coarse splinters	126
4.3	8.2	12.3	17.0	0.6	17.5	22.6							274	do	126
7.8	15.7	24.4	36.8	3.5	38.3	63.0							250	Broke with fine splinters	686
8.2	15.6	24.6	39.0	4.9	41.0								229	Broke with thin flakes from tension side	686
12.0	23.0	38.7											200	Specimen cross-grained; split with grain	648
9.1	20.0	34.2											165	Specimen cross-grained	648
7.7	15.0	23.0											157	Specimen cross-grained; broke at small knots	16
6.4	12.4	19.0	27.5	2.0	28.0	38.2							285	Square break on tension side; split in axis	16
6.0	11.0	16.8	22.8	0.0	24.0	31.7							203	do	76
5.0	9.6	14.5	20.3	0.6	21.0	28.4							277	Crushed at center bearing; broke with long splinters	76
4.3	8.0	12.4	17.0	0.9	18.0	24.3							297	Crushed at center bearing; broke with fine splinters	76[a]
7.0	14.0	18.5	27.0	2.0	29.0								239	Square break	123
10.0	23.0												140	do	393
6.0	12.0	17.7	24.0	1.0	24.0	31.0	40.0						349	Square break on tension side, splitting in axis; shattered	1057
5.4	9.4	14.0	10.0	0.3	10.2	24.0	29.5	35.6	44.0				430	Specimen cross-grained; shattered	112
5.4	10.0	14.8	20.4	0.6	20.5	25.5	32.3						327	do	117
5.6	10.0	15.4	21.6	1.3	21.8	20.7	42.0						310	Specimen cross-grained; long break started at small knot	149

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
227. Planera aquatica	758	Florida	Chattahoochee	A. H. Curtiss	Rich, alluvial	0.5761		509	488	574
	758	...do	...do	...do	...do	0.5926		697	751	820
	918	...do	...do	C. Mohr	...do	0.5113		407	415	469
228. Celtis occidentalis *Sugarberry. Hackberry.*	75	Missouri	Allenton	G. W. Letterman	Low, rich	0.5887		610	665	712
	75	...do	...do	...do	Alluvial	0.6023		787	849	808
	306	Texas	Dallas	J. Reverchon	...do	0.7239		555	552	738
	306	...do	...do	...do	...do	0.7558		478	528	755
	306	...do	...do	...do	...do	0.7700		751	697	846
	873	Massachusetts	Salem	J. Robinson	Loam	0.7727		542	564	771
	873	...do	...do	...do	...do	0.7920		626	610	762
	1111	Missouri	Saint Louis	Henry Eggert	Moist loam	0.7613		787	763	891
	1111	...do	...do	...do	...do	0.7154		976	939	820
228. Celtis occidentalis, var. reticulata *Hackberry. Palo Blanco.*	652	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry	0.7920		669	651	586
	652	...do	...do	...do	...do	0.7882		976	1085	1024
229. Ficus aurea	486	Florida	Bay Biscayne	A. H. Curtiss	Coral	0.3215		817	257	278
	486	...do	...do	...do	...do	0.3061		222	....	199
231. Ficus pedunculata *Wild Fig. India-rubber Tree.*	508	...do	Boca Chica Key	...do	...do	0.5085		407	....	230
232. Morus rubra *Red Mulberry.*	132	Missouri	Allenton	G. W. Letterman.	Rich loam	0.6876		1039	1062	937
	132	...do	...do	...do	...do	0.6784		814	904	848
	1244	...do	...do	...do	Upland	0.6516		939	888	766
	1245	...do	...do	...do	...do	0.6506		718	814	738
	1246	...do	...do	...do	...do	0.6312		697	723	696
	1255	...do	...do	...do	Rich	0.6875		751	697	745
	1255	...do	...do	...do	...do	0.6646		634	678	698
234. Maclura aurantiaca *Osage Orange. Bois d'Arc.*	253	Texas	Dallas	J. Reverchon	Bottom	0.8011		857	930	1111
	253	...do	...do	...do	...do	0.7927		939	957	1150
PLATANACEÆ.										
235. Platanus occidentalis *Sycamore. Button Wood. Button-ball Tree. Water Beech.*	21	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.5724		407	454	468
	126	Missouri	Allenton	G. W. Letterman	Rich, alluvial	0.6125		888	976	792
	126	...do	...do	...do	...do	0.6295		1136	1190	642
236. Platanus racemosa *Sycamore. Button Wood.*	686	California	Carmel river	G. R. Vasey	Clay	0.5170		626	622	586
	686	...do	...do	...do	...do	0.4812		595	626	537
237. Platanus Wrightii *Sycamore.*	648	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Rich, gravelly	0.5170		407	425	468
	648	...do	...do	...do	...do	0.5369		531	488	387
JUGLANDACEÆ.										
238. Juglans cinerea *Butternut. White Walnut.*	16	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.4829		634	651	368
	16	...do	...do	...do	...do	0.4579		763	787	668
	76	Missouri	Allenton	G. W. Letterman	Moist, alluvial	0.4318		814	888	687
	76	...do	...do	...do	...do	0.4375		976	1017	649
	76^{3}	...do	...do	...do	Rich, moist upland.	0.4043		1130	1221	696
	123	Michigan	Dansville	W. J. Beal	Gravelly clay	0.3864		697	697	560
	393	Michigan	Lansing	...do	Gravelly loam	0.3205		488	424	328
	1057	Massachusetts	Topsfield	J. Robinson	Drift	0.5284		814	814	818
239. Juglans nigra *Black Walnut.*	112	Missouri	Allenton	G. W. Letterman	Alluvial	0.5852		904	1039	1029
	117	Michigan	Dansville	W. J. Beal	Gravelly	0.5852		904	970	766
	149	Illinois	Waukegan	Robert Douglas	Loam	0.6031		872	976	726

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
9.6	20.0	33.5	48.5	6.0	49.6	.....	.....	.....	.....	.....	.....	.....	245	Sap-wood; broke through knot	758
7.0	13.0	19.9	27.2	1.7	29.5	37.2	51.0	80.0	.....	.....	.....	.....	350	Specimen cross-grained	758
12.0	23.5	39.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	200	Broke with large splinters; shattered	918
8.0	14.7	23.0	33.0	3.0	34.4	45.5	78.0	.....	.....	.....	.....	.....	304	Broke with coarse splinters	75
6.2	11.5	17.5	25.3	1.9	25.0	33.5	48.0	.....	.....	.....	.....	.....	345	Failed by bending; fine splinters	75
8.8	17.7	27.5	40.5	4.5	41.5	56.0	82.0	.....	.....	.....	.....	.....	315	Specimen cross-grained; splinters on corners at knots	306
10.2	18.5	29.5	42.7	5.5	44.5	60.0	87.0	.....	.....	.....	.....	.....	322	Broke with large splinters	306
6.5	14.0	21.5	30.0	2.5	32.0	42.0	57.5	87.0	.....	.....	.....	.....	361	Broke with large scale	306
9.0	17.3	29.0	42.0	5.7	44.0	58.8	91.6	.....	.....	.....	.....	.....	329	Square break on tension side with coarse splinters	873
7.8	18.0	25.2	37.6	4.8	30.0	53.0	82.5	.....	.....	.....	.....	.....	325	Broke with coarse splinters	873
6.2	12.8	20.0	28.0	2.3	29.0	37.3	51.0	74.0	.....	.....	.....	.....	380	Shattered; large, coarse splinters	1111
5.0	10.4	16.0	21.7	1.1	22.3	30.0	38.2	.....	.....	.....	.....	.....	350	Broke at knot; coarse splinters	1111
7.3	15.0	25.0	37.0	5.3	38.0	.....	.....	.....	.....	.....	.....	.....	250	Specimen cross-grained; split with grain	652
5.0	9.0	14.3	20.0	1.5	20.2	26.5	35.4	50.0	70.5	.....	.....	.....	437	Specimen cross-grained; broke with large splinters	652
15.4	38.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	119	Square break	486
22.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	85	do	486
12.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	98	Specimen cross-grained; split with grain	508
4.7	9.2	14.0	20.5	1.3	20.7	28.0	40.0	55.0	.....	.....	.....	.....	400	Broke with coarse splinters	132
6.0	10.8	16.4	23.0	1.0	23.5	31.0	43.0	61.0	.....	.....	.....	.....	362	do	132
5.2	11.0	15.8	22.6	2.0	23.5	32.3	46.0	.....	.....	.....	.....	.....	327	Broke with thin flakes	1244
6.8	12.0	18.5	26.6	2.3	27.0	38.2	57.0	.....	.....	.....	.....	.....	315	Failed from splinters on the corner	1245
7.0	13.5	20.0	29.0	2.6	30.3	42.0	.....	.....	.....	.....	.....	.....	297	Failed from thin scales on tension side	1248
6.5	14.0	21.4	32.4	2.8	32.2	43.2	70.0	.....	.....	.....	.....	.....	318	Broke with large splinters	1255
7.7	14.4	22.2	32.5	3.0	33.5	44.3	.....	.....	.....	.....	.....	.....	298	do	1255
5.7	10.5	15.2	20.2	0.7	20.6	27.0	31.5	38.5	47.0	56.4	.....	.....	474	Broke with fine splinters	253
5.2	10.2	15.2	20.4	0.4	21.0	20.4	32.0	38.5	47.8	58.0	.....	.....	491	do	253
12.0	23.0	38.0	55.7	9.2	.....	.....	.....	.....	.....	.....	.....	.....	200	Specimen cross-grained; split with grain	21
5.5	10.0	14.5	19.6	1.0	20.8	25.0	33.0	.....	.....	.....	.....	.....	338	Square break with coarse splinters	126
4.3	8.2	12.3	17.0	0.6	17.5	22.6	.....	.....	.....	.....	.....	.....	274	do	126
7.8	15.7	24.4	36.8	3.5	38.3	63.0	.....	.....	.....	.....	.....	.....	250	Broke with fine splinters	686
8.2	15.6	24.6	39.0	4.0	41.0	.....	.....	.....	.....	.....	.....	.....	220	Broke with thin flakes from tension side	686
12.0	23.0	38.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	200	Specimen cross-grained; split with grain	648
9.1	20.0	34.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	165	Specimen cross-grained	648
7.7	15.0	23.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	157	Specimen cross-grained; broke at small knots	16
6.4	12.4	19.0	27.5	2.0	28.0	38.2	.....	.....	.....	.....	.....	.....	285	Square break on tension side; split in axis	16
6.0	11.0	16.8	22.8	0.9	24.0	31.7	.....	.....	.....	.....	.....	.....	293	do	76
5.0	9.6	14.5	20.3	0.6	21.0	28.4	.....	.....	.....	.....	.....	.....	277	Crushed at center bearing; broke with long splinters	76
4.3	8.0	12.4	17.0	0.9	18.0	24.3	.....	.....	.....	.....	.....	.....	297	Crushed at center bearing; broke with fine splinters	76[a]
7.0	14.0	18.5	27.0	2.0	29.0	.....	.....	.....	.....	.....	.....	.....	239	Square break	123
10.0	23.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	110	do	393
6.0	12.0	17.7	24.0	1.0	24.0	31.0	40.0	.....	.....	.....	.....	.....	349	Square break on tension side, splitting in axis; shattered	1057
5.4	9.4	14.0	19.0	0.3	19.2	24.0	29.5	35.6	44.0	.....	.....	.....	439	Specimen cross-grained; shattered	112
5.4	10.0	14.8	20.4	0.6	20.5	25.5	32.3	.....	.....	.....	.....	.....	327	do	117
5.6	10.0	15.4	21.6	1.3	21.8	29.7	42.0	.....	.....	.....	.....	.....	310	Specimen cross-grained; long break started at small knot	149

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity.		Modulus of rupture.
								First deflection.	Second deflection.	
239. Juglans nigra—continued	318	Michigan	Lansing	W. J. Beal	Loam	0.6619		976	976	586
	325	Texas	Dallas	J. Reverchon	Alluvial	0.6455		976	930	668
	407		Charlestown Navy-yard.	S. H. Pook		0.5981		976	1130	923
	430	Tennessee	Nashville	A. Gattinger	Limestone	0.5724		857	921	898
	766	Florida	Aspalaga	A. H. Curtiss	Clay	0.6933		1221	1221	820
	766	...do	...do	...do	...do	0.6949		1627	1627	1137
	951	Texas	New Braunfels	C. Mohr	Moist, calcarcous	0.7483		1221	1191	923
	951	...do	...do	...do	...do	0.7386		939	1017	937
240. Juglans rupestris *Walnut.*	415	New Mexico	Pinos Altos mountains.	E. L. Greene	Alluvial	0.6125		697	688	462
	415	...do	...do	...do	...do	0.7297		660	679	949
	672	California	Contra Costa county	G. R. Vasey	...do	0.5977		775	842	468
	672	...do	...do	...do	...do	0.6063		626	697	520
241. Carya olivæformis *Pecan. Illinois Nut.*	322	Mississippi	Greenville	C. Mohr	...do	0.7444		642	651	457
	322	...do	...do	...do	...do	0.7489		904	976	675
	326	Texas	Dallas	J. Reverchon	...do	0.7181		470	496	581
	326	...do	...do	...do	...do	0.6250		542	542	600
242. Carya alba *Shell-bark Hickory. Shag-bark Hickory.*	3	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.8295		1395	1356	1245
	3	...do	...do	...do	...do	0.7955		1320	1356	1249
	29[2]	Kentucky	Danville	W. M. Linney	Shale	0.9710		1163	1220	1266
	118[2]	Michigan	Hudson	W. J. Beal	Clay	0.8085		1356	1395	1057
	118[3]	...do	Lansing	...do	...do	0.8035		1575	1550	1036
	152	Missouri	Allenton	G. W. Letterman	Rich upland	0.8217		1627	1627	1132
	249	Virginia	Wytheville	H. Shriver	Clay	0.8108		1221	1191	1144
	249	...do	...do	...do	...do	0.8041		1085	1163	1160
	249	...do	...do	...do	...do	0.8103		1221	1320	1242
	531	Mississippi	Kemper's mill	C. Mohr	Alluvial	0.8835		1320	1479	1289
	531	...do	...do	...do	...do	0.8829		1356	1395	1289
	531	...do	...do	...do	...do	0.8746		1526	1601	1444
	539	...do	...do	...do	...do	0.9148		1285	1526	1242
	539	...do	...do	...do	...do	0.7608		1479	1575	1237
	816	West Virginia	Grafton	C. G. Pringle	...do	0.7569		1526	1627	1041
	816	...do	...do	...do	...do	0.7947		1628	1028	1216
	1056	Massachusetts	Topsfield	J. Robinson	Rich loam	0.8614		800	976	1137
	1056	...do	...do	...do	...do	0.8439		888	921	1073
	1097	Missouri	Allenton	G. W. Letterman	Alluvial	0.8201		1395	1502	1331
	1097	...do	...do	...do	...do	0.7522		1221	1356	1172
243. Carya sulcata *Big Shell-bark. Bottom Shell-bark.*	91	Kentucky	Mercer county	W. M. Linney	...do	0.7130		976	1062	1022
	91[2]	...do	...do	...do	...do	0.6603		729	781	755
	383	Missouri	Allenton	G. W. Letterman	...do	0.9376		751	842	1223
	383	...do	...do	...do	...do	0.9333		660	729	1055
	383	...do	...do	...do	...do	0.9421		939	1085	1160
	391	...do	...do	...do	...do	0.8886		872	057	1172
	391	...do	...do	...do	...do	0.8048		939	1007	1116
	1082	...do	...do	...do	...do	0.9000		740	849	1087
	1082	...do	...do	...do	...do	0.8834		600	835	1083
	1164	...do	...do	...do	...do	0.7927		1221	1191	1144
	1164	...do	...do	...do	...do	0.8481		1356	1526	1352
	1164	...do	...do	...do	...do	0.7702		1221	1395	1287

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
5.0	10.0	15.0	21.6	0.6	21.7	......	......	......	......	......	......	......	250	Specimen cross-grained; shattered	318
5.0	10.5	16.0	21.9	1.0	21.7	28.0	......	......	......	......	......	......	285	Specimen cross-grained; split at corner	325
5.0	8.6	13.0	17.5	0.2	17.7	22.7	28.5	38.0	......	......	......	......	394	Crushed at center bearing; broke in long splinters	407
5.7	10.6	16.0	22.0	0.7	23.0	28.2	37.0	49.5	......	......	......	......	383	Square break; split from end to end	430
4.0	8.0	12.6	18.0	1.2	18.7	24.0	32.0	41.6	......	......	......	......	350	Square break on tension side; split in axis	766
3.0	6.0	9.8	13.2	0.2	13.5	17.0	21.0	26.0	32.0	40 0	......	......	485	......do	766
4.0	8.2	12.7	17.5	1.0	18.0	23.0	29.5	39.2	......	......	......	......	394	Specimen cross-grained	951
5.2	9.6	15.0	21.0	1.5	21.2	28.0	36.0	49.5	......	......	......	......	400	Shattered	951
7.0	14.2	23.0	......	......	......	......	......	......	......	......	......	......	197	Specimen cross-grained; broke at knot	415
7.4	14.4	21.5	20.0	2.0	29.4	38.5	50.0	68.5	112.0	......	......	......	405	Failed from splinters on corners	415
6.3	11.6	17.2	24.0	1.0	......	......	......	......	......	......	......	......	200	Specimen cross-grained; broke at knot	672
7.8	14.0	21.5	30.0	1.6	31.2	......	......	......	......	......	......	......	222	Cross-grained; broke with large splinters	672
7.6	15.0	23.0	......	......	......	......	......	......	......	......	......	......	195	Defective specimen; square break on tension side	322
5.4	10.0	15.7	21.4	0.9	21.6	28.0	......	......	......	......	......	......	288	Split; did not break	322
10.4	19.7	32.0	51.5	8.8	54.4	......	......	......	......	......	......	......	248	Specimen cross-grained; square break on tension sido; split in axis.	326
9 0	18.0	20.3	43.0	5.3	44.0	61.0	......	......	......	......	......	......	256	Square break on tension side; long splinters	326
3.5	7.2	11.4	16.0	0.4	16.2	20.8	27.3	34.5	43.0	58.0	87.0	......	531	Sap-wood; broke with fine splinters	3
3.7	7.2	10.8	14.4	0.4	14.5	18.2	23.5	30.0	37.0	50.7	75.0	......	533	......do	3
4.2	8.0	12.2	17.0	0.9	17.6	23.0	29.5	36.0	44.0	60.4	82.0	......	540	Broke with fine splinters	29[2]
3.0	7.0	10.5	14.0	0.6	14.2	17.6	21.7	26.5	32.0	46.0	......	......	451	Broke with long flakes from tension side	118[2]
3.1	6.3	9.0	12.1	0.2	12.4	15.5	19.0	23.0	29.5	......	......	......	442	Broke with long, fine splinters	118[3]
3.0	6.0	9.2	12.5	0.2	12.8	16.0	19.5	24.0	29.0	37.0	......	......	483	Broke with large, coarse splinters	152
4.0	8.2	13.0	18.2	1.0	19.0	25.0	33.0	43.0	56.0	76.0	......	......	488	Sap-wood; broke with fine splinters	249
4.5	8.4	12.7	16.8	0.6	17.3	21.5	28.5	36.6	46.0	64.0	......	......	495	......do	249
4.0	7.4	11.2	15.3	0.8	15.4	10.2	25.7	33.5	45.0	57.0	84.0	......	530	......do	249
3.7	6.6	10.0	13.0	0.2	13.2	16.6	21.0	25.5	33.0	41.0	55.0	100.0	550	Crushed at center bearing; fine splinters	531
3.6	7.0	10.2	13.2	0.3	13.5	17.0	21.0	26.0	33.0	40.6	55.0	......	550	......do	531
3.2	6.1	9.0	12.0	0.3	12.2	15.3	19.0	23.5	28.4	35.0	44.5	59.0	610	Deflection of 88 millimeters under pressure of 600 kilograms; some crushing at center bearing.	531
3.8	6.4	9.6	12.5	0.3	13.0	15.8	20.2	24.0	29.5	39.0	54.0	......	530	Crushed at center bearing; fine splinters	539
3.3	6.2	9.2	12.6	0.2	13.0	16.2	20.0	25.0	31.5	40.0	59.5	......	528	0.5 sap-wood; crushed at center bearing; fine splinters	539
3.2	6.0	0.0	12.0	0.2	12.5	16.0	19.7	24.5	30.5	......	......	......	444	Broke with long splinters	816
3.0	6.0	8.6	11.5	0.3	11.5	14.2	18.2	22.5	28.5	36.0	49.5	......	519	......do	816
6.1	10.0	14.6	20.0	0.9	20.4	26.2	35.0	45.0	58.0	81.0	......	......	485	Broke with fine splinters	1056
5.5	10.6	16.0	22.6	1.0	23.0	30.3	40.2	54.0	74.5	105.0	......	......	458	Sap-wood; broke with fine splinters	1056
3.5	6.5	9.6	12.5	0.3	13.0	16.0	20.2	25.0	30.7	38.0	49.5	71.2	568	......do	1097
4.0	7.2	10.5	14.2	0.5	14.4	18.0	22.5	28.9	37.0	48.0	70.0	......	500	0.5 sap-wood; broke with fine splinters	1097
5.0	9.2	14.0	18.5	0.4	19.0	24.2	30.8	41.0	55.6	......	......	......	436	Broke with two large splinters on tension sido	91
6.7	12.5	18.5	26.2	1.4	27.0	36.0	50.0	......	......	......	......	......	322	Failed from thin flakes on back	91[2]
6.5	11.0	17.6	25.0	2.0	26.1	33.6	45.2	60.0	85.0	132.0	......	......	479	Slipped from bearings; splintered	383
7.4	13.4	21.5	30.5	3.2	31.0	40.0	53.0	78.5	102.5	104.0	......	......	450	Sap-wood; slipped from bearings; did not break	383
5.2	9.0	13.2	18.3	1.0	19.1	25.0	31.4	41.4	54.5	75.0	......	......	495	Failed from thin flakes on back	383
5.0	10.2	15.0	20.5	1.1	21.0	28.0	36.0	46.0	59.0	91.0	185.0	......	500	Broke with fine splinters	391
5.2	9.7	14.7	20.0	1.0	20.6	26.5	34.0	43.0	61.5	84.0	......	......	476	0.5 sap-wood; broke with fine splinters	391
6.0	11.5	16.1	22.2	1.0	22.6	30.0	40.0	54.0	77.0	130.0	......	......	464	Did not break; pushed through tho bearings	1082
7.4	11.7	16.0	21.3	1.1	22.0	27.5	36.0	47.0	63.0	95.0	......	......	462	Broke with fine splinters	1082
4.0	8.2	12.0	16.5	0.6	16.6	21.0	27.5	35.0	45.0	66.5	......	......	488	......do	1164
3.6	6.4	9.5	12.8	0.4	12.7	16.0	20.0	24.5	30.3	37.0	46.0	65.0	577	......do	1164
4.0	7.0	10.2	13.6	0 4	14.0	17.4	22.0	27.4	33.2	42.6	56.0	......	549	......do	1164

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
243. Carya sulcata—continued	1165	Massachusetts	North Reading	J. Robinson	Drift	0.7181		1221	1221	780
	1166	... do	...do	...do	...do	0.8881		939	1007	1085
	1170	...do	...do	...do	...do	0.7636		1221	1305	1020
244. Carya tomentosa. *Mocker Nut. Black Hickory. Bull Nut. Big-bud Hickory. White-heart Hickory. King Nut.*	72	Kentucky	Perryville	W. M. Linney	Utica shale	0.7587		904	948	919
	72	...do	...do	...do	...do	0.8058		976	1085	1041
	254	Missouri	Allenton	G. W. Letterman	Rich upland	0.8693		1479	1628	1411
	348	Alabama	Citronelle	C. Mohr	Sandy	0.8659		814	939	1146
245. Carya porcina. *Pig Nut. Brown Hickory. Black Hickory. Switch-bud Hickory.*	6	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.8161		888	976	1054
	6	...do	...do	...do	...do	0.7818		976	1062	1054
	88	Missouri	Allenton	G. W. Letterman	Rich loam	0.9658		1252	1395	1354
	88	...do	...do	...do	...do	0.9369		1039	1149	1171
	121[1]	Michigan	Dansville	W. J. Beal	Gravelly clay	0.6659		1085	1221	876
	288	Missouri	Allenton	G. W. Letterman	Rich loam	0.8473		970	1085	1146
	442	Tennessee	Nashville	A. Gattinger	Upland	0.8452		751	814	800
	538	Alabama	Kemper's mill	C. Mohr	Alluvial	0.8183		1062	1221	1092
	538	... do	...do	...do	...do	0.6932		1062	1097	928
	538	...do	...do	...do	...do	0.7463		1085	1221	1110
	1051	Massachusetts	North Reading	J. Robinson	Drift	0.8636		525	734	1164
	1051	...do	...do	...do		0.8750		996	1097	1108
	1098	Missouri	Allenton	G. W. Letterman	Flinty	0.8614		888	814	963
	1098	...do	...do	...do	...do	0.8113		718	751	935
	1168	...do	...do	...do	...do	0.8580		660	713	911
	1168	...do	...do	...do	... do	0.8500		800	880	1054
246. Carya amara. *Bitter Nut. Swamp Hickory.*	153	...do	...do	...do	Rich upland	0.8153		1039	1085	1132
	838	Massachusetts	Danvers	J. Robinson	Rich loam	0.7864		763	814	935
	838	...do	... do	...do	...do	0.8040		957	1085	1122
	838	... do	...do	... do	...do	0.8080		1085	1130	1214
247. Carya myristicæformis. *Nutmeg Hickory.*	237	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich, swampy	0.8636		1221	1302	1296
	237	...do	...do	...do	...do	0.8330		1479	1628	1402
248. Carya aquatica. *Water Hickory. Swamp Hickory. Bitter Pecan.*	120	...do	...do	...do	Swampy	0.7380		1062	1163	1064
	362	Mississippi	Vicksburg	C. Mohr		0.7546		651	697	921
	362	...do	...do	...do		0.7727		970	948	937
	362	...do	...do	... do		0.7813		976	976	1099
	740	Georgia	Bainbridge	A. H. Curtiss	Alluvial	0.8198		976	1085	787
	740	...do	...do	... do	...do	0.8470		1221	1375	1235
	740	...do	...do	...do	...do	0.8199		1085	1028	468
MYRICACEÆ.	917	Florida	Chattahoochee	C. Mohr	...do	0.6415		729	848	562
249. Myrica cerifera. *Bayberry. Wax Myrtle.*	586	...do	Saint John's river	A. H. Curtiss	Sandy loam	0.6227		814	888	955
250. Myrica Californica	665	California	Santa Cruz	G. Engelmann and C. S. Sargent.	Rich loam	0.6511		904	976	1055
	665	...do	... do	...do	...do	0.6625		976	1007	1017
CUPULIFERÆ.										
251. Quercus alba. *White Oak.*	8	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.7432		679	723	782
	8	... do	... do	...do	... do	0.8358		763	888	918
	32	Kentucky	Mercer county	W. M. Linney	Limestone	0.8000		1136	1136	1028
	32[2]	...do	Boyle county	... do	Shale	0.7008		814	930	911
	32[3]	...do	...do	...do	Slate	0.6534		904	948	818

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
4.0	8.0	11.5	15.6	0.5	16.0	20.0	25.0	......	......	......	......	......	333	Broke with coarse splinters	1165
5.2	9.7	15.0	20.8	1.3	21.0	28.0	37.2	50.0	69.5	137.0	......	......	463	Fine splinters; not broken	1166
4.0	7.0	10.5	13.5	0.5	14.0	18.0	24.0	34.0	50.0	......	......	......	435	Broke with fine splinters	1170
5.4	10.3	15.3	22.0	1.4	23.0	29.6	41.5	58.0	......	......	......	......	392	Sap-wood; failed with two thin flakes on back	72
5.0	9.0	13.8	19.6	1.1	20.0	20.0	33.0	44.0	62.0	......	......	......	444	Sap-wood; broke with fine splinters	72
3.3	6.0	0.0	12.2	0.3	12.2	15.0	19.1	22.7	27.4	33.0	40.0	50.0	602	Broke with coarse splinters	254
6.0	10.4	15.6	21.4	1.1	22.0	28.0	37.1	47.0	61.0	89.0	......	......	489	Sap-wood; broke with fine splinters	348
5.5	10.0	14.5	20.4	1.0	20.5	27.0	34.0	44.0	57.5	78.7	......	......	450	0.5 sap-wood; broke with fine splinters	0
5.0	9.2	14.2	20.0	1.1	20.7	26.2	35.0	44.2	60.0	......	......	......	450	......do	0
3.9	7.0	10.9	14.2	0.5	15.0	18.5	23.6	31.0	36.0	40.0	60.2	76.0	578	Broke with fine splinters	88
4.7	8.5	12.5	17.5	1.1	18.0	22.5	30.3	37.5	49.0	66.0	......	......	500	......do	88
4.5	8.0	12.0	16.2	0.6	10.6	21.3	28.0	38.2	......	......	......	......	374	......do	121[1]
5.0	9.0	13.7	18.0	0.9	19.0	23.6	30.6	40.0	52.0	05.0	......	......	489	Broke with fine splinters	288
6.5	12.0	19.0	26.7	2.0	28.0	36.0	47.0	......	......	......	......	......	344	Broke at knot with coarse splinters	442
4.6	8.0	11.0	16.0	0.6	16.0	21.0	27.0	35.0	44.0	60.0	......	......	460	Broke with fine splinters	538
4.6	8.9	12.7	17.1	0.6	17.0	23.0	30.0	39.5	......	......	......	......	396	......do	538
4.5	8.0	11.6	15.7	0.0	16.4	21.2	28.6	30.4	40.0	08.0	......	......	474	Square break on tension side; split in axis	538
9.3	13.3	18.0	22.6	6.0	23.3	28.4	36.0	46.5	61.0	84.0	......	......	497	Broke with fine splinters	1051
4.9	8.9	13.4	18.5	1.3	19.0	24.5	31.0	42.5	50.0	75.5	......	......	473	......do	1051
5.5	12.0	18.8	27.5	3.0	28.5	37.6	52.5	70.0	110.0	......	......	......	411	Broke with coarse splinters; flaked on tension side	1098
6.8	13.0	19.2	28.0	2.6	28.8	37.5	51.6	73.0	......	......	......	......	399	......do	1098
7.4	13.7	21.0	31.5	5.0	32.5	41.4	57.0	85.0	......	......	......	......	389	Broke with coarse splinters	1168
6.1	11.1	16.1	23.0	2.2	24.2	31.6	41.6	55.0	73.0	105.0	......	......	450	......do	1168
4.7	9.0	13.3	19.0	1.0	18.4	24.0	21.3	41.5	56.4	84.0	......	......	483	Broke with long splinters	153
6.4	12.0	18.5	20.3	2.2	27.5	37.0	50.5	70.5	......	......	......	......	390	Broke with fine splinters	838
5.1	9.0	14.0	19.0	1.1	19.0	24.7	32.5	42.5	56.7	74.5	......	......	479	......do	838
4.5	8.6	13.7	18.4	0.6	18.7	24.0	30.6	39.0	51.0	68.5	103.0	......	518	Broke with long splinters	838
4.0	7.5	11.2	14.0	0.3	15.0	19.0	23.7	30.0	36.0	45.0	58.5	77.0	558	Broke with fine splinters	237
3.3	6.0	9.0	11.6	0.1	12.0	14.7	18.1	22.0	26.0	31.2	38.5	48.0	637	Deflection 63 millimeters with a pressure of 600 kilograms; broke with fine splinters.	237
4.6	8.4	12.0	16.5	1.0	16.5	22.0	20.0	37.5	52.5	72.0	......	......	454	Shattered	129
7.5	14.0	21.0	30.5	3.0	31.2	41.2	57.2	86.0	......	......	......	......	393	0.5 sap-wood; failed from flakes on back	362
5.0	10.3	15.2	21.5	1.2	22.0	30.0	42.0	56.5	82.0	......	......	......	400	Broke with long splinters	362
5.0	10.0	14.7	20.2	1.1	21.0	27.5	30.5	49.0	68.0	109.0	......	......	469	Broke with coarse splinters	362
5.0	9.0	13.5	18.0	0.7	18.2	23.5	30.2	......	......	......	......	......	336	Failed from long splinter on corner	740
4.0	7.1	10.8	14.4	0.4	15.0	18.0	22.2	27.0	33.0	40.0	47.2	......	527	Broke with coarse splinters	740
4.5	9.5	16.5	20.5	4.0	......	......	......	......	......	......	......	......	200	Specimen cross-grained	740
6.7	11.8	17.0	23.0	0.9	23.6	......	......	......	......	......	......	...	240	Square break on tension side, splitting in axis	917
6.0	11.0	17.4	24.0	1.3	24.0	31.5	42.0	......	......	......	......	......	348	Shattered	580
5.4	10.0	14.4	19.9	1.0	20.0	25.2	32.0	40.0	50.0	......	......	......	450	Square break on tension side; split in axis; shattered	665
5.0	9.7	14.7	20.0	1.0	20.4	26.0	33.0	42.4	60.0	......	......	......	434	......do	005
7.2	13.5	21.2	30.7	3.1	32.0	42.0	59.0	......	......	......	......	......	334	Square break on tension side; split in axis	8
6.4	11.0	16.7	23.5	1.5	24.0	31.0	40.0	52.0	70.0	......	......	......	392	Broke with large splinters	8
4.3	8.6	13.0	17.6	0.4	18.0	23.0	30.5	38.6	48.5	......	......	......	439	......do	32
6.0	10.5	15.0	20.7	1.0	21.5	28.2	37.0	47.5	......	......	......	......	389	Broke with small splinters	32[2]
5.4	10.3	15.5	21.5	0.7	21.6	28.6	37.0	......	......	......	......	......	340	Square break on tension side, splitting in axis	32[3]

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
251. Quercus alba—continued	49	Missouri	Allenton	G. W. Letterman	Rich upland	0.7027		976	1028	1024
	49	...do	...do	...do	...do	0.7060		740	751	817
	49^{1}	...do	...do	...do	...do	0.7784		872	930	937
	49^{2}	...do	...do	...do	...do	0.7501		814	814	813
	49^{3}	...do	...do	...do	...do	0.7614		872	918	921
	113	Michigan	Big Rapids	W. J. Beal	Gravelly	0.6001		679	697	684
	113^{2}	...do	Dansville	...do	Sandy	0.7149		814	896	686
	113^{2}	...do	...do	...do	...do	0.7060		857	775	585
	113^{3}	...do	Hudson	...do		0.7469		976	976	977
	238	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich, damp loam	0.8085		1356	1356	1055
	238	...do	...do	...do	...do	0.7797		1221	1221	1655
	250	Virginia	Wytheville	H. Shriver	Clay	0.7876		1163	1221	1047
	250	...do	...do	...do	...do	0.7796		1061	1191	928
	251	...do	...do	...do		0.7102		814	842	764
	251	...do	...do	...do		0.7170		1163	1221	1059
	259^{1}	...do	...do	...do	Gravelly	0.8091		976	976	1043
	259^{2}	...do	...do	...do	...do	0.7631		872	921	844
	403	Maryland	Charlestown Navy-yard.	S. H. Pook		0.7361		976	976	722
	403	...do	...do	...do		0.7143		842	849	653
	443	Tennessee	Nashville	A. Gattinger	Rich bottom	0.6050		567	592	487
	547	Alabama	Kemper's mill	C. Mohr	Alluvial	0.8475		906	1017	1031
	547	...do	...do	...do	...do	0.8579		976	1177	1282
	748	Florida	Chattahoochee	A. H. Curtiss	Clay	0.8075		1221	1252	1125
	748	...do	...do	...do	...do	0.8099		1320	1302	1153
	749	...do	...do	...do	...do	0.8233		751	775	1043
	749	...do	...do	...do	...do	0.8655		814	781	750
	895	Massachusetts		M. C. Beedle		0.7306		740	842	703
	895	...do		...do		0.7818		697	723	703
	1050	...do	North Reading	J. Robinson		0.8001		1110	1191	1158
	1050	...do	...do	...do		0.8343		787	751	1040
	1257		Charlestown Navy-yard.	S. H. Pook		0.8466		1252	1268	1005
	1257		...do	...do		0.8773		1061	1085	919
252. Quercus lobata. *White Oak. Weeping Oak.*	670	California	Redding	G. R. Vasey	Gravelly loam	0.7443		079	665	876
	670	...do	...do	...do	...do	0.7557		703	709	851
253. Quercus Garryana. *White Oak.*	985	Oregon	Weidler's saw-mill	G. Engelmann and C. S. Sargent.		0.7864		904	888	1048
	985	...do	...do	...do		0.7556		814	842	945
	988	...do	Portland	...do	Rich loam	0.7142		751	787	019
	988	...do	...do	...do	...do	0.7548		814	857	1022
	1027	...do	Portland Furniture Company.	...do		0.7745		607	814	820
	1027	...do	...do	...do		0.7535		610	673	703
	1029	...do	...do	...do		0.7429		888	930	921
	1029	...do	...do	...do		0.6753		097	697	659
254. Quercus obtusiloba. *Post Oak. Iron Oak.*	37^{2}	Kentucky	Harrodsburg	W. M. Linney	Shale	0.8705		763	751	1055
	151	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich upland	0.8085		763	849	1005
	151	...do	...do	...do	...do	0.8913		976	1017	1048
	250	Missouri	Allenton	G. W. Letterman	Clay	0.8943		763	781	912
	351	Alabama	Citronelle	C. Mohr	...do	0.7614		610	630	677
	351	...do	...do	...do	...do	0.7688		751	888	893

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
5.0	9.5	14.4	20.0	1.0	20.0	26.2	34.0	43.5	57.5				437	Broke with fine splinters	49
6.6	13.0	20.4	30.0	3.2	30.5	41.0	57.5						349	Square break on tension side, splitting in axis	49
5.6	10.5	17.0	24.0	2.5	25.4	33.5	45.0	59.5	89.0				400	do	49[1]
6.0	12.0	19.0	28.0	3.3	28.7	37.0	48.0						347	do	49[2]
5.6	10.7	16.5	23.4	1.8	24.0	31.0	42.5	55.0					393	do	49
7.2	14.0	23.0	33.2	4.0	34.5	49.0							293	do	113
6.0	10.9	16.2	22.7	1.5	23.3	32.5							294	Broke with small splinters; slightly crushed at bearing	113[2]
5.7	12.6	20.0	30.8	3.0	31.5								250	Broke with fine splinters	113[2]
5.0	10.0	16.5	24.2	2.5	25.0	32.0	42.0	58.0	85.0				417	do	113[3]
3.6	7.2	11.0	15.3	0.5	15.4	20.5	26.5	33.0	45.5				450	do	238
4.0	8.0	12.0	16.0	0.5	16.3	21.0	27.5	35.0	46.5	63.0			450	do	238
4.2	8.0	12.0	16.3	0.6	16.6	21.2	28.5	36.0	49.2				447	do	250
4.6	8.2	12.7	17.5	0.7	17.7	22.5	30.0	36.5					396	Broke with large flakes	250
6.0	11.6	18.0	26.0	2.2	26.5	36.3	55.0						326	Broke with fine splinters	251
4.2	8.0	12.0	16.0	0.3	16.1	21.0	27.0	33.5	44.5	61.5			452	Broke with large splinters	251
5.0	10.0	16.0	22.8	1.5	24.0	30.5	39.5	53.5	70.0				445	Broke with fine splinters	259[1]
5.6	10.6	16.3	23.2	1.5	24.0	32.0	42.2	59.5					360	Broke with large scale	259[3]
5.0	10.0	15.3	21.8	1.5	22.2	29.5	40.8						308	Broke with fine splinters	403
5.8	11.5	17.8	25.3	2.2	27.0	36.5							279	Broke with large scale	403
8.6	16.5	26.0	41.6	5.6	43.5								208	Square break on tension side, splitting in axis	443
4.9	9.6	14.5	20.7	1.3	21.3	28.5	37.5	49.5	60.0				440	Broke with fine splinters	547
5.0	8.3	12.2	16.0	0.6	16.2	20.7	26.0	32.5	40.7	48.7	67.5		547	do	547
4.0	7.8	11.6	16.0	0.5	16.3	20.5	27.0	33.5	43.0	56.0			480	do	748
3.7	7.5	11.0	15.0	0.5	15.5	19.6	25.0	32.0	41.5	51.2			492	do	748
6.5	12.6	18.8	25.5	2.2	27.5	34.5	45.5	65.0	92.0				445	do	749
6.0	12.5	20.0	29.0	3.0	30.0	42.0	73.0						320	Broke at knot	749
6.6	11.8	17.5	24.7	1.0	25.0	33.5							300	Specimen cross-grained	895
7.0	13.5	20.6	29.0	2.0	29.6	39.0							300	Broke with fine splinters	895
4.4	8.2	12.7	17.1	0.7	17.5	22.3	28.5	37.0	47.0	66.0			494	do	1050
6.2	13.0	19.5	28.0	2.4	28.5	36.0	50.0	68.5	100.0				444	do	1050
3.9	7.7	11.7	16.0	0.4	16.5	21.0	26.5	33.5	40.5				429	Broke with large splinters	1257
4.6	9.0	13.3	18.6	0.9	18.7	24.0	32.0	38.0					392	do	1257
7.2	14.7	23.5	33.0	4.0	34.0	45.6	62.0	90.0					374	Specimen cross-grained; splintered on both corners	670
6.4	12.7	18.7	27.3	2.5	28.4	37.0	50.5	75.0					363	Splintered on corner	670
5.4	11.0	15.5	21.5	1.1	21.5	28.5	37.0	47.0	60.5				447	Square break on tension side, splitting in axis	985
6.0	11.6	18.0	25.0	1.7	26.0	33.0	44.0	57.5	75.5				403	Specimen cross-grained	985
6.5	12.4	19.0	27.0	2.0	27.3	34.7	45.6	62.0					392	Square break on tension side, splitting in axis	988
6.0	11.4	10.7	23.0	1.2	23.5	30.0	40.0	52.5	70.0				436	do	988
7.0	12.0	18.0	25.5	1.5	25.6	33.5	44.0						350	do	1027
8.0	14.5	23.0	32.3	2.5	33.5	43.5	59.5						300	do	1027
5.5	10.5	16.0	22.3	1.0	22.3	29.0	36.5	49.0					393	Specimen cross-grained; broke with long splinters	1029
7.0	14.0	22.0	31.0	2.2	31.0	40.7							281	do	1029
6.4	13.0	19.6	27.5	2.0	28.0	36.0	40.7	62.0	76.5	105.0			450	Square break on tension side, splitting in axis	37[2]
6.4	11.5	17.5	24.0	1.1	24.6	32.0	40.0	50.6	67.5				429	do	151
5.0	9.6	14.5	19.5	1.0	19.9	26.0	33.5	43.0	60.0				447	Broke with coarse splinters	151
6.4	12.5	19.6	28.2	3.0	29.2	38.0	50.8	64.0					389	Square break on tension side, splitting in axis	256
8.0	15.5	23.0	32.5	2.7	33.7	43.5							289	do	351
6.5	11.0	17.7	24.7	1.7	25.0	32.0	43.0	56.0					381	do	351

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
254. Quercus obtusiloba—continued	771	Florida	Aspalaga	A. H. Curtiss	Gravelly barrens	0.9172		888	930	800
	771	...do	...do	...do	...do	0.8958		814	814	581
255. Quercus undulata, *var.* Gambelii. *Scrub Oak.*	417	New Mexico	Pinos Altos mountains.	E. L. Greene		0.8489		610	610	820
	417	...do	...do	...do		0.8092		751	718	998
	525	Colorado	Engelmann's cañon.	Robert Douglas	Rocky	0.7996		443	430	323
	525	...do	...do	...do	...do	0.8073		514	528	579
256. Quercus macrocarpa. *Burr Oak. Mossy-cup Oak. Over-cup Oak.*	79	Kentucky	Mercer county	W. M. Linney	Alluvial	0.7636		1221	1221	1055
	79[2]	...do	...do	...do	...do	0.7358		1085	1163	1092
	137	Missouri	Allenton	G. W. Letterman	Moist upland	0.9418		872	948	1226
	143	Illinois	Waukegan	Robert Douglas	Rich	0.8368		679	679	696
	310	Texas	Dallas	J. Reverchon	Rich, moist	0.8580		1017	1028	968
	310	...do	...do	...do	...do	0.8466		939	967	919
	432	Tennessee	Nashville	A. Gattinger	Alluvial	0.7507		976	930	926
	831	Illinois	Winnebago county	M. S. Bebb	Loam	0.7455		1030	1149	1055
	933	Texas	Austin	C. Mohr	Alluvial	0.7864		697	723	914
	933	...do	...do	...do	...do	0.8313		729	712	803
	1071	Vermont	Charlotte	C. G. Pringle		0.8523		814	835	1052
	1072	...do	...do	...do		0.8153		904	913	1029
	1073	...do	...do	...do		0.8153		763	814	1034
257. Quercus lyrata. *Over-cup Oak. Swamp Post Oak. Water White Oak.*	545	Mississippi	Kemper's mill	C. Mohr	Alluvial	0.7784		1039	1073	865
	545	...do	...do	...do	...do	0.7972		1221	1221	1146
	545	...do	...do	...do	...do	0.7898		1285	1302	1041
	762	Florida	Chattahoochee	A. H. Curtiss	...do	0.7955		1627	1550	1020
	762	...do	...do	...do	...do	0.7955		1744	1526	1055
258. Quercus bicolor. *Swamp White Oak.*	54	Missouri	Allenton	G. W. Letterman	Alluvial	0.9102		763	835	1106
	54	...do	...do	...do	...do	0.7182		976	1085	998
	54[2]	...do	...do	...do	...do	0.7443		976	1085	937
	54[3]	...do	...do	...do	...do	0.7580		1062	1140	1036
	846	Massachusetts	West Newbury	J. Robinson	Low, swampy	0.8752		543	502	581
	846	...do	Arnold Arboretum	C. S. Sargent	Drift	0.8689		651	693	792
259. Quercus Michauxii. *Basket Oak. Cow Oak.*	240	South Carolina	Bonneau's Depot	H. W. Ravenel	Alluvial	0.8432		1085	1085	1064
	240	...do	...do	...do	...do	0.8687		957	939	1099
	524	Alabama	Kemper's mill	C. Mohr	...do	0.7898		970	930	1110
	524	...do	...do	...do	...do	0.7710		1110	1112	1144
	755	Florida	Chattahoochee	A. H. Curtiss	...do	0.9190		828	840	1153
	755	...do	...do	...do	...do	0.9289		888	857	1127
260. Quercus Prinus. *Chestnut Oak. Rock Chestnut Oak.*	31	Kentucky	Boyle county	W. M. Linney	Shale	0.7313		1221	1252	1219
	31[1]	...do	...do	...do	...do	0.7528		1039	1140	930
	35	...do	...do	...do	Limestone	0.8352		1628	1684	1305
	434	Tennessee	Nashville	A. Gattinger	Rocky upland	0.6552		581	505	546
	925	Alabama	Cullman	C. Mohr	Dry, rocky	0.8267		1028	1028	1130
	925	...do	...do	...do	...do	0.7523		1221	1221	1050
261. Quercus prinoides. *Yellow Oak. Chestnut Oak. Chinquapin Oak.*	34	Kentucky	Mercer county	W. M. Linney	Limestone	0.7983		976	976	1146
	34[2]	...do	Boyle county	...do	Waverly shale	0.8949		1479	1526	1455
	273	Missouri	Allenton	G. W. Letterman	Limestone	0.9861		976	1050	1291
	287	...do	...do	...do	Flinty	0.9125		1221	1221	1277

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
5.5	10.5	15.7	21.0	1.5	21.7	28.0	36.0	.....	.....	.....	.....	.....	345	Splintered on corner	771
6.0	12.0	18.7	26.4	2.5	27.0	.....	.....	.....	.....	.....	.....	.....	248	Square break	771
8.0	16.0	25.3	36.0	4.0	37.0	48.0	66.0	.....	.....	.....	.....	.....	350	Broke with coarse splinters	417
6.5	13.6	21.7	31.0	2.7	31.9	41.5	58.0	84.0	145.0	.....	.....	.....	426	Sap-wood; drew off bearings; fine splinters	417
11.0	22.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	138	Specimen rotten; square break	525
0.5	18.5	30.3	43.5	3.2	45.0	.....	.....	.....	.....	.....	.....	.....	247	Split at one end; square break on tension side	525
4.0	8.0	13.0	17.0	0.3	17.0	22.0	29.0	37.0	47 0	64.0	.....	.....	450	Broke with long splinter on corner	79
4.5	8.4	12.0	17.2	0.5	17.5	22.5	22.7	38.0	48.5	64.0	.....	.....	460	Broke with fine splinters	79[2]
5.6	10.3	15.4	21.5	1.5	22.0	28.0	30.5	46.0	60.0	79.0	110.0	.....	523	Broke with large splinter on corner	137
7.2	14.4	22.4	32.0	3.4	33.0	44.0	.....	.....	.....	.....	.....	.....	297	Specimen cross-grained; started at knot	143
4.8	9.5	14.0	19.0	1.0	20.0	25.7	33 5	41.5	54.3	.....	.....	.....	413	Specimen cross-grained; split	310
5.2	10.1	15.3	21.6	1.5	21.6	28.2	38.0	49.6	.....	.....	.....	.....	392	Splintered at corners	310
5.0	10.5	15.5	21.4	1.4	21.2	29.0	39.5	54.3	.....	.....	.....	.....	395	Typical	432
4.7	8.5	13.4	17.6	0.6	17.9	23.0	30.5	40.0	54.5	73.0	.....	.....	450	Broke with fine splinters	831
7.0	13.5	20.6	29.0	3.3	29.7	40.2	56.0	73.2	.....	.....	.....	.....	390	......do	933
6.7	13.7	21.3	31.4	3.3	33.0	45.0	61.0	.....	.....	.....	.....	.....	343	Square break on tension side	933
6.0	11.7	18.6	25.5	2.5	26.8	34.0	40.0	62.0	79.0	.....	.....	.....	449	Failed from small splinters on corner	1071
5.4	10.7	17.0	23.4	2.0	23.6	30.8	40.5	54.6	73.5	.....	.....	.....	439	Failed from thin flakes on back	1072
6.4	12.0	18.2	26.1	2.5	26.3	34.4	47.0	62.5	88.5	.....	.....	.....	441	Failed from fine splinters on corner	1073
4.7	9.1	13.4	18.0	0.8	19.2	24.0	31.0	41.0	.....	.....	.....	.....	369	Square break; crushed	545
4.0	8.0	12.0	16.0	0.5	16.1	20.4	27.0	33.0	43.0	56.0	.....	.....	489	Broke with fine splinters	545
3.8	7.5	11.7	16.0	0.5	10.0	20.5	26.0	34.0	44.5	.....	.....	.....	444	Failed from long splinters on tension side	545
3.0	6.3	0.5	12.5	0.4	12.9	16.0	21.0	20.2	32.7	.....	.....	.....	435	Broke at knot in center of stick	762
2.8	6.4	9.4	12.5	0.5	12.5	16.0	20.0	25.0	31.4	39.0	.....	.....	450	Square break on tension side	762
6.4	11.7	18.2	25.7	1.4	26.0	33.5	45.0	58.0	78.0	109.5	.....	.....	472	Broke with small splinters; drew off bearing	54
5.0	9.0	14.0	19.0	1.0	19.5	26.0	34.5	45.0	62.0	.....	.....	.....	420	Broke with long splinters	54
5.0	9.0	13.7	19.2	1.0	19.0	25.3	33.0	42.5	57.5	.....	.....	.....	400	Square break on tension side, splitting in axis	54[2]
4.6	8.5	12.7	17.0	0.6	17.2	22.5	29.5	35.5	47.5	.....	.....	.....	442	Broke with fine splinters	54[3]
0.0	16.5	24.5	35.0	3.7	36.0	.....	.....	.....	.....	.....	.....	.....	248	Broke at knot near the end	846
7.5	14.1	22.0	31.6	3.3	32.1	41.5	50.0	.....	.....	.....	.....	.....	338	Specimen cross-grained; split with grain	846
4.5	9.0	13.5	18.5	0.9	19.1	24.2	31.6	40.0	52.2	73.0	.....	.....	454	Broke with fine splinters	240
5.1	10.4	15.4	21.0	1.0	21.6	27.6	37.0	49.5	64.5	90.0	.....	.....	469	......do	240
5.0	10.5	15.6	21.5	1.1	22.3	28.0	37.0	48.5	65.0	87.0	.....	.....	476	......do	524
4.4	8.7	14.0	18.7	1.0	19.0	24.0	31.5	42.5	56.0	75.5	.....	.....	488	......do	524
5.9	11.5	17.5	24.5	1.8	25.5	32.3	43.7	54.0	76.0	99.0	.....	.....	492	Failed from large splinter, starting at knot	755
5.5	11.4	17.2	24.0	2.0	24.5	32.0	42.5	58.0	76.0	135.0	.....	.....	481	Did not break; drew from bearing	755
4.0	7.8	11.4	14.7	0.3	15.0	19.0	24.4	30.0	37.5	47.5	61.5	.....	520	Broke with fine splinters	31
4.7	8.5	13.0	17.3	0.5	17.7	21.5	30.0	36.7	.....	.....	.....	.....	307	Square break on tension side, splitting in axis	31[1]
3.0	5.8	8.5	11.0	0.3	11.6	14.0	17.5	21.5	26.2	31.6	40.0	55.5	557	Crushed at bearing; broke with fine splinters	35
8.4	16.4	26.2	37.5	4.0	39.0	.....	.....	.....	.....	.....	.....	.....	233	Square break on tension side, splitting in axis	434
3.0	6.0	9.0	12.6	0.6	12.7	10.0	22.0	27.5	34.5	44.0	.....	.....	482	Square break with large splinters	925
4.0	8.0	12.0	16.0	0.6	16.6	20.7	26.0	33.3	41.0	.....	.....	.....	448	Failed from large splinter on corner	925
5.0	10.0	14.6	20.4	1.4	20.8	26.8	35.0	40.3	58.0	78.5	.....	.....	489	Broke with fine splinters	34
3.3	6.4	10.0	13.0	0.3	13.3	16.5	20.6	25.0	30.0	36.2	45.0	54.0	621	Deflection with a pressure of 600 kilograms, 68 millimeters; broke with fine splinters.	34[1]
5.0	9.3	14.0	19.0	1.0	19.3	25.0	32.5	42.0	51.5	60.5	92.5	135.0	551	Broke with large splinters	273
4.0	8.0	12.0	16.3	0.6	16.4	21.5	27.5	35.0	43.0	55.5	70.0	.....	545	Broke with fine splinters	287

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
261. Quercus prinoides—continued	323	Texas	Dallas	J. Reverchon	Calcareous	0.9205		976	1007	1230
	323	do	do	do	do	0.9966		976	1007	1090
	514	Tennessee	Nashville	A. Gattinger	Alluvial	0.9059		1085	1149	1289
	514	do	do	do	do	0.8755		976	1062	1120
262. Quercus Douglasii *Mountain White Oak. Blue Oak.*	688	California	Contra Costa county	G. R. Vasey	Clay	1.0023		888	921	1048
	688	do	do	do	do	1.0284		610	622	937
263. Quercus oblongifolia *White Oak.*	655	do	San Diego county	do	Dry, gravelly	1.1408		697	697	968
	655	do	do	do	do	1.0474		1017	1017	469
264. Quercus grisea *White Oak.*	608	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, rocky	0.9821		718	740	937
266. Quercus Durandii	1103	Texas	Austin	S. B. Buckley	Damp, calcareous.	1.0023		888	888	998
	1103	do	do	do	do	1.0420		800	787	987
267. Quercus virens *Live Oak.*	404	Florida	Charlestown Navy-yard.	S. H. Pook		1.0469		1436	1502	1055
	799	do	Saint John's river	A. H. Curtiss	Sandy	0.9127		1285	1395	1322
	799	do	do	do	do	0.9307		1221	1252	1212
	919	Alabama	Mobile county	C. Mohr	Rich, sandy	0.9114		1221	1191	1010
	919	do	do	do	do	0.8972		1163	1122	1054
	954	Texas	Matagorda bay	C. Mohr	Sandy loam	1.0114		697	740	816
	954	do	do	do	do	1.0193		751	751	649
268. Quercus chrysolepis *Live Oak. Maul Oak. Valparaiso Oak.*	649	California	San Bernardino	W. G. Wright		0.8835		076	1085	1308
	649	do	do	do		0.8989		1039	1149	1268
	653	do	Marin county	G. R. Vasey	Gravelly	0.9386		1221	1221	1284
	653	do	do	do	do	0.9204		1285	1338	1212
269. Quercus Emoryi *Black Oak.*	654	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, rocky	1.0264		642	638	703
270. Quercus agrifolia *Enceno. Coast Live Oak.*	663	California	Marin county	G. R. Vasey	Loam	0.8602		1061	957	937
	663	do	do	do	do	0.8508		976	048	930
271. Quercus Wislizeni *Live Oak.*	685	do	Auburn	G. Engelmann		0.8676		904	849	759
	685	do	do	do		0.8653		857	872	877
271. Quercus rubra *Red Oak. Black Oak.*	7	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.7011		1953	1627	1282
	7	do	do	do	do	0.6872		1285	1356	1171
	7	do	do	do	do	0.6364		1136	1149	1048
	7	do	do	do	do	0.6500		1356	1320	1067
	45^1	Kentucky	Mercer county	W. M. Linney	Shale	0.5528		976	096	855
	45^2	do	do	do	do	0.6159		976	1007	902
	45^3	do	do	do	do	0.5432		857	1302	787
	92	Kentucky	Mercer county	W. M. Linney	Alluvial	0.6201		814	814	787
	140	Michigan	Dansville	W. J. Beal	Sandy	0.6787		1221	1252	919
	141	do	do	do	do	0.5987		763	769	780
	146	Illinois	Waukegan	Robert Douglas	Gravelly	0.7464		1221	1221	895
	215	Vermont	Charlotte	C. G. Pringle	do	0.7293		1356	1356	1057
	215	do	do	do	do	0.6763		976	1028	877
	217	do	do	do	do	0.7316		888	886	1071
	218	do	do	do	do	0.7254		1221	1302	1242
	218	do	do	do	do	0.6955		1221	1268	1172
	920	Mississippi	Enterprise	C. Mohr	Alluvial	0.5841		857	814	680
	920	do	do	do	do	0.5852		976	921	762

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
5.0	9.7	15.4	20.0	1.1	20.5	26.5	33.5	43.0	54.0	68.0	91.0	......	525	Broke with long splinters	323
5.0	9.7	15.3	21.0	1.5	21.5	28.0	36.0	45.5	59.5	93.0	......	......	465	......do	323
4.5	8.5	12.7	17.3	1.1	17.5	22.3	29.0	36.0	45.0	56.0	71.6	93.0	550	Broke with fine splinters	514
5.0	9.2	14.0	19.0	1.0	19.2	25.0	32.0	41.0	51.5	64.0	......	......	478	Shattered; cross-grained	514
5.5	10.6	16.0	22.0	1.0	22.0	28.0	36.0	46.0	56.0	......	......	......	447	Specimen cross-grained; split with grain	688
8.0	15.7	23.2	32.3	2.3	33.0	42.5	55.3	72.0	......	......	......	......	400	Specimen cross-grained; started at knot	688
7.0	14.0	21.0	30.0	2.5	31.0	40.0	52.5	70.0	90.5	......	......	......	413	Specimen cross-grained; split with grain	655
4.8	9.6	14.5	20.5	1.2	21.6	......	......	......	......	......	......	......	200	Sap-wood; broke at knot	655
6.8	13.2	20.7	29.0	2.5	29.8	39.0	51.0	65.5	......	......	......	......	400	0.75 sap-wood; heart defective; typical break	698
5.5	11.0	16.5	23.0	1.5	23.4	29.5	38.3	48.5	63.0	......	......	......	426	Specimen cross-grained; split with grain	1103
6.1	12.4	19.3	27.0	2.0	27.3	35.0	46.0	61.5	80.0	......	......	......	421	......do	1103
3.4	6.5	10.0	14.0	0.2	14.0	17.0	21.4	26.5	38.0	48.0	......	......	450	Specimen cross-grained; splinter on corner	404
3.8	7.0	10.7	14.0	0.4	14.5	18.0	22.7	28.0	34.0	43.5	55.5	73.5	664	Broke with fine splinters	799
4.0	7.8	11.5	15.5	0.9	15.7	20.0	25.7	32.0	40.5	50.2	66.7	......	517	......do	799
4.0	8.2	12.3	16.3	0.5	16.2	20.6	26.5	33.0	55.0	......	......	......	431	Specimen cross-grained; broke at small knot	919
4.2	8.7	12.5	17.1	0.2	17.0	22.0	28.4	35.0	43.0	......	......	......	450	......do	919
7.0	13.2	20.6	29.5	3.0	30.0	39.0	51.7	69.2	......	......	......	......	348	......do	954
6.5	13.0	20.0	29.2	3.1	30.0	40.7	......	......	......	......	......	......	277	Specimen cross-grained; started at knot	954
5.0	9.0	13.5	18.2	0.5	18.2	23.0	28.0	35.5	43.0	54.2	73.0	120.0	558	Broke with fine splinters	649
4.7	8.5	12.2	16.6	0.5	16.6	20.0	25.5	32.0	38.0	46.5	50.0	......	541	Failed from large splinter on corner	649
4.0	8.0	12.0	16.4	0.6	16.5	21.0	27.0	33.0	40.0	49.0	66.0	......	548	Specimen cross-grained; large splinter on corner	653
3.8	7.3	11.2	14.7	0.6	15.0	19.0	24.5	30.5	36.5	45.0	59.0	......	517	Broke with coarse splinters	653
7.6	15.3	23.7	33.2	3.5	34.7	45.5	62.4	......	......	......	......	......	300	Specimen cross-grained; split with grain	654
4.6	10.2	15.6	21.8	1.6	22.7	29.6	39.2	52.0	75.0	......	......	......	400	Broke with fine splinters; buckled on compression side	663
5.0	10.3	15.0	21.3	1.5	21.9	29.0	38.0	51.0	......	......	......	......	397	Broke with long scale	663
5.4	11.5	17.5	25.4	1.7	25.8	35.0	47.0	......	......	......	......	......	324	Broke at knot near the end	685
5.7	11.2	16.8	23.3	1.3	24.0	33.0	39.5	51.5	......	......	......	......	374	Specimen cross-grained; square break on tension side, splitting in axis.	685
2.5	6.0	9.0	12.0	0.1	12.2	15.3	19.0	23.2	28.2	34.2	45.2	......	547	Broke with fine splinters	7
3.8	7.2	10.7	14.4	0.2	14.7	18.0	22.5	28.0	35.0	45.2	67.0	......	500	..... do	7
4.3	8.5	12.3	16.6	0.3	16.8	21.5	27.5	35.0	46.0	......	......	......	447	Broke with thin scale and fine splinters	7
3.6	7.4	11.3	15.2	0.4	15.3	19.5	25.3	32.0	43.0	59.0	......	......	451	......do	7
5.0	9.8	14.7	20.5	0.7	20.7	27.6	37.6	53.5	......	......	......	......	365	Broke with fine splinters	45[1]
5.0	9.7	15.3	21.7	0.5	20.7	27.0	35.0	46.0	......	......	......	......	385	Broke with coarse splinters	45[2]
5.7	11.5	17.0	23.7	1.2	24.7	32.5	47.5	......	......	......	......	......	336	Failed from scale on back	45[3]
6.0	12.0	18.0	24.5	1.3	24.6	32.0	42.5	......	......	......	......	......	336	0.5 sap-wood; square break on tension side, splitting in axis	92
4.0	7.8	11.5	15.4	0.3	15.7	20.0	26.0	33.0	......	......	......	......	392	Failed from large splinter on each corner	140
6.4	12.7	19.2	26.4	1.3	26.7	35.0	47.0	......	......	......	......	......	333	Specimen cross-grained	141
4.0	8.0	12.5	16.8	0.8	17.0	22.1	28.3	35.5	......	......	......	......	382	Failed from long splinter on corner	146
3.6	7.2	11.0	14.5	0.3	14.6	18.7	23.5	29.0	36.0	43.6	......	......	451	......do	215
5.0	9.5	14.5	20.0	0.6	20.0	26.2	34.5	46.0	......	......	......	......	374	Specimen cross-grained; broke with large splinters	215
5.5	11.0	17.0	24.0	2.0	24.5	31.0	41.0	52.5	68.0	92.0	......	......	457	Broke with coarse splinters	217
4.0	7.5	11.0	14.6	0.2	14.7	18.5	23.0	28.5	34.8	43.0	54.0	......	530	Broke with thin scale and fine splinters	218
4.0	7.7	11.2	15.4	0.3	15.5	19.7	25.0	30.7	38.0	46.0	60.0	......	500	Broke with fine splinters	218
5.7	12.0	18.0	27.0	2.3	27.7	30.5	......	......	......	......	......	......	200	Failed from long scale on back	920
5.0	10.6	16.0	24.0	2.0	24.5	33.0	40.0	......	......	......	......	......	325	Broke with long, coarse splinters	920

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
272. Quercus rubra—continued	1043	Massachusetts	North Reading	J. Robinson	Drift	0.7580		1221	1320	1282
	1043	do	do	do	do	0.7426		1221	1302	1172
272. Quercus rubra, *var.* Texana. *Red Oak.*	931	Texas	Austin	C. Mohr	Calcareous	0.8580		076	1039	1252
	931	do	do	do	do	0.8926		1017	1028	794
273. Quercus coccinea. *Scarlet Oak.*	752	Florida	Aspalaga	A. H. Curtiss	Clay	0.7654		976	1085	1055
274. Quercus tinctoria. *Black Oak. Yellow-bark Oak. Quercitron Oak. Yellow Oak.*	17	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.7102		1221	1221	1151
	17	do	do	do	do	0.6847		1085	1149	1054
	36^{1}	Kentucky	Danville Junction	W. M. Linney	Shale	0.7284		976	1028	1043
	36^{2}	do	do	do	do	0.7610		1221	1221	1270
	36^{3}	do	do	do	Slate	0.7932		697	723	954
	74	Missouri	Allenton	G. W. Letterman	Rich upland	0.8495		921	930	1181
	74	do	do	do	do	0.8408		814	814	930
	86	do	do	do	do	0.7519		888	930	1120
	244	Virginia	Wytheville	H. Shriver	Clay	0.5432		842	820	794
	244	do	do	do	do	0.5026		561	558	551
	247	do	do	do	do	0.7102		1479	1479	1284
	247	do	do	do	do	0.7046		1395	1436	1261
	437	Tennessee	Nashville	A. Gattinger	do	0.6949		1136	1136	937
275. Quercus Kelloggii. *Black Oak.*	628	Oregon	Saw-mill, Ashland	G. Engelmann and C. S. Sargent.		0.6642		814	849	869
	628	do	do	do		0.6841		872	921	844
	963	do	Eugene City	G. H. Collier		0.6960		660	651	663
	963	do	do	do		0.6875		525	558	698
276. Quercus nigra. *Black Jack. Jack Oak.*	268	Missouri	Allenton	G. W. Letterman	Clay	0.7688		976	976	1043
277. Quercus falcata. *Spanish Oak. Red Oak.*	131	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich loam	0.7521		1395	1302	1172
	131	do	do	do	do	0.7421		1320	1394	1071
	245	Virginia	Wytheville	H. Shriver	Clay	0.6307		1221	1221	1041
	245	do	do	do	do	0.6767		1320	1394	1172
	265^{2}	do	Carroll county	do	do	0.7837		1526	1502	1334
	265^{3}	do	do	do	do	0.6933		1221	1221	1172
	548	Mississippi	Kemper's mill	C. Mohr	Rich loam	0.7875		1526	1601	1266
	548	do	do	do	do	0.7614		1628	1575	1317
278. Quercus Catesbæi. *Turkey Oak. Scrub Oak. Forked-leaf Black Jack. Black Jack.*	342	Alabama	Cottage Hill	do	Barren, sandy	0.6875		888	948	990
	342	do	do	do	do	0.7193		1017	1062	1027
	770	Florida	Aspalaga	A. H. Curtiss	do	0.8395		076	1007	1113
	770	do	do	do	do	0.8442		1163	1122	1055
279. Quercus palustris. *Pin Oak. Swamp Spanish Oak. Water Oak.*	47	Missouri	Allenton	G. W. Letterman	Rich, alluvial	0.7148		1526	1479	1233
	282	do	do	do	do	0.7671		957	970	1055
	282	do	do	do	do	0.7534		904	913	982
280. Quercus aquatica. *Water Oak. Duck Oak. Possum Oak. Punk Oak.*	264^{1}	Virginia	Carroll county	H. Shriver		0.6523		1085	1122	989
	264^{2}	do	do	do		0.6170		1130	1191	1052
	264^{3}	do	do	do		0.6158		1163	1149	932
	349	Alabama	Cottage Hill	C. Mohr	Sandy loam	0.7142		1163	1285	1155
	349	do	do	do	do	0.7313		1221	1285	1120
	511	Tennessee	Tullahoma	A. Gattinger	do	0.7560		976	1028	919
	511	do	do	do	do	0.7411		1221	1338	1170

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
4.0	7.4	11.0	14.6	0.3	15.0	19.0	24.0	30.3	37.0	46.0	63.5	......	547	Broke with fine splinters and scale	1043
4.0	7.5	11.4	15.4	0.3	15.6	20.0	26.0	31.7	40.0	51.5	......	......	500	Failed from splinter on each corner	1043
5.0	9.4	14.0	19.0	0.5	19.2	25.0	32.0	40.0	50.7	63.0	86.5	......	534	Specimen cross-grained; broke with large splinters	931
4.8	9.5	14.7	20.4	1.2	21.0	27.2	38.0	......	......	......	......	......	359	Specimen affected with dry rot; broke at knot near the end	931
5.0	9.0	14.0	20.1	1.4	20.5	27.0	36.0	47.0	62.5	90.0	......	......	450	Broke with fine splinters	752
4.0	8.0	12.0	16.1	0.3	16.4	21.0	27.0	34.0	42.0	56.5	......	......	491	Broke with medium splinters	17
4.5	8.5	12.2	16.5	0.4	16.5	21.1	27.0	34.5	44.0	55.0	......	......	450	Broke with scales and fine splinters	17
5.0	9.5	14.5	20.2	1.0	20.4	27.2	35.0	45.5	58.2	......	......	......	445	Broke with coarse splinters on corner	36[1]
4.0	8.0	12.0	16.5	0.6	16.4	20.7	27.0	32.5	41.5	51.7	68.0	......	542	Broke with fine splinters	36[2]
7.0	13.5	21.4	31.0	3.5	31.5	42.0	58.0	80.0	135.0	......	......	......	407	Broke with split through center parallel to pressure	36[3]
5.3	10.5	15.8	22.6	1.8	23.6	30.6	40.0	51.5	64.0	88.5	140.0	......	504	Broke with fine splinters	74
6.0	12.0	18.5	25.8	1.8	26.3	34.0	46.2	60.5	......	......	......	......	397	Specimen cross-grained, knotty	74
5.5	10.5	15.7	21.7	1.5	22.1	28.2	36.7	47.0	57.7	75.0	......	......	478	Failed from scale on back and splinter on corner	86
5.8	11.9	18.0	26.0	1.5	26.5	37.0	55.0	......	......	......	......	......	339	Square break on tension side, splitting in axis of stick	244
8.7	17.5	28.5	43.4	5.0	44.0	......	......	......	......	......	......	......	235	......do	244
3.3	6.6	10.0	14.0	0.6	14.0	17.7	22.1	27.0	33.0	40.5	50.6	......	548	Crushed with fine splinters	247
3.5	6.8	10.0	13.4	0.4	13.4	16.7	20.5	25.6	31.7	40.5	51.6	......	538	......do	247
4.3	8.6	12.8	18.0	1.0	18.2	24.5	33.0	44.0	55.0	......	......	......	400	Failed from large scale and coarse splinter	437
6.0	11.5	17.3	23.5	0.9	23.9	31.0	40.3	51.5	......	......	......	......	371	Specimen cross-grained	628
5.6	10.6	16.0	22.0	0.8	22.1	28.5	36.0	46.7	......	......	......	......	360	......do	628
7.4	15.0	26.0	54.3	10.5	57.0	88.0	......	......	......	......	......	......	283	Failed from coarse splinter on compression side	963
9.3	17.5	27.5	41.5	4.8	43.5	61.5	......	......	......	......	......	......	298	Shaky	963
5.0	10.0	15.0	21.0	1.2	21.4	28.0	36.0	45.0	60.0	......	......	......	445	Broke with fine splinters	268
3.5	7.5	10.5	14.0	0.5	14.0	17.5	22.0	27.5	33.0	40.5	54.0	......	500	......do	131
3.7	7.0	10.2	13.7	0.4	14.0	17.4	21.6	26.5	32.5	41.0	55.0	......	457	Broke with coarse splinters	131
4.0	8.0	12.0	16.0	0.5	16.0	20.2	25.7	33.0	42.0	......	......	......	444	Square break on tension side, splitting in axis	245
3.7	7.0	10.0	13.7	0.5	13.7	17.0	21.2	26.3	33.0	43.5	60.0	......	500	Crushed at center bearing; broke with fine splinters	245
3.2	6.5	9.5	12.7	0.4	13.0	16.2	20.7	25.5	30.5	88.5	48.0	65.5	569	..... do	265[2]
4.0	8.0	12.0	16.0	0.5	10.0	20.0	25.2	31.5	40.0	48.3	......	......	500	Broke with long, coarse splinters	265[3]
3.2	6.1	9.0	12.1	0.3	12.4	15.4	19.0	23.0	28.0	34.2	40.0	......	540	Broke at knot with long flake	548
3.0	6.2	9.3	12.0	0.2	12.0	15.0	18.5	23.0	28.2	35.5	46.0	63.2	562	Crushed slightly at center bearing	548
5.5	10.3	15.4	20.0	0.9	21.1	27.0	34.5	44.0	55.5	......	......	......	423	Broke with large splinters	342
4.8	9.2	14.0	19.0	1.0	19.0	25.0	31.3	39.0	50.2	......	......	......	438	Broke with large splinters; shattered	342
5.0	9.7	14.6	20.2	1.1	20.0	26.0	33.0	41.6	51.5	66.2	......	......	475	Specimen cross-grained; split through knot	770
4.2	8.7	13.0	18.5	1.0	18.9	24.2	31.2	39.0	50.0	......	......	......	450	Specimen cross-grained; shattered	770
3.2	6.6	10.2	13.7	0.3	14.2	17.5	22.5	28.0	35.5	44.0	63.0	......	526	Crushed at center bearing; broke with fine splinters	47
5.1	10.0	15.0	21.0	1.8	22.0	29.0	38.5	49.5	66.0	105.0	......	......	450	Square break on tension side, splitting in axis	282
5.4	10.7	17.0	24.0	2.1	24.4	32.5	44.0	60.0	91.0	......	......	......	419	Broke with scale and fine splinters	282
4.5	8.7	13.0	17.7	0.7	18.0	24.0	32.0	44.0	58.5	......	......	......	422	Square break on tension side, splitting in axis	264[1]
4.3	8.2	11.8	16.0	0.2	10.5	21.0	26.7	34.0	44.6	......	......	......	449	Broke with fine scale	264[2]
4.2	8.5	13.0	18.0	0.9	18.3	24.2	32.5	44.2	......	......	......	......	398	Square break on tension side, splitting in axis	264[3]
4.2	7.6	11.5	15.5	0.5	15.6	20.0	24.7	31.0	37.0	47.0	......	......	493	Broke with fine splinters	349
4.0	7.6	11.5	15.8	0.6	16.0	20.4	26.5	34.0	44.5	58.5	......	......	478	......do	349
5.0	9.5	14.0	20.4	1.2	20.7	26.5	34.3	44.0	......	......	......	......	392	Broke with coarse scales	511
4.0	7.3	10.9	14.3	0.5	15.0	19.0	24.0	30.0	38.5	47.0	......	......	499	Broke with coarse splinters	511

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity.		Modulus of rupture.
								First deflection.	Second deflection.	
280. Quercus aquatica—continued	742	Georgia	Bainbridge	A. H. Curtiss	Alluvial	0.7415		1221	1285	800
	742	...do	...do	...do	...do	0.8006		1356	1356	1334
281. Quercus laurifolia. *Laurel Oak.*	756	Florida	Saint John's river	...do	Sandy loam	0.8034		1221	1177	1055
	756	...do	...do	...do	...do	0.7980		1320	1221	1111
	801	...do	...do	...do		0.8105		1356	1320	1289
	801	...do	...do	...do		0.8204		1221	1320	1266
282. Quercus heterophylla. *Bartram's Oak.*	1171	New Jersey	Mount Holly	S. P. Sharples	Clay	0.7023		1395	1338	1165
	1171	...do	...do	...do	...do	0.6818		1110	1085	947
	1171	...do	...do	...do	...do	0.6898		1221	1252	1111
283. Quercus cinerea. *Upland Willow Oak. Blue Jack. Sand Jack.*	352	Alabama	Citronelle	C. Mohr	Pine-barren	0.7159		697	751	994
284. Quercus hypoleuca	674	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, rocky	0.8716		904	967	1120
	674	...do	...do	...do	...do	0.8325		939	921	1106
285. Quercus imbricaria. *Shingle Oak. Laurel Oak.*	40[1]	Kentucky	Harrodsburg	W. M. Linney	Utica shale	0.7440		1136	1085	1153
	50	Missouri	Allenton	G. W. Letterman	Rich, moist	0.7477		1252	1302	1284
286. Quercus Phellos. *Willow Oak. Peach Oak.*	512	Tennessee	Tullahoma	A. Gattinger	Moist, siliceous	0.7693		751	781	923
	512	...do	...do	...do	...do	0.7557		763	787	1055
287. Quercus densiflora. *Tanbark Oak. Chestnut Oak. Peach Oak.*	687	California	Marin county	G. R. Vasey	Gravelly	0.6910		872	842	846
	687	...do	...do	...do	...do	0.7205		976	1085	1048
288. Castanopsis chrysophylla. *Chinquapin.*	729	California	Mendocino county	A. Kellogg		0.5739		996	1007	846
	729	...do	...do	...do		0.5909		1017	1017	635
289. Castanea pumila. *Chinquapin.*	573	Arkansas	Hot Springs	G. W. Letterman	Sandy loam	0.6017		1285	1221	1031
	573	...do	...do	...do	...do	0.5960		1062	1062	949
290. Castanea vulgaris, *var.* Americana. *Chestnut.*	18	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.4123		498	525	415
	18	...do	...do	...do	...do	0.5330		888	872	703
	18	...do	...do	...do	...do	0.4568		679	651	619
	258[2]	Virginia	Fancy Gap	H. Shriver	Moist	0.5050		1221	1163	898
	258[3]	...do	...do	...do	...do	0.5053		1085	1039	867
	510	Tennessee	Nashville	A. Gattinger	Sandy	0.4939		872	888	675
291. Fagus ferruginea. *Beech.*	9	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.7333		1221	1302	1312
	9	...do	...do	...do	...do	0.7146		1221	1221	1235
	44[2]	Kentucky	Mercer county	W. M. Linney	Hudson River shale	0.6352		1085	1050	1026
	44[3]	...do	...do	...do	...do	0.6410		1039	1122	037
	119	Michigan	Dansville	W. J. Beal	Gravelly	0.7571		1221	1302	1284
	119	...do	...do	...do	...do	0.6945		1221	1302	1180
	765	Florida	Chattahoochee	A. H. Curtiss	...do	0.6892		976	1007	1024
	765	...do	...do	...do	...do	0.6770		1103	1136	1048
	853	Massachusetts	Hamilton	J. Robinson	...do	0.7000		1221	1221	1106
	853	...do	...do	...do	...do	0.7324		1285	1252	1221
	853	...do	...do	...do	...do	0.7250		1395	1305	1256
292. Ostrya Virginica. *Hop Hornbeam. Iron Wood. Lever Wood.*	11	...do	Arnold Arboretum	C. S. Sargent	Drift	0.7784		1628	1028	1446
	11	...do	...do	...do	...do	0.7614		1305	1470	1289
	877	...do	Danvers	J. Robinson	Rich loam	0.8460		1395	1395	820
	877	...do	...do	...do	...do	0.8591		1320	1395	084
	1047	...do	North Reading	...do		0.8068		1110	1163	1209
	1047	...do	...do	...do		0.8182		1136	1177	1057

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
4.0	7.6	12.0	16.[illegible]	1.0	17.0	21.8	29.0	......	......	......	......	......	344	Specimen cross-grained	742
3.6	7.2	10.3	13.7	0.4	14.0	17.5	21.3	26.0	31.0	37.0	46.5	58.0	569	Broke with coarse splinters	742
4.0	8.3	12.2	17.0	0.8	17.0	22.5	28.7	36.0	46.3	60.0	......	......	450	Broke with large splinters	756
3.7	8.0	11.6	16.0	0.5	16.0	20.6	27.0	33.2	42.5	58.5	......	......	474	Broke with large splinters and scale on tension side	756
3.6	7.4	11.0	14.5	0.5	15.0	18.7	23.5	29.5	36.5	46.0	58.5	80.0	550	0.5 sap-wood; broke with fine splinters	801
4.0	7.4	11.0	15.0	0.6	15.5	19.0	24.5	30.5	37.5	46.7	58.5	......	540	......do	801
3.5	7.3	11.0	14.7	0.5	15.0	19.2	23.7	29.5	37.0	48.0	......	......	497	Crushed at center bearing; broke with fine splinters	1171
4.4	9.0	12.0	10.5	0.5	17.0	20.9	26.0	33.0	42.0	......	......	......	404	Specimen cross-grained; broke with large splinters	1171
4.0	7.8	11.-0	14.7	0.5	15.3	19.0	24.0	30.5	38.7	49.0	......	......	474	Broke with fine splinters	1171
7.0	13.0	19.5	26.5	1.5	27.0	35.0	46.0	59.0	76.0	......	......	......	424	Cross-grained; broke with coarse splinters	352
5.4	10.1	15.0	20.8	1.0	21.0	27.0	35.5	44.3	55.7	72.5	......	......	478	Broke with coarse splinters	074
5.2	10.6	16.0	22.7	1.2	22.7	30.0	37.0	47.0	58.0	73.0	......	......	472	......do	674
4.3	9.0	13.5	18.5	0.5	18.6	24.4	31.5	40.0	49.6	60.7	......	......	492	0.5 sap-wood; broke with large splinters	40[1]
3.9	7.5	11.2	15.3	0.5	16.0	19.8	25.0	31.5	40.0	50.0	62.0	......	548	Broke with fine splinters	50
6.5	12.5	19.4	28.0	2.1	29.0	39.0	52.5	69.0	......	......	......	......	394	Broke with large splinters, starting at knot	512
6.4	12.4	19.2	27.0	1.9	27.5	36.0	47.0	63.0	81.5	110.0	......	......	450	Broke with coarse splinters	512
5.6	11.6	17.5	24.5	1.0	24.4	31.0	40.5	55.0	......	......	......	......	361	Broke with scale; started at knot	687
5.0	0.0	13.6	18.2	0.5	18.4	23.5	29.5	37.0	46.0	......	......	......	447	Broke with coarse splinters	687
4.9	9.7	14.8	20.0	0.4	20.2	25.5	32.0	40.5	......	......	......	......	361	Specimen cross-grained; shattered	729
4.8	9.6	14.6	20.2	0.5	20.3	20.0	......	......	......	......	......	......	271	Specimen cross-grained; splinter on corner	729
3.8	8.0	12.0	16.2	0.5	16.2	20.5	25.7	32.2	40.7	......	......	......	441	Scale on tension side; broke with coarse splinters	573
4.6	9.2	14.0	19.0	1.2	19.2	24.6	31.5	41.0	62.0	......	......	......	405	Crushed at center bearing; broke with scales on tension side	573
9.8	18.6	30.4	......	......	......	......	......	......	......	......	......	......	177	Shattered	18
5.5	11.2	17.0	23.6	0.7	24.0	30.7	40.5	......	......	......	......	......	300	......do	18
7.2	15.0	23.5	33.0	1.7	33.2	45.0	......	......	......	......	......	......	264	Square break; split at end	18
4.0	8.4	13.0	17.5	0.1	17.6	22.0	20.0	38.0	......	......	......	......	383	Crushed; square break	258[2]
4.5	9.4	14.4	19.5	0.4	19.6	25.0	33.0	41.0	......	......	......	......	370	Specimen cross-grained; shattered	258[2]
5.6	11.0	17.0	23.2	0.6	24.0	31.5	......	......	......	......	......	......	288	Broke with coarse splinters	516
4.0	7.5	11.6	15.7	0.5	15.6	20.0	26.0	30.7	36.5	45.0	55.5	......	560	......do	9
4.0	8.0	12.2	16.2	0.2	16.3	21.0	26.7	32.5-	42.0	54.0	75.0	......	527	Crushed; coarse splinters	9
4.5	9.3	14.0	19.0	0.4	19.0	25.0	31.5	41.0	52.5	......	......	......	438	Square break on tension side, splitting in axis	44[2]
4.7	8.7	13.6	18.0	0.5	18.2	23.7	30.5	38.5	52.0	......	......	......	400	Scale on tension side	44[3]
4.0	7.5	11.0	14.7	0.4	15.0	19.0	24.0	30.5	37.0	47.0	65.5	......	548	Broke with coarse splinters	119
4.0	7.5	11.2	14.7	0.5	15.0	·19.0	24.5	30.0	37.5	46.7	70.0	......	504	Broke with fine splinters; scale on tension side	119
5.0	9.7	14.2	19.4	0.7	19.5	25.0	32.0	40.0	53.0	....	......	......	437	Broke with coarse splinters	765
4.2	8.6	13.2	18.0	0.6	18.5	23.6	30.0	39.0	51.5	......	......	......	447	Specimen cross-grained; broke at knot	765
4.0	8.0	11.5	16.0	0.5	16.5	19.7	25.0	31.0	40.0	49.5	......	......	472	Failed from long splinter on corner	853
3.8	7.8	11.6	15.4	0.5	15.5	20.0	25.5	31.0	40.0	50.0	76.5	......	521	Crushed with fine splinters	853
3.5	7.0	10.0	13.6	0.4	14.0	17.5	21.7	27.0	32.5	42.0	56.5	......	536	Crushed with long splinters	853
3.0	6.0	8.6	11.5	0.3	12.0	15.0	18.5	22.0	27.0	33.5	40.0	52.0	617	Sap-wood; broke with fine splinters; deflection with 600 kilograms pressure, 64 millimeters.	11
3.5	6.6	10.0	13.5	0.2	13.7	17.0	22.0	28.0	34.0	43.0	60.0	75.0	550	Sap-wood; broke with fine splinters	11
3.5	7.0	10.4	14.0	0.4	14.0	18.0	22.3	28.0	......	......	......	......	350	Broke at knot	877
3.7	7.0	11.0	14.5	0.5	14.5	18.5	23.4	30.0	37.5	......	......	......	420	Square break on tension side, splitting in axis	877
4.4	8.4	13.0	17.5	1.0	18.0	23.7	30.5	40.0	51.5	67.5	102.0	......	516	Specimen cross-grained; splintered on corner	1047
4.3	8.3	12.0	17.5	1.0	18.0	23.5	31.0	40.0	52.0	73.5	......	......	451	Failed from scale on back	1047

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
293. Carpinus Caroliniana	46	Missouri	Allenton	G. W. Letterman	Damp, alluvial	0.7708		921	957	1134
Hornbeam. Blue Beech. Water Beech. Iron Wood.	73	Kentucky	Mercer county	W. M. Linney	Trenton limestone	0.7707		1221	1285	1355
	73[1]	...do	...do	...do	...do	0.7852		1395	1305	1172
	73[2]	...do	...do	...do	...do	0.7641		888	030	1055
	73[3]	...do	...do	...do	...do	0.7983		1285	1395	1406
	1038	Massachusetts	Danvers	J. Robinson	Gravelly	0.7367		857	921	773
BETULACEÆ.										
294. Betula alba, var. populifolia	16	...do	Arnold Arboretum	C. S. Sargent	Drift	0.6121		814	814	909
White Birch. Old-field Birch. Gray Birch.	16	...do	...do	...do	...do	0.6168		465	503	586
	848	...do	Danvers	J. Robinson	Gravelly	0.5949		872	872	837
295. Betula papyrifera	722	Montana	Missoula	Sereno Watson	Wet	0.6244		1110	1149	1083
Canoe Birch. White Birch. Paper Birch.	722	...do	...do	...do	...do	0.5948		1221	1140	1008
	836	Massachusetts	Townsend	J. Robinson		0.7034		1221	1320	1181
	996	Alaska	Chilcoot inlet	Paul Schultze		0.6136		1039	1085	816
	990	...do	...do	...do		0.6239		1221	1191	994
	1065	Vermont	Charlotte	C. G. Pringle		0.6921		1526	1502	1165
	1065	...do	...do	...do		0.6653		1628	1575	1099
	1065	...do	...do	...do		0.6614		1395	1526	1228
	1066	...do	...do	...do		0.6136		1085	1191	1069
	1060	...do	...do	...do		0.6136		1320	1338	1017
	1067	...do	...do	...do		0.6409		1356	1356	1134
	1067	...do	...do	...do		0.6628		1285	1285	982
296. Betula occidentalis	528	Colorado	Engelmann's cañon	Robert Douglas	Wet, sandy	0.5998		888	872	738
Black Birch.	629	California	Strawberry valley	G. Engelmann and C. S. Sargent.	Wet, peaty	0.5905		970	976	874
297. Betula lutea	843	Massachusetts	Danvers	J. Robinson	Gravelly	0.7147		1628	1550	1202
Yellow Birch. Gray Birch.	843	...do	...do	...do	...do	0.7215		1575	1526	1289
	1068	Vermont	Charlotte	C. G. Pringle	...do	0.6579		1575	1661	1216
	1668	...do	...do	...do	...do	0.6647		1628	1628	1219
	1669	...do	...do	...do	...do	0.6573		1479	1628	1320
	1060	...do	...do	...do	...do	0.6647		1628	1684	1212
	1670	...do	...do	...do	...do	0.6710		1479	1550	1245
	1670	...do	...do	...do	...do	0.6056		1953	1775	1282
298. Betula nigra	136	Missouri	Allenton	G. W. Letterman	Moist loam	0.5835		1039	1085	1041
Red Birch. River Birch.	136	...do	...do	...do	...do	0.5815		1221	1221	975
	841	Massachusetts	North Andover	J. Robinson	Alluvial	0.6335		1039	1085	954
	841	...do	...do	...do	...do	0.6273		1221	1356	1005
	842	...do	...do	...do	...do	0.6346		921	904	937
	842	...do	...do	...do	...do	0.6149		1639	1028	920
299. Betula lenta	4	...do	Arnold Arboretum	C. S. Sargent	Drift	0.7393		1395	1436	1289
Cherry Birch. Black Birch. Sweet Birch. Mahogany Birch.	4	...do	...do	...do	...do	0.7454		1470	1502	1282
	221	Vermont	Charlotte	C. G. Pringle	Gravelly	0.7602		1356	1302	1294
	844	Massachusetts	Danvers	J. Robinson	...do	0.8579		1395	1415	1052
	844	...do	...do	...do	...do	0.8215		1575	1502	1165
301. Alnus rubra	967	Alaska	Sitka	Paul Schultze		0.5060		970	1028	761
Alder.	967	...do	...do	...do		0.5017		1017	1617	763
	991	Washington territory.	Puyallup	G. Engelmann and C. S. Sargent.		0.5199		842	888	830
	991	...do	...do	...do		0.5244		842	807	826

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
5.3	10.2	15.2	21.0	1.2	21.5	28.0	36.4	48.0	60.5	80.0	......	......	484	Square break on tension side, splitting in axis	46
4.0	7.6	11.0	15.0	0.4	15.0	19.0	24.0	29.7	35.5	45.0	56.0	68.0	578	Broke with fine splinters	73
3.5	7.0	10.5	14.0	0.6	14.4	18.6	23.5	29.0	34.3	41.5	......	......	500	Specimen cross-grained; failed from large splinter on corner	73[1]
5.5	10.4	15.7	21.7	1.5	22.4	29.0	37.0	50.5	64.0	93.5	......	......	450	Square break on tension side, splitting in axis	73[2]
3.8	7.0	10.0	13.7	0.4	14.0	17.7	21.7	27.2	33.0	38.5	48.0	59.0	600	Deflection with 600 kilograms pressure, 82 millimeters; broke with fine splinters.	73[3]
5.7	10.6	17.0	24.0	2.2	24.8	33.0	45.0	......	......	......	......	......	330	Specimen cross-grained; started at knot	1038
6.0	12.0	18.0	25.4	0.4	26.0	34.2	48.5	67.0	......	......	......	......	388	Crushed at center bearing; square break on tension side	10
10.5	19.4	30.6	46.0	6.5	47.8	......	......	......	......	......	......	......	250	Broke at knot	10
5.6	11.2	17.6	25.5	2.5	26.8	36.2	56.0	82.0	......	......	......	......	357	Crushed at center bearing; broke with fine splinters	848
4.4	8.5	13.0	17.2	0.5	17.5	22.6	28.4	35.7	46.0	65.0	......	......	462	Square break on tension side, splitting in axis	722
4.0	8.5	13.4	10.0	1.0	19.2	25.0	33.0	44.0	58.5	......	......	......	430	Broke with coarse splinters	722
4.0	7.4	11.0	15.0	0.5	15.0	19.0	24.0	30.0	37.5	49.0	68.7	......	504	Failed from scale and long splinter on corner	836
4.7	9.0	14.0	19.5	1.0	20.0	26.3	35.0	.....	......	......	......	......	348	Specimen cross-grained; broke on corner	990
4.0	8.2	12.4	17.0	0.5	17.0	22.0	28.0	36.0	50.0	......	......	......	424	Broke with coarse splinters	990
3.2	6.5	10.0	13.0	0.5	13.4	17.0	21.0	26.5	33.0	43.0	......	......	497	Crushed at center bearing; broke with fine splinters	1065
3.0	6.2	9.5	13.3	0.7	13.3	17.0	21.5	26.5	33.0	43.0	......	......	469	Crushed at center bearing; broke with large splinter on corner	1065
3.5	6.4	10.0	13.4	0.6	13.7	17.0	22.0	27.0	33.0	39.0	51.5	......	524	Square break on tension side; broke with splinters	1065
4.5	8.2	12.6	17.0	0.4	17.3	21.7	27.5	35.0	44.0	......	......	......	456	Specimen cross-grained; broke with coarse splinters	1066
3.7	7.3	11.2	15.0	0.4	15.5	19.7	25.0	32.0	41.6	......	......	......	434	Crushed at center bearing; broke with fine scales	1066
3.6	7.2	10.7	14.3	0.3	14.3	18.0	23.0	28.0	35.5	43.0	......	......	484	Failed from scales and coarse splinters	1067
3.8	7.6	12.0	16.5	0.5	16.5	21.5	28.0	36.0	52.0	......	......	......	419	Crushed at center bearing; splintered	1067
5.5	11.2	18.0	27.0	2.9	27.4	37.5	54.0	......	......	......	......	......	315	Specimen cross-grained; shattered	528
5.0	10.0	15.5	21.4	0.9	21.6	29.2	40.5	60.0	......	......	......	......	373	Crushed at center bearing; square break on tension side, splitting in axis.	629
3.0	6.3	9.3	12.7	0.5	12.7	16.2	20.0	24.5	30.5	36.5	50.0	......	513	Sap-wood; specimen cross-grained; shattered	843
3.1	6.4	9.2	12.5	0.4	12.6	15.7	19.5	24.5	30.0	36.0	47.5	60.0	550	Sap-wood; crushed at center bearing; broke with coarse splinter on corner.	843
3.1	6.1	9.4	12.4	0.3	12.2	15.4	19.2	23.2	29.0	37.5	57.0	......	519	Sap-wood; crushed at center bearing; broke with coarse scales	1068
3.0	6.0	9.0	11.5	0.3	11.5	14.5	18.0	21.7	27.0	34.5	49.5	......	520	Crushed at center bearing; broke with fine splinters	1068
3.3	6.0	8.7	11.6	0.2	11.5	14.0	17.0	20.7	25.0	31.0	40.0	55.0	563	0.5 sap-wood; crushed at center bearing; broke with fine splinters	1069
3.0	5.8	8.8	11.6	0.3	11.7	14.5	17.7	21.7	26.5	33.0	45.5	......	517	0.75 sap-wood; crushed at center bearing; broke with fine splinters.	1069
3.3	6.3	9.4	12.4	0.3	12.4	15.6	19.5	24.0	30.5	38.0	......	......	531	Sap-wood; crushed at center bearing; broke with fine splinters on corner.	1070
2.5	5.5	8.3	11.3	0.1	11.4	14.5	18.0	22.0	27.0	33.7	45.5	......	547	Heart-wood; crushed at center bearing; broke with fine splinters	1070
4.7	9.0	13.3	18.2	0.5	18.6	23.5	30,0	30.0	64.5	......	......	......	444	Sap-wood; broke with coarse splinters at corners	136
4.0	8.0	12.0	15.9	0.7	16.3	21.0	27.0	35.5	51.0	......	......	......	416	Sap-wood; crushed at center bearing; broke with coarse splinters at corners.	136
4.7	0.0	14.0	19.0	0.9	19.4	25.0	32.5	45.0	66.0	......	......	......	407	Sap wood; crushed at center bearing; splintered at corners	841
4.0	7.2	11.0	14.7	0.6	14.7	19.0	24.0	31.0	41.0	......	......	......	429	Sap-wood; crushed at center bearing; broke with fine splinters on tension side.	841
5.3	10.8	17.0	23.6	1.5	24.0	32.0	45.0	61.5	100.0	......	......	......	400	Sap-wood; crushed at center bearing; shattered on corner	842
4.7	9.5	14.0	19.2	0.5	10.4	25.0	33.0	45.0	......	......	......	......	395	Sap-wood; specimen cross-grained; started at knot	842
3.5	6.8	10.0	13.5	0.4	13.5	17.5	21.6	27.0	34.0	40.7	51.5	72.0	550	Sap-wood; crushed at center bearing; square break on tension side, splitting in axis.	4
3.3	6.5	10.0	13.0	0.3	13.5	16.7	20.8	20.0	32.0	40.0	51.0	......	547	Sap-wood; splintered on corners	4
3.6	7.5	10.4	13.3	0.2	13.0	16.5	19.7	24.0	28.5	34.5	43.7	60.0	552	Square break on tension side, splitting in axis	221
3.5	0.9	10.0	13.0	0.4	13.5	17.2	22.0	27.0	34.0	......	......	......	448	Splintered on corners	844
3.1	6.5	10.0	13.7	0.4	14.0	18.0	22.6	28.0	35.5	45.5	......	......	497	Specimen cross-grained	844
5.0	9.5	14.4	19.0	0.5	19.5	25.5	......	......	......	......	......	......	299	Square break on tension side, splitting in axis	967
4.8	0.6	14.6	19.8	0.5	20.0	26.0	......	......	......	......	......	......	300	......do	967
5.8	11.0	16.7	22.5	0.7	22.7	30.0	37.5	50.0	......	......	......	......	354	......do	991
5.8	12.1	19.0	27.0	1.9	27.5	37.0	50.0	72.0	......	......	......	......	350	......do	991

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY.		Modulus of rupture.
								First deflection.	Second deflection.	
301. Alnus rubra—continued	1025	Oregon	Portland Furniture, Company.	G. Engelmann and C. S. Sargent.		0.4739		1320	1285	900
	1025	....do	....do	....do		0.5084		1221	1338	905
302. Alnus rhombifolia *Alder.*	635	....do	Ashland	....do		0.4857		904	948	738
	717	Montana	Missoula	Sereno Watson	Wet	0.4545		679	669	567
	717	....do	....do	....do	....do	0.4886		729	751	701
	979	Oregon	Drain	C. S. Sargent	Moist loam	0.4465		904	948	698
	979	....do	....do	....do	....do	0.4375		888	913	703
303. Alnus oblongifolia *Alder.*	694	California	San Bernardino	W. G. Wright		0.4170		787	751	696
	694	....do	....do	....do		0.4049		787	787	677
305. Alnus incana *Speckled Alder. Hoary Alder. Black Alder.*	862	Massachusetts	Danvers	J. Robinson	Wet loam	0.5005		1163	1085	820
SALICACEÆ.										
306. Salix nigra *Black Willow.*	855	....do	Topsfield	....do	Alluvial	0.5330		407	391	424
307. Salix amygdaloides *Willow.*	908	Colorado	Cañon City	E. Weston		0.4675		610	514	511
	908	....do	....do	....do		0.4676		488	476	530
	911	....do	....do	....do		0.4670		554	514	609
308. Salix lævigata *Willow.*	690	California	Santa Cruz	G. Engelmann and C. S. Sargent.	Moist, sandy	0.5341		479	488	734
	690	....do	....do	....do	....do	0.5284		509	488	553
309. Salix lasiandra, *var.* lancifolia	640	....do	Strawberry valley	....do	Moist, rich	0.4705		542	525	584
	981	Oregon	Portland	F. Skinner	Alluvial	0.4375		1163	1085	701
	981	....do	....do	....do	....do	0.4614		976	1028	743
309. Salix lasiandra, *var.* Fendleriana	889	Utah	City Creek cañon	M. E. Jones	Gravelly	0.4498		330	305	469
313. Salix flavescens	721	Montana	Pattee's cañon, Missoula.	Sereno Watson	Rich, moist	0.5057		1221	1085	809
313. Salix flavescens, *var.* Scouleriana *Black Willow.*	972	Washington territory.	Seattle	G. Engelmann and C. S. Sargent.	Moist, sandy	0.5719		1285	1375	928
	972	....do	....do	....do	....do	0.5278		1221	1149	888
316. Salix lasiolepis *Willow.*	660	California	Santa Cruz	....do	Sandy loam	0.5760		921	888	813
318. Populus tremuloides *Aspen. Quaking Asp.*	272[2]	Colorado	Alpine	T. S. Brandegee	Damp	0.3955		740	781	562
	272[2]	....do	....do	....do	....do	0.3885		651	651	541
	1035	Massachusetts	Danvers	J. Robinson	Gravelly	0.4580		976	913	720
	1035	....do	....do	....do	....do	0.4828		888	913	881
319. Populus grandidentata *Poplar.*	847	....do	....do	....do	....do	0.4443		976	996	696
	847	....do	....do	....do	....do	0.4386		904	930	748
320. Populus heterophylla *River Cottonwood. Swamp Cottonwood.*	522	Tennessee	Nashville	A. Gattinger	Alluvial	0.4155		740	723	642
321. Populus balsamifera *Balsam. Tacamahac. Balm of Gilead.*	961	Alaska	Chilcoot inlet	Paul Schultze	....do	0.4080		857	842	574
	961	....do	....do	....do	....do	0.4034		888	872	527
321. Populus balsamifera, *var.* candicans	1054	Massachusetts	Topsfield	J. Robinson	Gravelly	0.4085		740	697	626
	1054	....do	....do	....do	....do	0.4500		751	763	593
322. Populus angustifolia *Black Cottonwood.*	552	Colorado	Manitou Springs	Robert Douglas	Sandy loam	0.4488		488	458	401
323. Populus trichocarpa *Black Cottonwood. Balsam Cottonwood.*	1012	Oregon	Saint John's Barrel Factory, Portland.	F. Skinner		0.3750		1062	1050	682
	1012	....do	....do	....do		0.3808		1085	1002	637
	1028	....do	Portland Furniture Company.	G. Engelmann and C. S. Sargent.		0.4108		1221	1221	694
	1028	....do	....do	....do		0.4108		1163	1136	845

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
3.7	7.6	11.5	15.[illegible]	0.1	15.7	20.0	25.2	33.0					384	Crushed at center bearing; broke with fine splinters	1025
4.0	7.3	11.0	14.7	0.0	14.8	18.5	23.5	30.0					386	Specimen cross-grained; scaled on corner	1025
5.4	10.3	15.5	20.6	0.5	21.2	27.0	35.7						315	Square break on tension side, splitting in axis	635
7.2	14.6	23.0	34.0	3.5	35.0								242	Sap-wood; cross-grained	717
6.7	13.0	20.4	30.0	3.0	31.0	44.0							299	Square break	717
5.4	10.3	15.7	21.8	0.9	22.0	30.2							298	Square break on tension side, splitting in axis	979
5.5	10.7	16.5	22.2	1.0	23.0	30.6	50.0						300	Specimen cross-grained; square break on tension side, splitting in axis.	979
6.2	13.0	19.6	28.3	1.3	29.0	39.0							297	Crushed at center bearing; square break on tension side, splitting in axis.	694
6.2	12.4	19.0	27.3	1.5	28.0	38.7							289	Crushed at center bearing; splintered on corner	694
4.2	9.0	14.0	19.6	0.8	19.6	26.0	35.0						350	Broke with coarse splinters	862
12.0	25.0	44.0											181	Specimen cross-grained; split with grain	855
8.0	19.0	36.0	64.5	16.2	73.0								218	Crushed at center bearing; splintered on compression side	908
10.0	20.5	36.0	58.0	11.0	63.0								226	......do	908
8.8	19.0	32.5	55.0	11.5	57.0	91.0							260	Crushed at center bearing; splintered on tension side	911
10.2	20.0	31.2	46.0	5.0	47.5	64.0	110.0						313	Square break on tension side, splitting in axis; shattered	690
9.6	20.0	32.0	46.0	4.8	48.5								236	Specimen cross-grained; flaked on tension side	690
9.0	18.6	31.0	46.0	5.0	48.0								249	Specimen cross-grained; broke at knot	640
4.2	9.0	14.2	21.0	1.2	21.5	29.5	45.0						299	Crushed at center bearing; broke with fine splinters	981
5.0	9.5	14.3	19.5	0.5	20.0	26.0	36.0						317	Crushed at center bearing; scaled on tension side	981
14.8	32.0	57.0	125.0	32.5									200	Crushed at center bearing; shattered	889
4.0	9.0	14.0	10.0	1.1	20.0	20.5	36.5						345	Crushed at center bearing; splintered; square break on tension side, splitting in axis.	721
3.8	7.1	10.5	14.2	0.5	14.7	18.3	24.0	31.5					396	Crushed at center bearing; broke with fine splinters	972
4.0	8.5	12.5	16.8	0.3	17.2	22.0	28.0	35.0					379	Crushed at center bearing; broke with coarse splinters.	972
5.3	11.0	16.6	24.5	1.5	25.0	33.0	46.0						347	Crushed at center bearing; broke with fine splinters	669
6.6	12.5	19.3	27.7	2.4	28.7								240	Broke with long scale	272[2]
7.5	15.0	23.2	33.0	3.8	37.2								231	Specimen cross-grained; broke at knot	272[2]
5.0	10.7	17.0	24.0	1.5	24.5	32.0	50.0						309	Crushed at center bearing	1035
5.5	10.7	17.0	25.0	2.9	26.0	35.0	48.0	71.5					376	Broke with many fine splinters	1035
5.0	9.8	15.0	21.4	1.5	22.0	30.0							297	Splintered on corner	847
5.4	10.5	15.5	21.7	1.0	22.0	28.7	41.0						319	Crushed at center bearing; broke with fine splinters	847
6.6	13.5	21.4	30.7	3.3	32.0	47.0							274	......do	522
5.7	11.6	17.4	25.0	1.3	26.2								245	Specimen affected with dry rot; square break	961
5.5	11.2	17.6	25.5	1.7	20.2								225	......do	961
6.6	14.0	22.4	34.2	4.1	35.8	52.0							267	Crushed at center bearing; square break	1054
6.5	12.8	21.0	34.8	5.9	36.0	62.0							253	......do	1054
10.0	21.3	35.2											171	Specimen cross-grained; broke at knot	552
4.6	0.3	14.0	20.8	1.0	20.8	28.4							291	Square break with small splinters	1012
4.5	9.2	14.0	19.6	0.9	20.0	27.5							272	......do	1012
4.0	8.0	12.0	18.0	1.1	17.6	24.0							296	......do	1028
4.2	8.6	12.6	17.6	0.5	17.0	25.0							275	......do	1028

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
324. Populus monilifera. *Cottonwood. Necklace Poplar. Carolina Poplar. Big Cottonwood.*	255	Missouri	Allenton	G. W. Letterman	Alluvial	0.3552		669	669	548
	304	...do	...do	...do	...do	0.3824		888	857	661
	304	...do	...do	...do	...do	0.3477		751	723	605
	309	Texas	Dallas	J. Reverchon	...do	0.5136		1130	1149	803
	309	...do	...do	...do	...do	0.4858		842	842	759
	754	Florida	Chattahoochee	A. H. Curtiss	...do	0.5001		1221	1302	902
	754	...do	...do	...do	...do	0.4909		1221	1221	937
	754	...do	...do	...do	...do	0.4925		1221	1191	851
325. Populus Fremontii. *Cottonwood.*	659	California	Sacramento valley	G. R. Vasey	...do	0.4977		1017	1017	584
	659	...do	...do	...do	...do	0.5000		1085	1085	813
325. Populus Fremontii, *var.* Wislizeni. *Cottonwood. White Cottonwood.*	646	...do	San Bernardino	W. G. Wright	...do	0.5079		651	665	743
	646	...do	...do	...do	...do	0.5023		669	679	687
	909	Colorado	Cañon City	E. Weston		0.4867		904	1149	705
	909	...do	...do	...do		0.4451		976	939	703
	909	...do	...do	...do		0.4409		872	835	579
	909	...do	...do	...do		0.5107		763	794	642
CONIFERÆ.										
326. Libocedrus decurrens. *White Cedar. Bastard Cedar. Post Cedar. Incense Cedar.*	634	California	Saw-mill, Strawberry valley.	G. Engelmann and C. S. Sargent.		0.3748		697	751	619
	634	...do	...do	...do		0.3979		814	814	702
	662	...do	Saw-mill, San Bernardino mountains.	W. G. Wright		0.4818		872	896	781
	662	...do	...do	...do		0.4989		872	888	654
	662	...do	...do	...do		0.4869		828	888	654
327. Thuya occidentalis. *White Cedar. Arbor-vitæ.*	379	Vermont	Monkton	C. G. Pringle	Cold, peaty	0.3025		488	514	455
	379	...do	...do	...do	...do	0.2902		444	452	441
	782	New Brunswick		Intercolonial railway.		0.3580		519	542	544
	783	...do	Bridgeton	Ed. Sinclair		0.3439		651	610	527
	783	...do	...do	...do		0.3413		626	651	448
	790	Province of Quebec	Amqui	A. Grant		0.3216		588	610	584
	790	...do	...do	...do		0.3336		610	581	586
	792	...do		Grand Trunk railway.		0.2714		331	337	394
	792	...do		...do		0.2012		270	294	352
	792	...do		...do		0.2805		260	266	354
	874	Maine	Mattawamkeag	J. Robinson		0.3835		763	781	586
	874	...do	...do	...do		0.3902		669	729	666
	1099	Wisconsin	Eau Claire	H. C. Putnam	Drift	0.3560		542	558	586
	1099	...do	...do	...do	...do	0.4121		514	542	654
328. Thuya gigantea. *Red Cedar. Canoe Cedar.*	1017	Oregon	Weidler's saw-mill, Portland.	G. Engelmann and C. S. Sargent.		0.4312		1221	1149	818
	1017	...do	...do	...do		0.4256		976	1028	820
	1021	...do	Portland Furniture Company.	...do		0.3623		872	930	635
	1021	...do	...do	...do		0.3783		1017	1028	722
329. Chamæcyparis sphæroidea. *White Cedar.*	350	Alabama	Cottage Hill	C. Mohr	Sandy, wet	0.3626		271	257	328
	350	...do	...do	...do	...do	0.3153		341	334	380
	850	Massachusetts	Beverly	J. Robinson	Swampy	0.3625		498	488	483
	850	...do	...do	...do	...do	0.3602		425	415	551
	851	...do	...do	...do	...do	0.3523		444	444	469
	851	...do	...do	...do	...do	0.3407		519	514	500
	852	...do	...do	...do	...do	0.3324		388	376	469

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
7.3	14.6	23.0	33.5										234	Crushed at center bearing; square break on tension side, splitting in axis.	255
5.5	11.4	17.2	24.2	1.4	25.3	33.2							282	Crushed at center bearing; square break	304
6.5	13.5	21.0	30.0	2.6	30.7	41.5							258	......do	304
4.3	8.5	13.3	18.8	1.1	19.1	26.0	35.2	51.5					381	Crushed at center bearing; broke with fine splinters	309
5.8	11.6	18.0	25.6	3.0	26.5	36.0	48.5						324	Crushed at center bearing; shattered	309
4.0	7.5	12.0	16.0	0.4	16.0	20.7	25.8	33.0					385	Crushed at center bearing; broke with fine splinters	754
4.0	8.0	12.5	16.8	0.3	17.0	21.5	27.5	35.5					400	Shattered	754
4.0	8.2	12.8	17.2	0.6	17.5	22.4	29.0	39.0					363	......do	754
4.8	9.6	14.8	21.4	1.7	21.8								249	Started at knot; splintered at corner	659
4.5	9.0	14.0	19.4	0.9	19.4	25.3	33.3						347	Specimen cross-grained; splintered on corner	659
7.5	14.7	22.0	32.4	2.4	33.0	43.0	62.5						317	Specimen cross-grained; split	646
7.3	14.4	23.0	32.6	2.5	34.0	47.0							293	Crushed at center bearing; square break on tension side, splitting in axis.	646
5.4	8.5	13.4	19.0	1.3	19.5	25.5	34.6						339	......do	909
5.0	10.4	16.4	23.0	1.5	23.2	31.0	42.5						300	Square break on tension side, splitting in axis	909
5.6	11.7	18.4	26.7	2.1	27.2								247	Shattered	909
6.4	12.3	20.0	31.0	5.5	30.4	43.5							274	Broke with fine splinters	909
7.0	13.0	20.7	28.0	1.2	29.0	41.5							264	Square break	634
6.0	12.0	18.0	25.0	0.6	25.5	32.5	45.0						300	......do	634
5.6	10.9	16.5	22.5	0.5	23.0	29.0	35.5						334	Specimen cross-grained; shattered	662
5.6	11.0	16.5	22.0	0.7	22.0	29.0							279	......do	662
5.9	11.0	16.6	22.0	0.4	22.5	28.5							270	......do	662
10.0	19.0	30.0											194	Square break; splintered	379
11.0	21.6	34.6											188	......do	379
9.4	18.0	28.0	38.7	2.0	40.7								232	Square break on tension side, splitting in axis	782
7.5	16.8	24.0	33.5	1.2	34.6								225	......do	783
7.8	15.0	23.2											191	Broke with coarse splinters	783
8.3	16.0	24.5	35.5	2.0	37.0								249	Square break; splintered	790
8.0	16.8	26.0	36.2	1.6	37.2								250	Square break; splintered	790
14.7	29.0	50.5											168	Square break	792
17.5	33.2												150	Square break; split to end	792
18.2	37.5	63.0											151	Square break	792
6.4	12.5	19.5	27.5	1.0	28.7								250	......do	874
7.3	13.4	20.5	28.5	1.4	29.0	39.0							284	......do	874
9.0	17.5	27.0	38.0	2.4	40.5								250	......do	1099
9.5	18.0	28.5	39.0	2.1	40.8	55.0							279	Square break with long splinters	1099
4.0	8.5	13.0	17.8	0.4	18.0	23.0	30.0						349	Shattered	1017
5.0	9.5	14.0	19.0	0.5	19.0	24.0	31.0						350	Square break	1017
5.6	10.5	15.5	21.7	0.8	22.2	31.0							271	Shattered	1021
4.8	9.5	14.5	20.0	0.8	20.0	26.7	37.0						308	Square break on tension side, splitting in axis	1021
18.0	38.0												140	......do	350
14.3	29.2	50.5											162	Square break	350
9.8	20.0	32.5	47.5	5.2	50.2								206	Square break on tension side, splitting in axis	850
11.5	23.5	36.0	54.0	5.6	55.0								235	Square break	850
11.0	22.0	33.2											200	Square break on tension side, splitting in axis	851
9.4	19.0	20.6	46.0	5.2	49.5								217	Square break	851
12.0	20.0	38.0	63.0	8.2									200	......do	852

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
330. Chamæcyparis Nutkaensis *Yellow Cypress. Sitka Cypress.*	969	Alaska	Sitka	Paul Schultze		0.5697		814	814	851
	969	...do	...do	...do		0.4229		888	976	696
	983	British Columbia	Saw-mill, Victoria	G. Engelmann and C. S. Sargent.		0.5267		1221	1221	1020
	983	...do	...do	...do		0.5114		1110	1191	930
	994	Alaska	Peril strait	Paul Schultze		0.5074		1163	1149	872
	994	...do	...do	...do		0.4913		1085	1122	937
	994	...do	...do	...do		0.6267		1320	1221	930
	1000	...do	Weidler's saw-mill, Portland.	G. Engelmann and C. S. Sargent.		0.5078		814	842	698
	1000	...do	...do	...do		0.5159		763	723	281
331. Chamæcyparis Lawsoniana *Port Orford Cedar. Oregon Cedar. White Cedar. Lawson's Cypress. Ginger Pine.*	701	Oregon	Dean & Co.'s saw-mill, Marshfield.	...do		0.5239		904	930	820
	707	...do	...do	...do		0.4682		1221	1221	818
	707	...do	...do	...do		0.6335		1628	1502	1029
332. Cupressus macrocarpa *Monterey Cypress.*	675	California	Monterey	...do	Gravelly loam	0.6307		976	1062	1041
	675	...do	...do	...do	...do	0.6512		1085	1085	1052
333. Cupressus Goveniana	691	...do	Marin county	G. R. Vasey	Dry ridges	0.5580		452	456	520
	691	...do	...do	...do	...do	0.5563		514	542	659
	1100	...do	Calistoga	W. F. Fisher	...do	0.4834		610	592	635
	1100	...do	...do	...do	...do	0.5078		457	407	342
337. Juniperus pachyphlœa *Juniper.*	692	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Gravelly	0.5630		610	630	783
	692	...do	...do	...do	...do	0.5419		595	595	738
338. Juniperus occidentalis, *var.* conjugens. *Juniper.*	1102	Texas	Austin	S. B. Buckley	Limestone	0.7347		751	734	409
339. Juniperus Virginiana *Red Cedar. Savin.*	14	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.5310		509	501	701
	14	...do	...do	...do	...do	0.5302		514	614	743
	327	Texas	Dallas	J. Reverchon	Calcareous	0.5357		595	610	851
	327	...do	...do	...do	...do	0.5239		610	630	562
	734	Florida	Chattahoochee	A. H. Curtiss	...do	0.5723		787	787	1052
	734	...do	...do	...do	...do	0.5354		814	849	1031
	800	...do	Saint John's river	...do	Sandy loam	0.5558		787	781	755
	800	...do	...do	...do	...do	0.5385		904	888	806
	924	...do	Chattahoochee	C. Mohr	Alluvial	0.4997		888	868	888
	1249	Tennessee	Wilson county	A. E. Baird		0.7373		588	688	750
	1250	...do	...do	...do		0.6029		444	474	394
	1251	...do	...do	...do		0.5671		488	542	469
	1252	...do	...do	...do		0.6398		718	697	860
	1253	...do	...do	...do		0.6670		581	595	520
	1254	...do	...do	...do		0.5307		561	603	703
340. Taxodium distichum *Bald Cypress. Black Cypress. Red Cypress. White Cypress. Deciduous Cypress.*	535	Alabama	Stockton	C. Mohr	Alluvial	0.4907		1163	1122	675
	535	...do	...do	...do	...do	0.4023		1110	1163	666
	741	Florida	Chattahoochee	A. H. Curtiss		0.4167		904	904	687
	741	...do	...do	...do		0.4334		939	939	698
341. Sequoia gigantea *Big Tree.*	657	California	Tulare county	G. Engelmann and C. S. Sargent.	Granite	0.3426		565	595	611
	657	...do	...do	...do	...do	0.3506		425	444	469
	666	...do	...do	...do	...do	0.2687		359	315	401
342. Sequoia sempervirens *Redwood.*	673	...do	Russian river	C. S. Sargent		0.4103		574	558	637
	673	...do	...do	...do		0.4211			751	703

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
6.0	12.0	18.0	24.7	1.0	24.5	31.5	41.0	60.7					363	Square break; splintered	969
5.5	10.0	15.0	21.0	1.0	21.2	29.5							297	Crushed at center bearing; square break	969
4.0	8.0	12.0	16.0	0.4	16.0	20.0	25.5	31.7	42.0				435	Crushed at center bearing; square break, splitting in axis	983
4.4	8.2	12.5	17.0	0.5	17.5	21.5	28.0	36.0					397	do	983
4.2	8.5	12.5	17.2	0.4	17.0	22.0	28.5	39.5					372	do	994
4.5	8.7	13.5	17.6	0.2	18.0	22.5	29.0	37.0	53.0				400	Shattered	994
3.7	8.0	11.5	15.4	0.0	15.0	19.0	24.0	31.5					397	do	994
6.0	11.6	17.5	24.2	1.0	24.4	31.5							298	do	1000
6.4	13.5												120	Specimen cross-grained; started at knot	1000
5.4	10.5	15.6	21.6	0.6	22.4	29.0	37.0						350	Square break; shattered	701
4.0	8.0	12.0	16.4	0.4	16.5	21.0	28.0						349	Crushed at center bearing; square break on tension side, splitting in axis.	707
3.0	6.5	9.6	12.7	0.2	13.0	16.0	20.0	25.4	32.0				439	do	707
5.0	9.2	13.5	18.0	1.0	18.0	22.5	28.0	33.0	40.0				444	Square break on tension side, splitting in axis; shattered from end to end.	675
4.5	9.0	13.5	17.6	0.3	18.0	22.5	27.5	34.0	42.0				449	do	675
10.8	21.4	35.0	49.0	5.0	49.0								222	Shattered	691
9.5	18.0	27.8	40.0	3.4	41.7	58.0							281	do	691
8.0	16.5	25.5	35.0	1.5	35.7	46.4							271	Specimen cross-grained; shattered	1100
10.7	24.0												146	Specimen cross-grained; splinter on corner	1100
8.0	15.5	24.0	32.5	1.0	32.4	42.5	55.0						334	Shattered	692
8.2	16.4	25.0	34.0	1.1	34.0	44.0	58.5						315	do	692
6.5	13.3	20.5	28.0	1.6									200	Specimen cross-grained; shattered	1102
9.6	19.5	29.0	40.6	1.9	40.0	52.0							299	Shattered	14
9.5	19.0	29.0	40.0	2.0	40.5	53.0	70.0						317	do	14
8.2	16.0	25.0	33.2	1.2	33.5	43.0	56.0	73.5					363	do	327
8.0	15.5	24.0	31.0	0.8	32.0								240	do	327
6.2	12.4	18.2	24.5	0.7	24.5	31.7	38.5	47.2	59.5				449	0.25 sap-wood; square break on tension side, splitting in axis	734
6.0	11.5	17.0	23.0	0.4	23.0	29.0	35.7	45.5	54.5				440	0.5 sap-wood; square break; split end to end	734
6.2	12.5	19.2	26.5	1.1	26.7	35.0	43.5						322	Square break at knot; split to end	800
5.4	11.0	16.5	21.7	0.3	22.0	28.2	35.0						344	Square break on tension side, splitting in axis	800
5.5	11.0	16.1	21.5	0.2	21.8	27.7	34.5	43.5					379	Square break; split parallel to pressure	024
8.3	14.2	21.4	28.0	0.8	29.0	34.7	48.5						320	Specimen not seasoned; shattered	1249
11.0	20.6	31.0											168	Specimen not seasoned; cross-grained	1250
10.0	18.0	26.0	34.0	1.5									200	Specimen not seasoned; cross-grained; split to end	1251
6.8	14.0	21.5	28.7	1.3	30.0	36.5	45.2	58.0					381	Specimen not seasoned; shattered	1252
8.4	16.4	25.6	37.0	4.1	39.0								222	Specimen not seasoned; square break on tension side, splitting in axis.	1253
8.7	16.2	26.0	36.0	2.4	37.0	48.0	66.0						300	Specimen not seasoned; shattered	1254
4.2	8.7	12.9	17.5	0.5	18.2	24.5							288	Square break	535
4.4	8.4	13.0	17.9	0.6	18.2	24.0							284	Crushed at center bearing with flakes on tension side	535
5.4	10.8	16.7	23.5	1.0	24.5	33.0							293	Square break on tension side, splitting in axis	741
5.2	10.4	16.0	22.8	1.1	23.0	30.8							298	Broke with coarse splinters	741
8.2	16.4	25.0	34.0	1.2	35.0								218	Square break on tension side, splitting in axis	657
11.5	22.0	34.0	49.0	3.6									200	Square break	657
13.6	31.0	54.0											171	Sap-wood; shattered	666
8.5	17.6	27.0	38.0	2.0	38.5	52.5							272	Square break; split to end	673
6.2	13.0	19.0	26.2	0.5	26.5	34.5							300	do	673

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
342. Sequoia sempervirens—continued .	710	California	Santa Cruz	Turner, Kennedy & Shaw.		0.4443		697	697	654
	711	...do	...do	...do		0.4525		751	751	581
	711	...do	...do	...do		0.4419		542	558	501
	712	...do	Mendocino county	J. Kentfield & Co		C.3239		542	568	394
	712	...do	...do	...do		0.3239		651	651	580
	713	...do	...do	...do		0.3841		814	849	558
	713	...do	...do	...do		0.3648		751	708	633
	714	...do	...do	...do		0.5289		751	751	734
	714	...do	...do	...do		0.5243		651	666	804
	715	...do	...do	...do		0.5533		651	610	295
343. Taxus brevifolia *Yew.*	978	Oregon	Portland	G. Engelmann and C. S. Sargent.	Moist, rich	0.6743		814	849	1148
	978	...do	...do	...do	...do	0.7110		697	673	1010
345. Torreya taxifolia *Stinking Cedar. Savin.*	62	Florida	Chattahoochee	C. S. Sargent	Alluvial	0.5993		651	651	945
	277	...do	...do	A. H. Curtiss	Calcareous	0.4093		872	921	844
	277	...do	...do	...do	...do	0.4639		939	913	872
346. Torreya Californica *California Nutmeg. Stinking Cedar.*	651	California	Marin county	G. R. Vasey	Stony	0.5063		407	450	469
	651	...do	...do	...do	...do	0.5135		444	444	698
347. Pinus Strobus *White Pine. Weymouth Pine.*	1	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.4301		751	849	623
	1	...do	...do	...do	...do	0.4090		921	930	682
	222	Vermont	Charlotte	C. G. Pringle	Wet, swampy	0.6204		574	692	804
	777	New Brunswick		Intercolonial railway.		0.3871		651	638	424
	777	...do		...do		0.3932		1085	1039	635
	788	...do	Bridgeton	Ed. Sinclair		0.4022		1085	1062	654
	788	...do	...do	...do		0.4088		1039	1039	687
	789	Province of Quebec	Amqui	A. Grant		0.3698		763	751	570
	789	...do	...do	...do		0.3871		775	751	527
	797	...do		Grand Trunk railway.		0.4092		970	976	330
	797	...do		...do		0.3938		842	849	621
	1044	Massachusetts	Reading	J. Robinson	Drift	0.3710		688	697	390
	1044	...do	...do	...do	...do	0.4549		872	888	584
348. Pinus monticola *White Pine.*	975	British Columbia	Hastings' saw-mill, Burrard inlet.	G. Engelmann and C. S. Sargent.		0.4323		1163	1191	684
	987	Oregon	Cascade mountains	C. S. Sargent	Moist loam	0.3682		751	740	627
	987	...do	...do	...do	...do	0.3699		957	921	616
349. Pinus Lambertiana *Sugar Pine.*	638	California	Saw-mill, Strawberry valley.	G. Engelmann and C. S. Sargent.		0.4301		888	888	687
	668	...do		G. R. Vasey		0.3927		740	740	677
	668	...do		...do		0.3971		814	814	656
	730	...do	Lassen's peak	Sierra Lumber Company.		0.3363		763	787	541
	730	...do	...do	...do		0.3307		740	740	530
350. Pinus flexilis *White Pine.*	819	Colorado	Forest City	T. S. Brandegee	Gravelly	0.4602		751	787	687
	819	...do	...do	...do	...do	0.4642		651	697	635
	819	...do	...do	...do	...do	0.4733		787	835	770
	913	Nevada	Danville	A. Triple	...do	0.4664		381	381	396
351. Pinus albicaulis	992	British Columbia	Silver Mountain valley, Fraser river.	G. Engelmann and C. S. Sargent.		0.5066		370	348	464
	992	...do	...do	...do		0.4587		679	673	701

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
7.0	14.0	21.2	29.5	1.0	30.0	39.0	......	......	......	......	......	......	279	Square break	710
6.5	13.0	19.4	26.0	0.5	26.4	33.5	......	......	......	......	......	......	248	Square break; shattered	711
9.0	17.5	26.6	36.3	1.7	37.0	......	......	......	......	......	......	......	252	Square break	711
9.0	17.2	26.6	......	......	......	......	......	......	......	......	......	......	168	Shattered with flakes on tension side	712
7.5	15.0	22.4	32.0	1.5	33.5	......	......	......	......	......	......	......	250	Square break	712
6.0	11.5	17.2	23.5	0.7	24.0	......	......	......	......	......	......	......	238	Square break on tension side, splitting in axis	713
6.5	13.8	20.0	27.7	1.0	28.4	38.0	......	......	......	......	......	......	270	Square break	713
6.5	13.0	20.0	26.6	0.6	27.0	34.0	50.0	......	......	......	......	......	313	Shattered from end to end	714
7.5	14.7	22.0	29.5	0.9	30.0	38.0	48.0	......	......	......	......	......	343	Square break	714
7.5	16.0	......	......	......	......	......	......	......	......	......	......	......	126	Specimen with curly grain; square break on tension side, splitting in axis.	715
6.0	11.5	17.8	24.0	0.9	24.0	31.5	38.0	47.0	59.3	75.0	......	......	490	Square break on tension side, splitting in axis; shattered	978
7.0	14.5	21.5	29.7	1.7	30.0	39.0	49.0	61.6	84.0	......	......	......	431	......do	978
7.5	15.0	22.5	31.0	2.4	31.0	41.0	52.0	66.5	92.5	......	......	......	403	Shattered	62
5.0	10.6	16.5	22.3	0.4	22.5	28.7	35.5	47.0	......	......	......	......	360	Square break on tension side, splitting in axis; shattered	277
5.2	10.7	16.0	22.6	0.5	22.2	28.5	35.5	46.2	......	......	......	......	372	......do	277
12.0	22.7	34.5	50.5	......	......	......	......	......	......	......	......	......	200	Broke at small knot at point of compression	651
11.0	22.0	33.0	46.5	3.1	49.5	68.0	......	......	......	......	......	......	298	Square break on tension side, splitting in axis; also broke at knot near the end.	651
6.5	11.5	17.2	23.8	1.2	24.2	32.0	......	......	......	......	......	......	260	Square break with scale on tension side	1
5.3	10.5	16.4	22.8	0.5	23.2	31.0	......	......	......	......	......	......	291	Square break on tension side, splitting in axis; shattered	1
8.5	16.5	25.0	34.3	2.3	35.0	46.5	62.0	......	......	......	......	......	343	Square break; shattered	222
7.5	15.3	22.6	......	......	......	......	......	......	......	......	......	......	181	Cross-grained	777
4.5	9.4	14.0	20.0	1.0	20.4	29.0	......	......	......	......	......	......	271	Started at knot	777
4.5	9.2	14.2	19.8	0.6	21.0	29.0	......	......	......	......	......	......	279	Crushed at center bearing; square break	788
4.7	9.4	14.8	20.5	0.3	21.0	28.0	......	......	......	......	......	......	293	......do	788
6.4	13.0	20.7	30.0	2.0	31.0	......	......	......	......	......	......	......	243	Square break	789
6.3	13.0	20.0	32.3	3.6	33.5	......	......	......	......	......	......	......	225	......do	789
5.0	10.0	15.4	21.6	1.0	21.8	30.0	......	......	......	......	......	......	397	Square break; split to one end	797
5.8	11.5	17.8	25.2	1.3	25.2	36.0	......	......	......	......	......	......	265	Square break	797
7.1	14.0	22.4	......	......	......	......	......	......	......	......	......	......	167	Specimen cross-grained; broke at large knot	1044
5.6	11.0	17.0	24.0	1.3	24.6	......	......	......	......	......	......	......	249	Crushed at center bearing; splinter on corner	1044
4.2	8.2	12.5	17.1	0.7	17.5	24.0	......	......	......	......	......	......	292	Crushed at center bearing; broke with fine splinters	975
6.5	13.2	20.2	32.1	3.8	34.2	......	......	......	......	......	......	......	225	Square break	987
5.1	10.6	16.2	23.5	1.3	24.0	35.0	......	......	......	......	......	......	263	......do	987
5.5	11.0	17.0	23.0	0.6	23.0	30.2	......	......	......	......	......	......	293	Square break on tension side, splitting in axis	638
6.6	13.2	20.3	29.0	1.2	29.0	......	......	......	......	......	......	......	246	Shattered	668
6.0	12.0	18.2	26.0	1.0	26.0	35.0	......	......	......	......	......	......	280	Square break	668
6.4	12.4	18.7	28.0	2.4	29.5	......	......	......	......	......	......	......	231	Crushed at center bearing; square break	730
6.6	13.2	20.6	32.0	3.0	32.8	......	......	......	......	......	......	......	226	Square break	730
6.5	12.4	18.9	26.0	1.0	27.0	35.0	......	......	......	......	......	......	293	Square break; shattered	819
7.5	14.0	21.6	31.0	2.0	31.4	46.2	......	......	......	......	......	......	271	......do	819
6.2	11.7	17.5	24.0	0.8	24.2	32.0	43.0	......	......	......	......	......	331	Specimen cross-grained; square break on tension side, splitting in axis.	810
12.8	25.6	41.5	......	......	......	......	......	......	......	......	......	......	169	Square break at knot	913
13.2	28.0	46.0	......	......	......	......	......	......	......	......	......	......	198	Square break; shattered	902
7.2	14.5	22.5	31.0	1.2	32.0	42.0	......	......	......	......	......	......	299	......do	902

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity.		Modulus of rupture.
								First deflection.	Second deflection.	
352. Pinus reflexa .... *White Pine.*	661	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	....	0.5261		814	849	689
	661	....do	....do	....do		0.5392		939	976	851
353. Pinus Parryana .... *Piñon. Nut Pine.*	656	California	San Diego county...	G. R. Vasey	....	0.0862		390	349	347
	656	....do	....do	....do	....	0.6342		444	407	504
355. Pinus edulis .... *Piñon. Nut Pine.*	397	Colorado	Cañon City	E. Weston	Gravelly	0.6704		420	421	448
356. Pinus monophylla .... *Piñon. Nut Pine.*	882	Utah	Lewiston	M. E. Jones	Rocky	0.5894		421	415	281
	915	Nevada	Danville	A. Triple	Gravelly	0.6570		519	454	295
357. Pinus Balfouriana	631	California	Scott mountains	G. Engelmann and C. S. Sargent.	Rocky	0.5623		542	528	291
	631	....do	....do	....do	....do	0.5714		651	660	558
357. Pinus Balfouriana, *var.* aristata.... *Foxtail Pine. Hickory Pine.*	821	Colorado	Forest City	T. S. Brandegee	....	0.5113		568	574	469
	821	....do	....do	....do	....	0.4987		888	888	771
	821	....do	....do	....do	....	0.4811		842	763	680
	914	Nevada	Prospect mountain..	A. Triple	Rocky	0.6240		651	634	604
358. Pinus resinosa .... *Red Pine. Norway Pine.*	315	Michigan	Hersey	W. J. Beal	....	0.5482		1356	1395	595
	315	....do	....do	....do	....	0.5511		1320	1375	735
	785	New Brunswick ..	Bridgeton	Ed. Sinclair	....	0.4951		1030	1039	806
	785	....do	....do	....do	....	0.4191		888	849	670
	1074	Vermont	Charlotte	C. G. Pringle	....	0.4886		1221	1110	773
	1075	....do	....do	....do	....	0.4780		976	1007	703
	1076	....do	....do	....do	....	0.5221		1039	1062	813
	1076	....do	....do	....do	....	0.5164		1103	1221	799
359. Pinus Torreyana	996	California	San Diego county...	G. Engelmann	Sandy	0.5471		634	630	809
	996	....do	....do	....do	....do	0.5800		542	454	703
360. Pinus Arizonica .... *Yellow Pine.*	1154	Arizona	Santa Rita mountains.	C. G. Pringle	Rocky	0.6570		763	746	703
	1154	....do	....do	....do	....do	0.7913		814	835	553
	1155	....do	....do	....do	....do	0.4749		814	857	593
	1155	....do	....do	....do	....do	0.4696		872	888	709
	1156	....do	....do	....do	....do	0.4250		729	794	647
361. Pinus ponderosa .... *Yellow Pine. Bull Pine.*	619	Dakota	Deadwood	Robert Douglas ...	Gravelly	0.5034		1221	1285	881
	626	Oregon	Saw-mill, Ashland ..	G. Engelmann and C. S. Sargent.	....	0.4788		1356	1252	930
	630	California	Strawberry valley ..	....do	Low, wet, swampy	0.4814		101	190	443
	630	....do	....do	....do	....do	0.4748		266	264	382
	632	....do	Saw-mill, Strawberry valley.	....do	....	0.5502		1221	1221	905
	636	....do	....do	....do	....	0.4429		814	814	780
	689	....do	Saw-mill, San Bernardino.	W. G. Wright	....	0.5079		1285	1302	1041
	718	Montana	Saw-mill, Missoula..	S. Watson	....	0.4502		1085	1110	766
	718	....do	....do	....do	....	0.4750		1163	1103	818
	731	California	Lassen's peak	Sierra Lumber Company.	....	0.4795		1221	1221	783
	731	....do	....do	....do	....	0.4863		1163	1103	795
	907	Colorado	Cañon City	E. Weston	....	0.5206		313	305	391
	910	....do	....do	....do	....	0.5277		271	247	438
362. Pinus Jeffreyi .... *Bull Pine. Black Pine.*	633	California	Scott mountains	G. Engelmann and C. S. Sargent.	Dry, gravelly	0.5678		498	506	585
	633	....do	....do	....do	....do	0.5758		417	394	316
	667	....do	Saw-mill, San Bernardino.	W. G. Wright	....	0.5948		1221	1320	902
	667	....do	....do	....do	....	0.0329		1627	1479	1171

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength; transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
6.0	11.5	17.5	24.2	1.0	25.0	32.0	.....	.....	.....	.....	.....	.....	294	Specimen cross-grained; failed with long split	661
5.2	10.0	15.0	20.0	0.8	20.2	25.6	33.0	43.0	.....	.....	.....	.....	363	......do	661
12.5	28.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	148	Broke at knot near end	656
11.0	24.0	37.2	55.0	7.0	59.2	.....	.....	.....	.....	.....	.....	.....	215	......do	656
11.4	23.2	30.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	191	Broke at knot	397
11.6	23.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	120	Specimen cross-grained; broke at knot	882
9.4	21.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	126	......do	915
9.0	18.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	124	......do	631
7.5	14.8	23.2	32.5	3.2	34.5	.....	.....	.....	.....	.....	.....	.....	238	Square break	631
8.6	17.0	25.7	36.0	2.5	.....	.....	.....	.....	.....	.....	.....	.....	200	......do	821
5.5	11.0	17.3	23.5	0.0	23.5	31.0	40.0	.....	.....	.....	.....	.....	329	0.25 sap-wood; specimen cross-grained	821
5.8	12.8	19.0	26.3	1.1	27.0	36.0	.....	.....	.....	.....	.....	.....	290	Square break with split at end	821
7.5	15.4	24.0	34.2	3.0	35.7	46.2	.....	.....	.....	.....	.....	.....	296	Shattered	914
3.6	7.0	10.7	14.5	0.3	14.6	18.8	24.0	31.0	.....	.....	.....	.....	382	Crushed at center bearing; square break on tension side, splitting in axis.	315
3.7	7.1	10.5	14.0	0.4	14.0	17.8	22.5	28.5	.....	.....	.....	.....	399	Crushed at center bearing; square break	315
4.7	9.4	14.0	19.2	0.8	19.5	25.7	35.0	.....	.....	.....	.....	.....	344	Specimen cross-grained; shattered	785
5.5	11.5	16.8	23.5	0.8	24.0	32.0	.....	.....	.....	.....	.....	.....	286	Square break	785
4.0	8.8	13.0	17.6	0.3	17.6	23.0	30.0	.....	.....	.....	.....	.....	330	Square break on tension side, splitting in axis	1074
5.0	9.7	15.0	20.0	0.6	20.3	26.0	40.2	.....	.....	.....	.....	.....	300	Square break on tension side, splitting in axis; crushed at center bearing.	1075
4.7	9.2	14.0	19.5	0.7	19.5	25.0	33.0	.....	.....	.....	.....	.....	347	Square break; crushed at center bearing	1076
4.2	8.0	12.3	16.6	0.5	17.0	21.5	28.4	.....	.....	.....	.....	.....	341	Broke with long scale	1076
7.7	15.5	22.4	30.8	1.0	31.5	41.5	55.5	.....	.....	.....	.....	.....	345	Shattered	996
0.0	21.5	34.6	50.2	7.5	51.7	73.0	.....	.....	.....	.....	.....	.....	300	......do	996
6.4	13.1	20.0	27.5	1.0	28.2	36.0	48.0	.....	.....	.....	.....	.....	300	Square break on tension side, splitting in axis	1154
6.0	11.7	17.9	25.0	1.5	25.3	.....	.....	.....	.....	.....	.....	.....	236	Specimen cross-grained; broke at knot	1154
6.0	11.4	16.6	23.2	1.1	24.0	31.0	.....	.....	.....	.....	.....	.....	253	Square break on tension side, splitting in axis	1155
5.6	11.0	16.0	22.1	0.8	22.1	29.0	39.0	.....	.....	.....	.....	.....	328	Square break on tension side, splitting in axis; shattered	1155
6.7	12.3	19.0	26.5	1.1	27.0	35.0	.....	.....	.....	.....	.....	.....	276	Square break; split to one end	1156
4.0	7.6	11.5	15.5	0.3	15.3	19.5	25.0	31.5	.....	.....	.....	.....	376	0.75 sap-wood; crushed at center bearing; square break on tension side, splitting in axis.	619
3.6	7.8	11.0	15.5	0.2	15.5	20.0	24.2	30.5	.....	.....	.....	.....	397	Square break; shattered	626
25.6	51.5	80.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	180	Broken at end; shattered	630
18.4	37.0	57.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	163	Short break; shattered	630
4.0	8.0	12.0	16.0	0.4	16.2	20.0	25.0	31.6	.....	.....	.....	.....	386	Square break on tension side, splitting in axis	632
0.0	12.0	18.0	24.8	1.0	25.3	33.5	44.0	.....	.....	.....	.....	.....	333	Square break	636
3.8	7.5	11.2	14.7	0.2	15.0	18.5	23.0	28.0	35.0	.....	.....	.....	444	Square break on tension side, splitting in axis	689
4.5	8.8	13.3	18.0	0.4	18.0	23.0	30.7	.....	.....	.....	.....	.....	327	......do	718
4.2	8.4	12.7	17.0	0.5	17.0	22.4	28.0	.....	.....	.....	.....	.....	349	Square break; split to one end	718
4.0	8.0	12.5	16.8	0.5	16.7	21.5	28.5	.....	.....	.....	.....	.....	334	Square break on tension side, splitting in axis	731
4.2	8.4	12.4	17.0	0.6	17.5	21.5	27.5	.....	.....	.....	.....	.....	339	Specimen cross-grained	731
15.6	32.0	54.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	167	Sap-wood; specimen cross-grained; broke at knot	907
18.0	39.5	71.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	187	Cross-grained	910
9.8	19.3	30.0	40.0	3.8	41.8	55.5	.....	.....	.....	.....	.....	.....	250	Square break on tension side, splitting in axis; shattered	633
11.7	24.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	135	Square break at knot	633
4.0	7.4	11.0	15.0	0.5	15.0	19.0	24.0	32.5	.....	.....	.....	.....	385	Crushed at center bearing; broke with fine splinters	667
3.0	6.6	9.6	13.0	0.4	13.2	16.0	20.0	24.5	30.0	.....	.....	.....	500	Square break on tension side, splitting in axis	667

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY.		Modulus of rupture.
								First deflection.	Second deflection.	
363. Pinus Chihuahuana	664	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, gravelly	0.5801		626	651	905
	664	...do	...do	...do	...do	0.5983		872	800	759
364. Pinus contorta *Scrub Pine.*	997	British Columbia	Vancouver's island	...do	...do	0.6456		1808	1775	1048
	997	...do	...do	...do	...do	0.6198		1395	1395	937
365. Pinus Murrayana *Tamarack. Black Pine. Lodge-pole Pine. Spruce Pine.*	293	Colorado	Forest City	T. S. Brandegee	Moist, sandy loam.	0.4551		542	501	286
	293	...do	...do	...do	...do	0.4265		525	514	347
	563	...do	...do	C. S. Sargent	...do	0.4546		976	976	743
	625	California	Scott mountains	G. Engelmann and C. S. Sargent.	...do	0.4600		857	888	675
	625	...do	...do	...do	...do	0.4018		976	976	709
366. Pinus Sabiniana *Digger Pine. Bull Pine.*	644	...do	Contra Costa county	G. R. Vasey	Gravelly	0.5460		514	528	738
	644	...do	...do	...do	...do	0.5426		651	642	820
367. Pinus Coulteri	1157	...do	San Bernardino	W. G. Wright	Dry, gravelly	0.4443		1221	1221	818
	1157	...do	...do	...do	...do	0.4322		1062	1062	703
368. Pinus insignis *Monterey Pine.*	676	...do	Monterey	G. R. Vasey	Gravelly loam	0.4835		888	872	670
	676	...do	...do	...do	...do	0.5095		1130	1085	809
369. Pinus tuberculata *Knob-cone Pine.*	576	...do	Mount Shasta	G. Engelmann and C. S. Sargent.	Gravelly	0.4071		354	362	293
	576	...do	...do	...do	...do	0.3901		519	496	525
370. Pinus Tæda *Loblolly Pine. Old-field Pine. Rosemary Pine.*	82	Florida	Duval county	A. H. Curtiss	Moist, sandy	0.6068		1627	1627	998
	82	...do	...do	...do	...do	0.6147		1744	1684	1462
	355	Alabama	Cottage Hill	C. Mohr	Low, rich	0.5914		688	638	790
	355	...do	...do	...do	...do	0.5840		888	864	066
	388	North Carolina	Wilmington	E. Kidder	Loam	0.5600		1395	1302	1012
	388	...do	...do	...do	...do	0.4806		888	888	562
	389	...do	...do	...do	...do	0.4675		921	939	773
	389	...do	...do	...do	...do	0.4937		1136	1085	795
371. Pinus rigida *Pitch Pine.*	13	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.5670		697	651	797
	13	...do	...do	...do	...do	0.5943		775	769	851
	1046	...do	North Reading	J. Robinson	...do	0.4371		542	537	647
	1046	...do	...do	...do	...do	0.5140		376	368	663
372. Pinus serotina *Pond Pine.*	83	Florida	Duval county	A. H. Curtiss	Moist, sandy loam.	0.7592		1136	1163	1158
	83	...do	...do	...do	...do	0.7518		1221	1177	1172
373. Pinus inops *Jersey Pine. Scrub Pine.*	621	South Carolina	Aiken	H. W. Ravenel	Dry, sandy	0.5403		465	465	682
	622	...do	...do	...do	...do	0.5537		097	697	562
	1169	Indiana	New Albany	M. J. Robinson		0.5610		751	781	855
	1169	...do	...do	...do		0.5703		542	528	499
	1172	New Jersey	Mount Holly	S. P. Sharples	Clay	0.5920		452	428	722
	1172	...do	...do	...do	...do	0.7088		373	358	637
374. Pinus clausa *Sand Pine. Scrub Pine. Spruce Pine.*	270	Florida	Apalachicola	A. H. Curtiss	Dry, sandy barren.	0.5341		542	528	429
	270	...do	...do	...do	...do	0.5218		595	558	574
375. Pinus pungens *Table-mountain Pine. Hickory Pine.*	321	Virginia	Wytheville	H. Shriver	Clay	0.5160		679	630	771
	321	...do	...do	...do	...do	0.5300		076	976	680
376. Pinus muricata *Obispo Pine. Bishop's Pine.*	671	California	Marin county	G. R. Vasey	Gravelly	0.5573		1039	1085	1065
	671	...do	...do	...do	...do	0.5883		1221	1302	1059

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
7.8	15.0	23.0	31.5	1.6	32.0	42.0	55.0	71.0	.....	.....	.....	.....	386	Square break on tension side, splitting in axis	664
5.6	12.2	18.2	25.7	1.3	25.8	32.4	43.7	.....	.....	.....	.....	.....	324	Failed from large splinter on tension side	664
2.7	5.5	8.2	11.5	0.2	11.6	14.4	18.0	21.6	26.0	.....	.....	.....	447	Crushed at center bearing; failed from tension side	997
3.5	7.0	10.2	14.0	0.3	14.0	18.0	21.3	27.0	.....	.....	.....	.....	400	Failed from large splinter on corner	997
9.0	19.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	122	Broke at knot	293
9.3	19.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	148	Square break at knot	293
5.0	10.0	15.0	20.7	0.5	21.0	27.0	37.5	.....	.....	.....	.....	.....	317	Square break; splintered	563
5.7	11.0	16.8	23.7	1.0	23.5	32.0	.....	.....	.....	.....	.....	.....	288	Square break	625
5.0	10.0	15.0	20.2	0.5	20.6	27.5	35.5	.....	.....	.....	.....	.....	328	do	625
9.5	18.5	29.0	43.0	4.6	44.5	61.0	95.0	.....	.....	.....	.....	.....	315	Square break on tension side, splitting in axis; shattered	644
7.5	15.2	22.5	32.0	2.0	33.0	44.0	62.5	.....	.....	.....	.....	.....	350	do	644
4.0	8.0	12.2	16.2	0.2	16.6	21.3	27.5	.....	.....	.....	.....	.....	349	do	1157
4.6	9.2	14.6	20.0	0.5	20.0	27.0	.....	.....	.....	.....	.....	.....	300	Broke at knot	1157
5.5	11.2	17.0	23.5	1.0	23.7	31.0	.....	.....	.....	.....	.....	.....	286	Specimen cross-grained; shattered	676
4.3	9.0	14.3	19.6	0.4	19.8	26.0	33.4	.....	.....	.....	.....	.....	345	do	676
13.8	27.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	125	Sap-wood; square break	576
9.4	19.7	30.6	45.0	4.8	48.0	.....	.....	.....	.....	.....	.....	.....	224	do	576
3.0	6.0	9.0	12.0	0.4	12.3	15.6	19.0	23.0	29.0	.....	.....	.....	426	Crushed at center bearing; square break on tension side, splitting in axis.	82
2.8	5.8	8.7	11.7	0.2	11.8	14.5	17.6	21.3	25.7	30.2	37.2	.....	624	do	82
7.1	15.3	23.3	33.0	2.5	33.0	44.0	57.5	.....	.....	.....	.....	.....	337	Long split at one end	355
5.5	11.3	17.6	24.0	1.5	24.5	32.6	.....	.....	.....	.....	.....	.....	284	Long split	355
3.5	7.5	11.0	15.0	0.3	15.0	18.6	23.5	29.2	38.0	.....	.....	.....	432	0.33 sap-wood; square break	388
5.5	11.0	17.0	24.0	1.1	24.0	.....	.....	.....	.....	.....	.....	.....	240	Square break on tension side, splitting in axis; shattered	388
5.3	10.4	16.0	22.4	1.0	22.5	29.4	38.5	.....	.....	.....	.....	.....	330	do	389
4.3	9.0	13.0	18.0	0.5	18.0	23.0	30.2	.....	.....	.....	.....	.....	339	do	389
7.0	15.0	23.6	33.5	3.0	34.0	45.8	63.5	.....	.....	.....	.....	.....	340	Square break on tension side, splitting in axis	13
6.3	12.7	20.0	28.5	2.4	29.2	37.5	50.0	68.0	.....	.....	.....	.....	363	do	13
9.0	18.2	27.5	41.6	4.0	42.7	60.0	.....	.....	.....	.....	.....	.....	276	Shattered	1046
13.0	26.5	40.0	60.0	8.0	63.0	88.0	.....	.....	.....	.....	.....	.....	283	Square break on tension side, splitting in axis	1046
4.3	8.4	12.3	17.0	0.6	17.0	21.5	27.0	33.0	39.0	48.5	.....	.....	494	Broke with coarse splinters	83
4.0	8.3	12.6	17.0	0.5	17.4	22.2	27.5	34.5	42.5	52.6	.....	.....	500	do	83
10.5	21.0	32.3	49.0	6.0	51.0	71.0	.....	.....	.....	.....	.....	.....	291	Square break on tension side, splitting in axis	621
7.0	14.0	22.0	31.0	0.5	33.0	.....	.....	.....	.....	.....	.....	.....	240	Oblique fracture; started at knot	622
6.5	12.5	10.5	27.0	1.6	27.5	35.8	47.6	63.5	.....	.....	.....	.....	365	Shattered	1169
9.0	18.5	29.5	43.0	5.3	45.0	.....	.....	.....	.....	.....	.....	.....	213	Square break	1169
10.8	22.8	36.0	50.0	6.0	52.5	71.0	114.0	.....	.....	.....	.....	.....	308	Specimen cross-grained; shattered	1172
13.1	27.3	41.0	60.0	6.3	63.5	88.0	.....	.....	.....	.....	.....	.....	272	do	1172
9.0	18.5	32.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	183	Specimen cross-grained; started at knot	279
8.2	17.5	28.0	40.0	3.5	41.2	.....	.....	.....	.....	.....	.....	.....	245	Shattered	279
7.2	15.5	24.0	35.0	3.5	35.5	47.0	64.0	.....	.....	.....	.....	.....	320	do	321
5.0	10.0	16.5	23.2	1.2	23.2	30.8	.....	.....	.....	.....	.....	.....	200	Specimen cross-grained; broke near end	321
4.7	9.0	13.2	18.5	0.3	18.0	23.2	29.0	36.0	47.0	.....	.....	.....	429	Square break	671
4.0	7.5	11.8	15.0	0.0	15.2	19.0	24.0	28.5	35.0	44.0	.....	.....	452	do	671

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
377. Pinus mitis. *Yellow Pine. Short-leaved Pine. Spruce Pine. Bull Pine.*	278	Florida	Chattahoochee	A. H. Curtiss	Clay	0.6524		1221	1252	874
	278	...do	...do	...do	...do	0.6490		1395	1415	1055
	310	Louisiana	Amite	C. Mohr	Sandy loam	0.6516		1470	1458	1188
378. Pinus glabra. *Cedar Pine. Spruce Pine. White Pine.*	142	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich upland	0.4650		034	660	469
	142	...do	...do	...do	...do	0.4035		642	660	570
	544	Mississippi	Gainesville	C. Mohr	Low, sandy	0.3535		220	208	202
	544	...do	...do	...do	...do	0.3500		244	238	340
	544	...do	...do	...do	...do	0.4268		244	233	431
	764	Florida	Chattahoochee	A. H. Curtiss	Low, wet	0.5089		561	542	766
	704	...do	...do	...do	...do	0.4713		595	592	633
379. Pinus Banksiana. *Gray Pine. Scrub Pine. Prince's Pine.*	394	Michigan	Baldwin	W. J. Beal	Low, sandy	0.4912		574	574	574
	394	...do	...do	...do	...do	0.4917		814	769	649
	780	New Brunswick		Intercolonial railway.		0.5191		1320	1356	947
	780	...do		...do		0.4297		872	939	570
	879	...do		...do		0.4839		976	930	448
	879	...do		...do		0.5129		1039	1085	722
380. Pinus palustris. *Long-leaved Pine. Southern Pine. Georgia Pine. Yellow Pine. Hard Pine.*	81	Florida	Duval county	A. H. Curtiss	Sandy loam	0.9375		1628	1628	1160
	81	...do	...do	...do	...do	0.8125		1526	1575	1266
	81	...do	...do	...do	...do	0.6950		976	1062	820
	81	...do	...do	...do	...do	0.9822		1628	1628	1240
	85	...do	...do	...do	Moist, sandy	0.6164		814	888	820
	85	...do	...do	...do	...do	0.6632		1628	1575	1036
	85	...do	...do	...do	...do	0.7568		1039	1085	937
	85	...do	...do	...do	...do	0.8800		642	630	935
	243	...do	Saw-mill, Saint John's river.	...do		0.7087		1953	1775	1266
	243	...do	...do	...do		0.7066		2123	1713	1289
	357	Alabama	Cottage Hill	C. Mohr	Sandy loam	0.6643		1628	1550	1172
	357	...do	...do	...do	...do	0.8410		1628	1713	1472
	358	...do	Citronelle	...do	...do	0.8906		1436	1395	1289
	358	...do	...do	...do	...do	0.8700		1628	1775	1392
	359	...do	Chunchula	...do	...do	0.7988		1628	1684	1233
	359	...do	...do	...do	...do	0.8728		1628	1628	1397
	360	...do	...do	...do	...do	0.7654		1684	1770	1386
	360	...do	...do	...do	...do	0.7242		1221	1302	1170
	361	...do	...do	...do	...do	0.7585		2035	1953	1287
	301	...do	...do	...do	...do	0.7480		2035	2035	1322
	384	Florida	Saw-mill, Cedar Keys.	A. H. Curtiss		0.6005		057	967	642
	384	...do	...do	...do		0.6438		1628	1655	1064
	385	...do	...do	...do		0.7038		1221	1221	1045
	390	North Carolina	Wilmington	E. Kidder		0.6739		1808	1770	1137
	390	...do	...do	...do		0.6293		1028	1550	1062
	1096	Alabama	Mobile	C. Mohr		0.6375		1085	1163	1165
	1096	...do	...do	...do		0.6852		1470	1450	1095
381. Pinus Cubensis. *Slash Pine. Swamp Pine. Bastard Pine. Meadow Pine.*	84	Florida	Duval county	A. H. Curtiss	Moist, sandy	0.6934		1479	1302	1170
	84	...do	...do	...do	...do	0.6640		1163	1101	1048
	84	...do	...do	...do	...do	0.8314		1470	1479	1181
	356	Alabama	Cottage Hill	C. Mohr	...do	0.7716		1878	1953	1270
	356	...do	...do	...do	...do	0.7710		1953	1053	1465

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
4.0	7.8	11.2	15.1	0.2	15.2	19.0	24.0	29.2	......	......	......	......	373	Specimen cross-grained; started at knot	278
3.5	6.9	10.8	14.2	0.3	14.2	18.0	22.0	27.0	32.0	45.0	......	......	450	Square break on tension side, splitting in axis	278
3.3	6.7	10.0	13.1	0.0	13.2	16.5	20.2	25.0	29.5	34.0	43.5	......	507	......do	319
7.7	14.8	23.2	32.0	3.0	33.2	......	......	......	......	......	......	......	200	Specimen cross-grained; broke with long split with grain	142
7.6	14.8	22.5	32.0	2.4	32.2	......	......	......	......	......	......	......	243	Square break on tension side, splitting in axis	142
22.2	47.0	......	......	......	......	......	......	......	......	......	......	......	112	......do	544
20.0	41.0	......	......	......	......	......	......	......	......	......	......	......	145	Shattered	544
20.0	42.0	70.5	......	......	......	......	......	......	......	......	......	......	184	Square break at knot	544
8.7	18.0	29.0	42.0	5.2	43.0	60.0	89.0	......	......	......	......	......	327	Shattered	764
8.2	16.5	26.0	37.0	3.8	38.0	51.0	......	......	......	......	......	......	270	......do	764
8.5	17.0	27.0	30.0	5.0	40.2	......	......	......	......	......	......	......	245	Square break	394
6.0	12.7	19.6	27.5	1.4	27.6	38.0	......	......	......	......	......	......	277	Long, shattered break	394
3.7	7.2	10.8	14.3	0.3	14.3	18.2	23.0	28.6	38.0	......	......	......	404	Broke with small splinters	780
5.6	10.4	16.4	20.5	1.0	21.0	......	......	......	......	......	......	......	243	Broke at small knots	780
5.0	10.5	17.0	......	......	......	......	......	......	......	......	......	......	191	Broke at knot	879
4.7	9.0	13.7	18.4	0.4	18.4	30.0	37.0	......	......	......	......	......	308	Broke at small knots; shattered	879
3.0	6.0	9.0	12.4	0.2	12.5	15.6	10.0	22.6	27.0	32.5	......	......	405	Square break on tension side, splitting in axis	81
3.2	6.2	0.3	12.4	0.3	12.7	15.5	19.0	23.0	27.2	31.7	37.5	......	540	Crushed at center bearing; square break	81
5.0	9.2	14.0	18.2	0.4	18.2	23.0	28.0	......	......	......	......	......	350	Square break with large splinters	81
3.0	6.0	9.0	12.6	0.3	12.3	15.6	19.0	22.0	26.2	31.0	39.0	......	529	Square break on tension side, splitting in axis with large splinters	81
6.0	11.0	17.0	23.2	1.5	24.0	31.5	41.5	55.7	......	......	......	......	350	Square break on tension side, splitting in axis	85
3.0	6.2	9.2	12.3	0.3	12.3	15.5	19.0	23.6	28.2	......	......	......	442	Crushed at center bearing; square break	85
4.7	9.0	13.7	18.8	1.0	18.8	24.0	31.0	37.2	......	......	......	......	400	0.5 sap-wood; splintered break	85
7.6	15.5	23.5	32.5	1.8	33.0	42.3	55.0	70.0	......	......	......	......	309	Shattered; split to one end	85
2.6	5.5	8.0	10.7	0.0	10.9	13.9	16.6	19.2	23.0	26.7	32.3	......	540	Broke with large flakes on back	243
2.3	5.7	8.2	11.0	0.0	11.0	13.6	16.6	20.0	23.0	27.5	32.5	30.0	550	......do	243
3.0	6.3	9.2	12.3	0.3	12.5	15.5	19.0	23.0	27.0	31.0	37.5	......	500	Square break with flakes on back	357
3.0	5.7	8.5	11.3	0.3	11.4	14.0	17.0	20.6	23.5	28.3	33.0	38.5	628	45 millimeters deflection with 600 kilograms; broke with flakes on back.	357
3.4	7.0	10.0	13.4	0.4	13.7	16.8	20.6	25.5	30.3	36.0	45.0	......	550	Square break. (*a*) Boxed 1852; chipped ten years; abandoned 1861	358
3.0	5.5	8.6	11.4	0.2	11.6	14.0	17.0	23.0	27.0	32.0	38.0	46.8	594	Shattered. (*a*) Boxed 1852; chipped ten years; abandoned 1861	358
3.0	5.8	9.0	11.6	0.3	12.0	14.5	17.5	21.0	25.0	20.0	34.0	......	626	Square break with large flakes on corners. (*a*) Boxed 1876; chipped four years; specimen taken along chip.	359
3.0	6.0	9.5	12.6	0.2	12.6	15.0	19.0	23.0	27.0	31.5	37.0	44.0	596	Square break on tension side, splitting in axis. (*a*) Boxed 1876; chipped four years; specimen taken along chip.	359
2.9	5.5	8.4	11.4	0.0	11.4	14.0	17.0	20.0	23.0	27.0	31.5	37.0	589	Broke with thin flakes on back. (*a*) Boxed 1876; chipped four years; specimen taken above chip.	360
4.0	7.5	11.0	14.6	0.4	14.6	18.4	22.5	28.0	33.0	40.0	......	......	499	Square break, somewhat shattered. (*a*) Boxed 1876; chipped four years; specimen taken above chip.	360
2.4	5.0	7.2	10.0	0.0	10.0	12.5	15.0	17.8	20.7	24.0	28.0	......	549	Square break on tension side, splitting in axis. (*a*) Boxed 1878; chipped two years.	361
2.4	4.8	7.3	9.8	0.3	10.0	12.0	15.0	17.0	20.2	23.6	28.0	34.0	564	Broke with many splinters. (*a*) Boxed 1878; chipped two years	361
5.1	10.1	15.2	20.3	0.6	20.5	20.7	......	......	......	......	......	......	274	Specimen cross-grained; split	384
3.0	5.9	8.5	11.5	0.2	11.6	14.2	17.5	20.8	24.5	29.0	36.5	......	454	Broke with flakes on back	384
4.0	8.0	11.4	15.5	0.4	15.4	10.6	24.0	29.2	35.0	......	......	......	446	Broke with thick flakes on back	386
2.7	5.5	8.5	11.0	0.0	11.2	14.2	17.0	21.0	25.0	30.5	......	......	485	......do	390
3.0	6.3	9.2	12.4	0.2	12.8	15.5	19.2	23.7	28.5	38.0	......	......	453	......do	390
4.5	8.4	12.6	16.8	0.6	16.8	21.5	26.6	32.5	39.0	48.0	......	......	497	Shattered. (*a*) Tree boxed eighteen or twenty years ago	1096
3.3	6.7	9.5	13.0	0.3	13.2	16.5	20.6	24.5	20.0	35.4	......	......	467	Broke with large flake. (*a*) Tree boxed eighteen or twenty years ago.	1096
3.3	7.5	11.2	15.3	0.2	15.5	19.5	24.5	30.0	35.7	44.0	......	......	409	Specimen cross-grained; split	84
4.2	8.2	12.4	16.5	0.4	16.4	20.8	25.3	31.0	36.5	......	......	......	447	Specimen cross-grained; broke with large splinters	84
3.3	6.6	10.0	13.0	0.2	13.2	16.2	20.0	24.0	28.5	33.0	39.0	......	504	Square break	84
2.6	5.0	7.8	10.3	0.2	10.2	13.0	15.5	18.2	21.3	25.0	30.0	......	542	Slightly splintered	356
2.5	5.0	7.3	10.0	0.3	10.0	12.0	15.0	17.5	21.0	24.0	28.0	31.5	625	39.2 millimeters deflection with 600 kilograms; broke with large flat splinters on corners.	356

a In the manufacture of turpentine.

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
381. Pinus Cubensis—continued	493	Florida	Bay Biscayne	A. H. Curtiss	Coral	0.8406		1479	1479	1064
	493	....do	...do	....do	...do	0.8942		1744	1084	998
382. Picea nigra *Black Spruce.*	231	Vermont	Charlotte	C. G. Pringle	Cold, peaty	0.5604		1526	1479	930
	231	....do	...do	....do	...do	0.5429		1221	1221	902
	373	.. do	Huntington	....do	Gravelly	0.4587		904	921	698
	776	New Brunswick	Bay of Fundy	Intercolonial railway.		0.4698		1062	1062	504
	776	....do	...do	....do		0.4919		1221	1221	834
	794	Province of Quebec.	Danville	Grand Trunk railway.		0.4296		996	1062	717
	794	.. do	... do	....do		0.4153		1221	1085	701
	880	New Brunswick	Bridgeton	Ed. Sinclair		0.4425		976	888	687
	880	....do	... do	....do		0.4785		939	872	741
383. Picea alba *White Spruce.*	513	New Hampshire	Stratford	C. G. Pringle	Gravelly	0.4455		787	769	736
	513	....do	...do	....do	...do	0.4983		679	688	703
	773	New Brunswick	Bay of Fundy	Intercolonial railway.		0.4579		1285	1252	813
	773	....do	...do	....do		0.4596		1163	1136	702
	784	....do	Bridgeton	Ed. Sinclair		0.4411		939	976	689
	784	....do	...do	....do		0.4530		976	976	731
	791	Province of Quebec.	Amqui	A. Grant		0.4319		1221	1236	811
	791	....do	...do	....do		0.4163		1136	1149	703
384. Picea Engelmanni *White Spruce.*	292	Colorado	Forest City	T. S. Brandegee	Damp	0.4325		976	1028	757
	292	....do	...do	....do	...do	0.3642		554	588	420
	575	....do	...do	C. S. Sargent	Peaty	0.3411		751	751	548
	822	....do	...do	T. S. Brandegee	...do	0.3805		888	864	577
385. Picea pungens *White Spruce. Blue Spruce.*	269	....do	Alpine	....do	Damp	0.3939		542	574	441
	270[1]	....do	...do	....do	...do	0.4036		444	444	387
	270[2]	....do	...do	....do	...do	0.3810		610	642	539
386. Picea Sitchensis *Tide land Spruce.*	970	Alaska	Sitka	Paul Schultze		0.4676		921	957	734
	970	....do	...do	....do		0.4568		1062	1085	741
	977	British Columbia	Saw-mill, Burrard inlet.	G. Engelmann and C. S. Sargent.		0.4038		1085	1149	682
	977	....do	... do	....do		6.3882		1039	1062	635
	1015	Oregon	Weidler's saw-mill, Portland	....do		0.4398		1221	1302	776
	1019	....do	Saw-mill, Astoria	....do		0.3517		996	976	614
	1019	....do	...do	....do		0.3688		1110	1085	673
	1026	....do	Portland Furniture Company.	....do		0.3891		642	651	553
	1026	....do	...do	....do		0.3810		610	642	431
387. Tsuga Canadensis *Hemlock.*	5	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.4210		763	814	674
	5	....do	...do	....do	...do	0.8989		787	781	580
	219	Vermont	Charlotte	C. G. Pringle	Gravelly	0.4716		1085	1062	738
	219	....do	...do	....do	...do	0.4699		1017	1007	797
	772	New Brunswick		Intercolonial railway.		0.5124		1136	1136	900
	772	....do		....do		0.5129		1136	1177	1031
	775	....do	Bay of Fundy	....do		0.4922		488	479	677
	775	....do	... do	..do		0.4458		432	432	635
	778	....do		... do		0.3496		679	688	541
	778	....do		....do		0.3675		669	665	530
	787	....do	Bridgeton	Ed. Sinclair		0.4811		976	976	745
	787	....do	...do	....do		0.4805		1085	1085	790

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
3.3	6.6	10.0	13.6	1.0	14.1	18.2	22.0	26.5	31.5	37.0	......	......	454	Square break	493
2.8	5.8	8.9	12.5	0.5	12.6	16.0	20.6	25.0	29.2	......	......	......	426	Square break on tension side, splitting in axis	493
3.2	6.6	10.0	13.5	0.3	13.8	17.0	21.2	28.0	......	......	......	......	397	Square break with scales on back	231
4.0	8.0	12.5	16.5	0.4	17.0	22.0	28.7	39.5	......	......	......	......	385	Crushed at center bearing; square break	231
5.4	10.6	16.4	22.7	1.0	23.0	30.0	......	......	......	......	......	......	298	Square break on tension side, splitting in axis	373
4.6	9.2	14.5	21.0	1.2	21.5	......	......	......	......	......	......	......	215	Square break at large knot	776
4.0	8.0	12.0	16.4	0.5	16.5	22.0	29.0	45.0	......	......	......	......	356	Square break	776
4.9	9.2	13.8	19.0	0.6	19.1	26.0	41.0	......	......	......	......	......	306	Square break on tension side, splitting in axis	794
4.0	9.0	13.5	19.0	0.5	19.5	27.0	......	......	......	......	......	......	299	Square break	794
5.0	10.0	15.0	21.2	0.9	21.5	30.0	......	......	......	......	......	......	293	......do	880
5.2	11.2	17.4	23.6	1.0	24.4	31.5	47.0	......	......	......	......	......	316	Square break; split to end	880
6.2	12.7	19.2	27.0	1.6	27.4	37.5	55.5	......	......	......	......	......	314	Broke with flat scales on back	513
7.2	14.2	22.4	32.7	4.0	33.5	45.7	......	......	......	......	......	......	300	Square break; shattered	513
3.8	7.8	12.0	16.0	0.5	16.2	21.0	29.2	......	......	......	......	......	347	Crushed at center bearing; failed from flakes on tension side	773
4.2	8.6	13.0	17.6	0.5	18.0	23.0	31.5	......	......	......	......	......	338	Square break	773
5.2	10.0	15.5	21.3	1.0	21.8	29.6	......	......	......	......	......	......	294	......do	784
5.0	10.0	15.3	21.3	0.6	21.5	29.5	43.2	......	......	......	......	......	312	......do	784
4.0	7.9	12.0	17.0	0.7	17.0	22.5	29.5	......	......	......	......	......	346	Crushed at center bearing; failed from thin scale on tension side	701
4.3	8.5	13.0	17.5	0.4	18.0	24.0	......	......	......	......	......	......	360	Crushed; square break	791
5.0	9.5	14.0	19.0	0.6	10.0	25.0	36.0	......	......	......	......	......	323	Broke with thin scale on back	292
8.8	16.6	26.4	......	......	......	......	......	......	......	......	......	......	179	Square break at knot near end	292
6.5	13.0	19.0	28.0	2.4	29.6	......	......	......	......	......	......	......	234	Square break	575
5.5	11.3	17.4	26.0	2.2	27.2	......	......	......	......	......	......	......	246	Square break with short splinters	822
0.0	17.0	28.0	......	......	......	......	......	......	......	......	......	......	188	Started at knot	269
11.0	22.0	35.2	......	......	......	......	......	......	......	......	......	......	165	......do	270[1]
8.0	15.2	24.7	39.5	5.5	41.2	......	......	......	......	......	......	......	230	Square break	270[2]
5.3	10.2	15.2	22.0	1.6	22.5	31.0	46.0	......	......	......	......	......	313	Crushed at center bearing; broke with few thin splinters	978
4.6	9.0	13.4	18.2	0.7	18.7	25.0	34.0	......	......	......	......	......	316	......do	970
4.5	8.5	13.2	19.0	1.0	19.0	27.0	......	......	......	......	......	......	291	Crushed at center bearing; broke with fine splinters	977
4.7	9.2	14.3	21.0	1.5	21.8	32.5	......	......	......	......	......	......	271	Crushed at center bearing; broke with thin flake	977
4.0	7.5	11.4	15.4	0.4	15.8	21.0	28.5	......	......	......	......	......	331	Crushed at center bearing; broke with fine splinters	1015
4.9	10.0	14.8	22.0	1.5	22.6	35.3	......	......	......	......	......	......	262	Crushed at center bearing; broke with thin flake	1019
4.4	9.0	13.6	10.7	1.0	20.0	28.0	......	......	......	......	......	......	287	Crushed at center bearing; broke with fine splinters	1019
7.6	15.0	24.4	36.4	4.3	38.0	......	......	......	......	......	......	......	230	Shattered	1026
8.0	15.2	24.7	......	......	......	......	......	......	......	......	......	......	184	Specimen cross-grained; split	1026
6.4	12.0	17.8	25.0	1.0	25.4	......	......	......	......	......	......	......	245	Shattered	5
6.2	12.5	19.2	27.0	2.0	27.9	......	......	......	......	......	......	......	250	Square break on tension side, splitting in axis	5
4.5	9.2	14.0	19.0	0.6	19.0	24.8	34.5	......	......	......	......	......	315	Broke with large flakes on back	219
4.8	9.7	14.3	19.5	0.7	19.8	25.0	33.0	......	......	......	......	......	340	Square break	219
4.3	8.6	12.8	17.0	0.3	17.3	22.0	28.5	36.4	......	......	......	......	384	Square break with long split in center	772
4.3	8.3	12.5	17.0	0.4	17.2	22.0	27.0	36.0	......	......	......	......	440	......do	772
10.0	20.4	34.0	49.0	7.2	51.0	69.5	......	......	......	......	......	......	289	Square break on tension side, splitting in axis	775
11.3	22.6	35.5	53.2	7.8	54.0	72.0	......	......	......	......	......	......	271	Shattered	775
7.2	14.2	21.8	32.8	4.0	33.0	......	......	......	......	......	......	......	231	Square break; shattered	778
7.3	14.7	22.7	34.5	3.0	30.0	......	......	......	......	......	......	......	226	Square break	778
5 6	10.0	15.0	20.5	0.6	21.0	27.5	35.7	......	......	......	......	......	318	Square break; somewhat shattered	787
4.5	9.0	13.5	18.5	0.6	16.7	24.0	32.5	......	......	......	......	......	337	Square break	787

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY. First deflection.	COEFFICIENT OF ELASTICITY. Second deflection.	Modulus of rupture.
387. Tsuga Canadensis—continued	793	Province of Quebec	Danville	Grand Trunk railway.		0.5264		1130	1177	839
	703	...do	...do	...do		0.5248		1221	1285	1024
	817	West Virginia	Grafton	C. G. Pringle		0.4041		957	986	640
	817	...do	...do	...do		0.3748		814	814	558
	1040	Massachusetts	Danvers	J. Robinson	Moist loam	0.5096		763	746	848
	1040	...do	...do	...do	...do	0.5114		751	763	858
	1042	...do	North Reading	...do		0.4248		1062	1028	703
	1042	...do	...do	...do		0.4244		921	896	703
388. Tsuga Caroliniana *Hemlock.*	623	North Carolina	Hendersonville	A. H. Curtiss	Dry, rocky	0.5335		697	713	462
389. Tsuga Mertensiana *Hemlock.*	971	Washington territory.	Wilkeson	G. Engelmann and C. S. Sargent.	Rich loam	0.5318		1017	1017	570
	995	Alaska	Sitka	Paul Schultze		0.5002		1628	1628	1104
	995	...do	...do	...do		0.5472		1526	1479	1055
390. Tsuga Pattoniana	980	British Columbia	Silver peak, near Fraser river.	G. Engelmann and C. S. Sargent.	Gravelly loam	0.4590		751	763	720
	980	...do	...do	...do	...do	0.4715		775	787	720
391. Pseudotsuga Douglasii *Red Fir. Yellow Fir. Oregon Pine. Douglas Fir.*	271²	Colorado	Alpine	T. S. Brandegee	Moist	0.4852		814	842	776
	271²	...do	...do	...do	...do	0.4780		857	888	666
	271³	...do	...do	...do	...do	0.4874		1110	1149	848
	627	California	Saw-mill, Strawberry valley.	G. Engelmann and C. S. Sargent.		0.5735		1744	1628	1050
	627	...do	...do	...do		0.5382		1221	1356	937
	702	Oregon	Saw-mill, Marshfield	...do		0.4373		888	930	572
	704	...do	...do	...do		0.6590		1526	1628	1181
	705	...do	E. B. Dean's saw-mill, Marshfield.	...do		0.5795		1136	1221	933
	706	...do	...do	...do		0.5477		1395	1395	937
	708	...do	...do	...do		0.6687		1575	1628	1249
	708	...do	...do	...do		0.6892		1808	1808	1317
	709	...do	...do	...do		0.4375		1085	1085	766
	709	...do	...do	...do		0.4448		1163	1085	802
	720	Montana	Saw-mill, Missoula	S. Watson		0.5345		1062	1062	703
	720	...do	...do	...do		0.5448		1221	1221	921
	732	California	Lassen's peak	Sierra Lumber Company.		0.5227		1221	1252	820
	732	...do	...do	...do		0.5090		1163	1163	703
	881	Utah	Salt Lake	M. E. Jones	Rocky	0.5601		996	976	933
	881	...do	...do	...do	...do	0.5705		1163	1110	975
	973	British Columbia	Saw-mill, Burrard inlet.	C. S. Sargent		0.5005		1221	1221	771
	973	...do	...do	...do		0.4909		1163	1149	820
	974	...do	...do	...do		0.5306		1356	1430	902
	980	...do	Saw-mill, Victoria	G. Engelmann and C. S. Sargent.		0.4596		1085	1122	787
	989	Oregon	Saw-mill, Portland	...do		0.6016		1221	1191	1008
	1008	British Columbia	Saw-mill, Burrard inlet.	...do		0.4879		1252	1338	764
	1008	...do	...do	...do		0.5501		1628	1628	808
	1011	Oregon	Oregon Railway and Navigation Co.	...do		0.5386		1221	1356	900
	1011	...do	...do	...do		0.5325		1191	1191	696
	1016	...do	Weidler's saw-mill, Portland.	...do		0.5960		1628	1713	900
	1010	...do	...do	...do		0.6085		1628	1028	696
	1018	...do	Saw-mill, Astoria	...do		0.6129		1628	1628	947
	1018	...do	...do	...do		0.6135		1808	1744	998
	1020	...do	Portland Furniture Company.	...do		0.4632		1110	1085	1048
	1020	...do	...do	...do		0.4485		[illegible]	976	1055

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
4.3	8.3	13.0	17.5	0.5	18.0	23.0	29.5	39.0					358	Crushed at center bearing with thin flake on tension side	793
4.0	7.6	11.5	15.3	0.2	15.6	10.5	24.3	30.0	42.4				437	Square break; long split in center	793
5.1	9.9	15.4	22.0	0.8	22.2	30.5							273	Square break	817
6.0	12.0	18.2	27.0	1.5	28.0								238	......do	817
6.4	13.1	20.4	28.0	2.0	28.0	36.0	47.0	64.0					362	Broke with flakes on tension side	1040
6.5	12.8	18.7	25.8	1.3	26.0	33.5	43.0	61.0					366	Square break on tension side, splitting in axis	1040
4.6	9.5	14.4	20.3	0.7	20.5	27.5							300	Crushed at center bearing; failed with flakes on corner	1042
5.3	10.9	16.4	23.2	1.3	23.7	32.0							300	Square break; shattered	1042
7.0	13.7	21.2											197	Specimen cross-grained; started at knot	623
4.8	9.6	14.4	21.0	1.4	21.5								243	Started at knots	971
3.0	6.0	9.3	12.6	0.4	12.9	16.0	19.7	24.5	30.5	39.0			471	Crushed at center bearing; failed from flakes on back	995
3.2	6.6	9.6	13.2	0.2	13.2	16.5	20.5	25.0	34.0				450	Crushed; splintered	995
6.5	12.8	19.5	27.0	1.1	27.9	36.0	55.5						307	Square break	980
6.3	12.4	18.9	26.4	1.4	26.7	35.5	48.2						307	......do	980
6.0	11.6	17.0	23.3	0.9	23.7	32.0	44.0						331	Square break and split at end	271[2]
5.7	11.0	16.5	24.0	1.0	24.0	33.0							284	Square break on tension side, splitting in axis	271[2]
4.4	8.5	13.0	17.5	0.6	18.0	23.0	29.5	41.2					362	Did not break; split through the center	271[3]
2.8	6.0	9.2	12.6	0.0	12.6	16.0	19.5	24.0	30.5				448	Square break; slightly splintered	627
4.0	7.2	11.0	14.5	0.2	14.6	18.2	23.0	29.6					400	......do	627
5.5	10.5	17.0	22.5	1.5	23.0								244	Flaked on tension side	702
3.2	6.0	9.0	12.1	0.3	12.2	15.0	18.5	23.0	27.0	33.0	38.5		504	Square break; large splinters	704
4.3	8.0	11.6	15.8	0.5	16.0	20.3	25.5	31.5					398	Specimen cross-grained; split with grain	705
3.5	7.0	10.4	13.0	0.3	14.0	17.0	22.0	27.8	39.5				400	Crushed at center bearing; square break	706
3.1	6.0	9.0	12.3	0.2	12.5	15.0	18.0	22.7	27.5	34.0	45.6		533	Square break on tension side, splitting in axis	708
2.7	5.4	8.2	11.0	0.0	11.2	14.0	17.0	20.0	24.5	29.0	34.5	44.5	562	......do	708
4.5	9.0	13.6	18.7	0.4	19.0	24.7	32.2						327	Failed from large splinter on corner	709
4.2	9.0	13.3	17.8	0.5	18.0	23.5	30.0						342	Specimen cross-grained; splintered	709
4.6	9.2	14.0	19.6	0.5	20.4	26.5	35.8						300	Specimen cross-grained; shattered	720
4.0	8.0	12.0	16.2	0.4	16.8	21.0	27.5	34.2					393	......do	720
4.0	7.8	11.7	16.0	0.4	16.0	20.8	26.5	36.0					350	Failed from large splinters on corners	732
4.2	8.4	13.0	17.8	0.6	18.0	23.4	30.5						300	Failed from large splinters on one corner	732
4.9	10.0	15.6	22.0	1.0	22.0	29.0	36.0	45.7					398	Square break on tension side, splitting in axis	881
4.2	8.8	13.4	18.6	0.5	18.5	24.6	30.6	38.5	51.5				416	Failed from large splinter on corner	881
4.0	8.0	12.2	17.0	0.4	17.5	22.0	29.2						329	Square break	973
4.2	8.5	12.7	17.0	0.3	17.5	22.5	28.7						350	......do	973
3.6	6.8	10.1	13.5	0.3	13.6	17.5	22.2	28.0					385	Failed from large splinter on each corner	974
4.5	8.7	13.2	18.0	0.6	18.0	24.2	31.0						336	Square break on tension side, splitting in axis	986
4.0	8.2	12.5	17.0	0.4	17.2	21.5	27.5	35.0	45.0				430	Crushed at center bearing; broke with fine splinters	989
3.9	7.3	11.0	14.7	0.3	15.0	19.0	25.5						320	Crushed at center bearing; broke with flakes on back	1008
3.0	6.0	9.0	12.5	0.0	12.2	15.5	19.5	26.6					383	Crushed at center bearing; square break; splintered	1008
4.0	7.2	11.0	14.5	0.5	14.8	18.7	24.0	31.5					384	Crushed at center bearing; broke with fine splinters	1011
4.1	8.2	12.3	16.8	0.4	16.9	22.2							297	Started at knot; splintered on corner	1011
3.0	5.7	8.8	12.0	0.2	12.3	15.0	19.0	24.0	32.0				384	Crushed at center bearing; broke with fine splinters	1016
3.0	6.0	9.0	11.6	0.2	12.0	14.8	18.4	23.4	32.5				297	Cracked at knot	1016
3.0	6.0	8.8	11.8	0.2	11.8	14.6	18.0	22.0	28.0				404	Crushed at center bearing and scaled on tension side	1018
2.7	5.0	8.6	11.6	0.2	12.0	14.5	18.5	23.0	31.0				420	Splintered	1018
4.4	9.0	13.3	18.0	0.5	18.0	24.0	34.0						447	......do	1020
5.0	10.0	15.2	21.2	0.7	21.5	28.5							450	......do	1020

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	Coefficient of elasticity. First deflection.	Coefficient of elasticity. Second deflection.	Modulus of rupture.
391. Pseudotsuga Douglasii—cont'd	1022	Oregon	Portland Furniture Company.	G. Engelmann and C. S. Sargent.		0.4899		1221	1221	769
	1022	...do	...do	...do		0.4735		1163	1136	698
391. Pseudotsuga Douglasii, *var.* macrocarpa. *Hemlock.*	642	California	Saw-mill, San Bernardino.	W. G. Wright		0.5357		1062	1050	783
	642	...do	...do	...do		0.5397		1085	1050	900
392. Abies Fraseri *Balsam. She Balsam.*	523	North Carolina	Roan mountain	Walcott Gibbs	Peaty loam	0.3602		976	1017	654
	523	...do	...do	...do	...do	0.3523		976	976	621
	523	...do	...do	...do	...do	0.3636		976	921	642
393. Abies balsamea *Balsam Fir. Balm of Gilead Fir.*	377	Vermont	Monkton	C. G. Pringle	Peaty	0.4455		740	734	445
	377	...do	...do	...do	...do	0.4419		651	638	584
394. Abies subalpina *Balsam.*	449[1]	Colorado	Forest City	T. S. Brandegee	Moist, sandy loam	0.3941		775	787	548
	449[1]	...do	...do	...do	...do	0.3750		775	723	370
	449[2]	...do	...do	...do	...do	0.3682		872	849	580
	449[2]	...do	...do	...do	...do	0.3807		679	642	347
	820	...do	...do	...do	...do	0.3358		688	679	518
	820	...do	...do	...do	...do	0.3350		751	740	402
	820	...do	...do	...do	...do	0.3673		787	787	492
	820	...do	...do	...do	...do	0.3622		976	888	469
395. Abies grandis *White Fir.*	1009	Oregon	Portland	G. Engelmann and C. S. Sargent.	Rich, alluvial	0.4002		763	751	333
	1010	...do	...do	...do	...do	0.3597		976	1085	527
	1010	...do	...do	...do	...do	0.3641		976	1030	021
396. Abies concolor *White Fir. Balsam Fir.*	529	Colorado	Engelmann's cañon	Robert Douglas	Rocky	0.3602		660	697	555
	529	...do	...do	...do	...do	0.3801		775	787	490
	630	California	Strawberry valley	G. Engelmann and C. S. Sargent.	Alluvial	0.4019		688	655	703
	639	...do	...do	...do	...do	0.4744		651	673	764
	733	...do	Lassen's peak	Sierra Lumber Company.		0.4989		1285	1320	904
	733	...do	...do	...do		0.4504		1252	1320	796
398. Abies amabilis	1004	British Columbia	Silver peak, near Fraser river.	G. Engelmann and C. S. Sargent.	Rich, sandy loam	0.4754		1221	1252	769
	1004	...do	...do	...do	...do	0.5108		1221	1268	816
399. Abies nobilis *Red Fir.*	965	Oregon	Cascade mountains	...do	Rich	0.5074		1221	1285	905
	965	...do	...do	...do	...do	0.4932		1221	1268	820
400. Abies magnifica *Red Fir.*	647	California	Soda Springs	G. Engelmann and C. S. Sargent.	Gravelly loam	0.4608		542	514	586
	647	...do	...do	...do	...do	0.5134		976	930	810
	647	...do	...do	...do	...do	0.4965		542	534	703
401. Larix Americana *Larch. Black Larch. Tamarack. Hackmatack.*	226[2]	Vermont	Charlotte	C. G. Pringle	Cold, swampy	0.7381		2325	1953	1169
	226[2]	...do	...do	...do	...do	0.7295		1526	1628	1055
	774	New Brunswick	Bay of Fundy	Intercolonial railway.		0.6147		1221	1356	987
	774	...do	...do	...do		0.6330		1395	1479	790
	781	...do	...do	...do		0.5973		697	734	703
	781	...do	...do	...do		0.5742		688	688	717
	786	...do	Bridgeton	Ed. Sinclair		0.5964		1430	1395	923
	786	...do	...do	...do		0.6204		1285	1356	1066
	795	...do	Danville	Grand Trunk railway.		0.6170		1479	1430	937
	795	...do	...do	...do		0.6030		1526	1395	870
	840	Massachusetts	Wenham	J. Robinson	Swampy	0.5988		842	872	820
	840	...do	...do	...do	...do	0.6272		814	842	823

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

DEFLECTION, IN MILLIMETERS, UNDER A PRESSURE, IN KILOGRAMS, OF—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
4.0	8.0	12.0	16.[illegible]	0.4	16.5	22.0	31.0	......	......	......	......	......	328	Square break; split at end	1022
4.2	8.6	12.5	17.0	0.4	17.1	22.0	29.0	......	......	......	......	......	298	Square break	1022
4.6	9.3	14.0	19.0	0.4	19.3	25.2	32.0	......	......	......	......	......	334	Square break on tension side, splitting in axis; shattered	642
4.5	9.3	14.3	19.4	0.4	19.7	25.7	33.0	42.8	......	......	......	......	388	......do	642
5.0	9.6	15.0	21.0	1.0	21.5	31.0	......	......	......	......	......	......	279	Square break; splintered	523
5.0	10.0	15.0	22.0	1.5	22.2	33.5	......	......	......	......	......	......	265	......do	523
5.0	10.6	15.5	22.6	1.1	23.7	34.0	......	......	......	......	......	......	274	......do	523
6.6	13.3	21.0	......	......	......	......	......	......	......	......	......	......	190	Square break	377
5.8	10.8	16.8	22.5	0.5	22.5	......	......	......	......	......	......	......	249	Specimen cross-grained	377
6.3	12.4	19.5	29.0	2.5	29.3	......	......	......	......	......	......	......	234	Crushed at center bearing; square break on tension side, splitting in axis.	449[1]
6.3	13.5	21.5	......	......	......	......	......	......	......	......	......	......	158	Square break at knot	449[1]
5.6	11.5	16.7	24.5	1.5	25.6	39.2	......	......	......	......	......	......	250	Crushed at center bearing; flaked on back	449[2]
7.2	15.2	......	......	......	......	......	......	......	......	......	......	......	148	Specimen cross-grained; broke at knot	449[2]
7.1	14.4	22.0	32.0	2.4	35.5	......	......	......	......	......	......	......	221	Square break	820
6.5	13.2	21.0	......	......	......	......	......	......	......	......	......	......	197	......do	820
6.2	12.4	20.5	32.5	4.4	35.0	......	......	......	......	......	......	......	210	Square break and split	820
5.0	11.0	17.0	......	......	......	......	......	......	......	......	......	......	200	Broke with long, oblique split	820
6.4	13.0	......	......	......	......	......	......	......	......	......	......	......	142	Specimen shaky; broke with long split	1009
5.0	9.0	14.0	20.5	1.0	20.7	......	......	......	......	......	......	......	225	Crushed at center bearing	1010
5.0	9.4	14.5	21.0	1.6	22.0	32.0	......	......	......	......	......	......	265	Square break with long, thin splinter	1010
7.4	14.0	21.5	32.0	2.5	34.5	......	......	......	......	......	......	......	237	Shattered	529
6.3	12.4	20.0	29.0	2.0	30.0	......	......	......	......	......	......	......	213	Square break; shattered	529
7.1	14.9	23.0	32.2	1.9	33.4	44.7	64.0	......	......	......	......	......	300	Square break with flakes on tension side	639
7.5	14.5	22.4	31.5	2.2	32.5	43.7	63.5	......	......	......	......	......	326	Thin flake on back	639
3.8	7.4	11.0	14.9	0.4	15.0	18.5	23.4	29.5	......	......	......	......	386	Crushed at center bearing with thin flakes	733
3.9	7.4	11.3	15.0	0.2	16.0	21.0	28.0	......	......	......	......	......	340	Crushed at center bearing; splintered	733
4.0	7.8	12.0	16.4	0.6	16.8	22.0	32.5	......	......	......	......	......	328	Square break	1004
4.0	7.7	11.9	16.2	0.5	16.8	22.0	30.0	......	......	......	......	......	348	Crushed at center bearing; square break	1004
4.0	7.6	11.4	15.4	0.4	16.0	21.0	27.0	38.0	......	......	......	......	386	Crushed at center bearing; flaked	965
4.0	7.7	11.7	16.0	0.4	16.2	21.8	29.0	47.0	......	......	......	......	350	Crushed at center bearing; splintered	905
9.0	19.0	30.7	46.0	5.5	40.4	94.0	......	......	......	......	......	......	250	Square break; split	647
5.0	10.4	15.7	22.0	1.0	22.5	30.0	41.0	......	......	......	......	......	348	Specimen cross-grained	647
9.0	18.3	29.5	40.8	4.0	43.5	62.0	......	......	......	......	......	......	300	Square break on tension side, splitting in axis	647
2.1	5.0	7.4	10.0	0.1	10.2	12.7	16.0	19.0	24.0	29.0	......	......	499	Crushed at center bearing; broke with fine splinters	226[2]
3.2	6.0	0.2	12.0	0.2	12.0	15.0	18.5	23.0	29.0	38.0	......	......	450	Crushed at center bearing; broke with thin scales	226[2]
4.0	7.2	10.8	14.5	0.8	14.6	18.0	23.5	30.0	46.0	......	......	......	400	Crushed at center bearing; broke with fine splinters	774
3.5	6.6	10.0	13.2	0.4	13.5	16.5	25.0	......	......	......	......	......	337	Large scale on tension side	774
7.0	13.3	21.0	29.7	2.8	30.5	40.4	55.5	......	......	......	......	......	300	Shattered at one end	781
7.1	14.2	22.4	32.0	2.9	32.8	44.0	63.5	......	......	......	......	......	306	Specimen cross-grained; square break; split	781
3.4	7.0	11.0	14.5	0.5	14.6	18.2	23.7	30.0	......	......	......	......	304	Crushed at center bearing; broke with fine splinters	786
3.8	7.2	10.8	14.5	0.4	14.7	18.5	23.4	29.0	36.0	46.0	......	......	455	Square break; splintered	786
3.3	6.8	10.0	13.2	0.3	13.5	17.0	21.5	28.5	40.0	......	......	......	400	Crushed at center bearing; scaled on tension side	795
3.2	7.0	10.3	14.0	0.4	14.5	18.8	24.2	32.5	......	......	......	......	371	Crushed at center bearing; scaled	795
5.8	11.2	18.2	26.3	3.0	27.0	35.0	49.0	......	......	......	......	......	350	Failed from large splinter on corner	840
6.0	11.6	17.8	25.7	2.0	26.5	35.5	47.0	75.0	......	......	......	......	351	Square break on tension side, splitting in axis	840

TABLE III.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity of the air-dried specimen.	Direction of grain.	COEFFICIENT OF ELASTICITY.		Modulus of rupture.
								First deflection.	Second deflection.	
402. Larix occidentalis .... *Tamarack.*	719	Montana	Missoula	S. Watson	....	0.6255		1221	1221	014
	719	....do	....do	....do	....	0.6966		1356	1395	1106
	984	Washington territory.	Fulda	W. Siksdorf	Moist	0.8136		1628	1713	1289
	984	....do	....do	....do	....do	0.8364		1628	1713	1481
	1006	....do	....do	....do	....do	0.8426		1878	1953	1287
	1006	....do	....do	....do	....do	0.8376		1953	1953	1287
PALMACEÆ.										
405. Washingtonia filifera .... *Fan-leaf Palm.*	1159	California	Agua Caliente	W. G. Wright	Dry, gravelly	0.6012		460	403	271
	1159	....do	....do	....do	....do	0.6307		697	723	586

TABLE IV.—BEHAVIOR OF SOME OF THE WOODS OF THE UNITED STATES

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity.	Direction of pressure.	COEFFCIENT OF ELASTICITY.		Modulus of rupture.
								Second dedeflection.	Fourth deflection.	
MAGNOLIACEÆ.										
1. Magnolia grandiflora .... *Big Laurel. Bull Bay.*	346	Alabama	Cottage Hill	C. Mohr	Rich loam	0.7347		1191	1097	974
2. Magnolia glauca .... *Sweet Bay. White Bay. Beaver Tree. White Laurel. Swamp Laurel.*	354	....do	....do	....do	Swampy	0.5262		1135	1028	816
SAPINDACEÆ.										
54. Sapindus marginatus .... *Wild China. Soapberry.*	307	Texas	Dallas	J. Roverchon	Rich, damp	0.7838		1109	1062	851
LEGUMINOSÆ.										
77. Robinia Pseudacacia .... *Locust. Black Locust. Yellow Locust.*	1248	New York	Long Island	M. C. Beedle	....	0.8476		1221	1221	1169
HAMAMELACEÆ.										
139. Liquidambar Styraciflua .... *Sweet Gum. Star-leaved Gum. Liquidamber. Red Gum. Bilsted.*	546	Alabama	Kemper's mill	C. Mohr	Rich, alluvial	0.6537		939	921	933
OLEACEÆ.										
192. Fraxinus Americana, *var.* Texensis	364	Texas	Dallas	J. Roverchon	Dry, calcareous	0.8198		1221	1101	1172
BIGNONIACEÆ.										
207. Catalpa speciosa .... *Western Catalpa.*	38	Missouri	Charleston	C. S. Sargent	Wet clay	0.4783		957	940	692
	38	....do	....do	....do	....do	0.4757		939	888	703
URTICACEÆ.										
224. Ulmus Americana .... *White Elm. American Elm. Water Elm.*	10	Massachusetts	Arnold Arboretum	....do	Drift	0.7534		1085	1050	1118
228. Celtis occidentalis .... *Sugarberry. Hackberry.*	306	Texas	Dallas	J. Reverchon	Alluvial	0.7491		888	800	916
JUGLANDACEÆ.										
230. Juglans nigra .... *Black Walnut.*	951	....do	New Braunfels	C. Mohr	Moist, calcareous.	0.7108		970	906	936
248. Carya aquatica .... *Water Hickory. Swamp Hickory. Bitter Pecan.*	362	Mississippi	Vicksburg	....do	....	0.7739		976	957	958
CUPULIFERÆ.										
251. Quercus alba .... *White Oak.*	8	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	0.6958		708	787	892
	8	....do	....do	....do	....do	0.6820		763	660	658

UNITED STATES UNDER TRANSVERSE STRAIN—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—													Ultimate strength: transverse pressure.	Remarks.	Office number.
50	100	150	200	0 (set.)	200	250	300	350	400	450	500	550			
4.0	8.0	12.0	16.2	0.5	16.5	21.0	27.5	36.0	......	......	......	......	390	Crushed at center bearing; broke with fine splinters	719
3.6	7.0	10.5	14.0	0.4	14.0	18.0	22.5	28.0	34.0	45.0	......	......	472	......do	719
3.0	5.7	8.4	11.0	0.3	11.4	14.0	17.5	20.6	24.7	28.5	35.7	47.6	550	......do	984
3.0	5.7	8.2	11.0	0.2	11.0	13.6	16.5	19.5	23.0	26.8	32.0	36.5	632	Deflection with 600 kilograms = 45.5 millimeters; broke with fine splinters.	984
2.6	5.0	7.6	10.4	0.2	10.4	13.0	16.0	19.0	22.7	27.2	34.0	......	549	Crushed at center bearing; flaked	1006
2.5	5.0	7.5	10.0	0.2	10.0	12.6	15.5	18.5	22.0	26.5	......	......	549	Failed from large splinter on corner	1006
10.6	24.2	......	......	......	......	......	......	......	......	......	......	......	116	Twisted and split	1159
7.0	13.5	20.0	29.4	1.8	33.5	......	......	......	......	......	......	......	250	Square break	1159

UNDER TRANSVERSE STRAIN: SPECIMENS EIGHT CENTIMETERS SQUARE.

Deflection, in millimeters, under a pressure, in kilograms, of—											Ultimate strength: transverse pressure.	Remarks.	Office number.
400	800	1200	1600	0 (set.)	1600	2000	2400	2800	3200	3600			
2.0	4.1	6.4	8.9	0.2	9.0	11.2	15.1	19.5	26.0	......	3325	Broke with large splinters on back	346
2.2	4.3	6.9	9.5	0.3	9.5	12.4	16.2	......	......	......	2785	Broke with large splinters	354
2.2	4.4	6.6	9.2	0.4	9.2	12.2	16.0	......	......	......	2903	Broke with large flake on back	307
2.0	4.0	6.1	8.0	0.0	8.1	10.2	12.6	15.2	19.2	25.0	3992	Broke with large splinters on back	1248
2.9	5.2	7.7	10.6	0.7	10.7	14.2	19.3	26.0	......	......	3184	Broke with many fine splinters	546
2.2	4.0	6.0	8.2	0.3	8.2	10.2	13.0	16.5	20.6	26.5	4000	Broke with large splinters	364
2.5	5.1	7.8	11.0	0.3	11.0	15.5	......	......	......	......	2361	Crushed and split to the end	38
2.8	5.2	7.9	11.0	0.4	11.0	15.7	29.6	......	......	......	2400	Broke with fine splinter on one corner	38
2.3	4.5	6.8	9.3	0.2	9.4	12.0	15.2	18.5	25.0	35.0	3815	Broke with fine splinters	19
2.0	5.5	8.6	12.2	0.8	12.3	17.0	23.2	33.0	......	......	3125	Broke with large splinter on one corner	306
2.6	5.0	7.5	9.8	0.4	10.0	12.5	15.5	19.5	......	......	3193	Broke with large splinters on corners	951
2.5	5.0	7.4	10.2	0.5	10.3	13.0	18.2	24.4	36.0	......	3270	Broke with large splinters	362
2.5	6.9	9.8	12.4	......	......	15.0	19.2	27.3	......	......	3043	Broke with large splinters on back	8
3.1	6.4	10.0	14.8	1.2	15.0	21.0	......	......	......	......	2245	......do	8

TABLE IV.—BEHAVIOR OF SOME OF THE WOODS OF THE UNITED STATES UNDER

Species.	Office number.	State.	Locality.	Collector.	Soil.	Specific gravity.	Direction of pressure.	Coefficient of elasticity.		Modulus of rupture.
								Second deflection.	Fourth deflection.	
250. Quercus Michauxii *Basket Oak. Cow Oak.*	524	Alabama	Kemper's mill	C. Mohr	Alluvial	0.8107		775	607	884
	524	do	do	do	do	0.8348		800	745	984
260 Quercus Prinus *Chestnut Oak. Rock Chestnut Oak.*	925	do	Cullman	do	Dry, rocky	0.8158		1085	1028	582
275. Quercus Kelloggii *Black Oak.*	963	Oregon	Eugene City	G. H. Collier		0.7625		626	564	736
280. Quercus aquatica *Water Oak. Duck Oak. Possum Oak. Punk Oak.*	349	Alabama	Cottage Hill	C. Mohr	Sandy loam	0.7253		1366	1320	1144
BETULACEÆ.										
301. Alnus rubra *Alder.*	991	Washington territory.	Puyallup	G. Engelmann and C. S. Sargent.		0.5381		729	610	524
CONIFERÆ.										
320. Chamæcyparis sphæroidea *White Cedar.*	350	Alabama	Cottage Hill	C. Mohr	Sandy, wet	0.3719		364	....	376
370. Pinus Tæda *Loblolly Pine. Old-field Pine. Rosemary Pine.*	82	Florida	Duval county	A. H. Curtiss	Moist, sandy	0.5802		1061	1017	792
	82	do	do	do	do	0.7614		1285	1302	820
372. Pinus serotina *Pond Pine.*	83	do	do	do	Moist, sandy loam.	0.7614		939	921	933
	83	do	do	do	do	0.8271		787	751	904
380. Pinus palustris *Long-leaved Pine. Southern Pine. Georgia Pine. Yellow Pine. Hard Pine.*	81	do	do	do	Sandy loam	0.8609		1436	1550	1057
	85	do	do	do	Moist, sandy	0.7213		1085	1007	940
	243	do	Saw-mill, Saint John's river.	do		0.6788		1221	1252	820
	243	do	do	do		0.6193		1163	1221	949
381. Pinus Cubensis *Slash Pine. Swamp Pine. Bastard Pine. Meadow Pine.*	84	do	Duval county	do	Moist, sandy	0.7033		1163	1221	1029

TRANSVERSE STRAIN: SPECIMENS EIGHT CENTIMETERS SQUARE—Continued.

Deflection, in millimeters, under a pressure, in kilograms, of—											Ultimate strength: transverse pressure.	Remarks.	Office number.
400	800	1200	1600	0 (set.)	1600	2000	2400	2800	3200	3600			
3.2	6.3	10.0	14.0	1.5	14.5	19.5	26.5	39.0	....	....	3016	A large season crack at one corner; splintered on opposite corner.	524
3.2	6.1	9.3	13.1	1.3	13.3	18.0	24.2	33.0	49.0	....	3393	Splinters on corners..	524
2.5	4.5	7.0	9.5	0.6	9.5	13.3	....	....	....	....	1987	Split lengthwise with small splinters on corners.	925
4.0	7.8	12.0	17.3	1.4	17.5	24.0	40.6	....	....	....	2513	Broke with large splinters on corners	963
2.0	3.5	5.5	7.4	0.2	7.3	9.3	11.8	14.6	19.0	25.5	3905	Crushed at center bearing; broke with fine splinters...	349
3.2	6.7	10.7	16.0	2.0	16.7	....	....	....	....	....	1789	Broke with large splinters on back; shattered..........	991
6.8	13.4	21.0	....	....	....	....	....	....	....	....	1284	Short, square break; no splinters	350
2.3	4.6	7.1	9.6	0.2	9.7	12.6	17.0	....	....	....	2703	Shattered	82
2.0	3.8	5.6	7.5	0.2	7.6	10.0	12.0	21.5	....	....	2800	......do..	82
2.7	5.2	8.0	10.6	0.4	11.0	13.6	17.3	22.0	....	....	3184	0.75 sap-wood; broke with large splinter on corner......	83
3.0	6.2	9.5	13.0	0.9	13.4	18.0	23.0	30.0	....	....	3085	0.5 sap-wood; broke with large splinter on corner........	83
1.9	3.4	5.1	6.3	0.0	7.0	8.7	10.5	12.5	14.6	17.5	3606	Square break on tension side, splitting in axis...........	81
2.1	4.5	7.0	9.7	0.3	9.9	12.6	16.4	20.5	27.5	....	3207	....	85
2.0	4.0	5.9	7.8	0.0	7.9	10.0	12.2	....	....	....	2799	Broke with large splinter on corner; somewhat shattered.	243
2.2	4.2	6.0	8.0	0.4	8.0	9.8	12.0	16.0	23.5	....	3239	Square break on tension side, splitting in axis	243
2.3	4.2	6.0	8.0	0.4	8.0	10.2	12.0	15.5	19.5	....	3513	Split between rings at one end	84

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS

Species	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
MAGNOLIACEÆ.							
1. Magnolia grandiflora. *Big Laurel. Bull Bay.*	346	Alabama	Cottage Hill	C. Mohr	Rich loam	7353	Crushed fibers at 10 millimeters knot 28 millimeters from end.
	346	...do	...do	...do	...do	8056	Triple flexure
2. Magnolia glauca. *Sweet Bay. White Bay. Beaver Tree. White Laurel. Swamp Laurel.*	354	...do	...do	...do	Swampy	7212	Fibers crushed at 51 millimeters from end.
	354	...do	...do	...do	...do	6369	Fibers crushed at middle
3. Magnolia acuminata. *Cucumber Tree. Mountain Magnolia.*	246	Virginia	Wytheville	H. Shriver	Clay limestone	6795	Fibers crushed at 76 millimeters from end.
	246	...do	...do	...do	...do	6582	Triple flexure
	261[2]	...do	Fancy Gap	...do	Rich, light	5126	Crushed in vicinity of knots at middle.
	261[2]	...do	...do	...do	...do	5576	Crushed fibers at 63 millimeters from end.
	534	Mississippi	Selvers' mill	C. Mohr	...do	7389	Crushed fibers at 76 millimeters from end.
	534	...do	...do	...do	...do	8333	Crushed fibers at 162 millimeters from end and on opposite side at end.
4. Magnolia cordata. *Cucumber Tree.*	1178	Alabama	Winston county	...do		6577	Crushed fibers at 38 millimeters from middle.
	1178	...do	...do	...do		6527	Crushed fibers in vicinity of knots 63 millimeters from end.
5. Magnolia macrophylla. *Large-leaved Cucumber Tree.*	532	Mississippi	Quitman	...do	Rich, low	7357	Opened longitudinal crack between rings.
	532	...do	...do	...do	...do	8361	Crushed fibers at 63 millimeters from end.
6. Magnolia Umbrella. *Umbrella Tree. Elk Wood.*	266[1]	Virginia	Wytheville	H. Shriver		5647	Crushed fibers at 128 millimeters from end.
	266[2]	...do	...do	...do		6073	Triple flexure; developed intersecting "Cooper lines".
7. Magnolia Fraseri. *Long-leaved Cucumber Tree.*	260	...do	Fancy Gap	...do	Damp	5806	Failed at 6 millimeters knot 51 millimeters from end.
	260	...do	...do	...do	...do	7575	Fibers crushed at 51 and at 128 millimeters from end.
8. Liriodendron Tulipifera. *Tulip Tree. Yellow Poplar. White Wood.*	395	Michigan	Lansing	W. J. Beal		4663	Failed at knot at middle
	818	West Virginia	Grafton	C. G. Pringle		6341	Fibers crushed at 51 millimeters from end; angle of crushing, 55°.
	818	...do	...do	...do		6636	Fibers crushed at 128 millimeters from end; angle of crushing, 65°.
	1231	Pennsylvania	Chester county	P. P. Sharples		6514	Fibers crushed at 76 millimeters from end; angle of crushing, 75°.
	1231	...do	...do	...do		6169	Fibers crushed at middle
	1232	...do	...do	...do		6305	......do
	1232	...do	...do	...do		5874	Fibers crushed in vicinity of knot 51 millimeters from end.
	1236	Tennessee	Saw-mill at Nashville.	A. E. Baird		5489	Fibers crushed at 63 millimeters from end.
	1236	...do	...do	...do		5606	......do
ANONACEÆ.							
9 Asimina triloba. *Papaw. Custard Apple.*	211	Missouri	Meramec river, Jefferson county.	G. W. Letterman	Alluvial	3402	Fibers crushed at 114 millimeters from end.
	211	...do	...do	...do	...do	3388	Crushed at knot 63 millimeters from end.
10. Anona laurifolia. *Pond Apple.*	479	Florida	Bay Biscayne	A. H. Curtiss	Swampy	4690	Fibers crushed at 63 millimeters from end; angle of crushing, 65°.
	479	...do	...do	...do	...do	4967	Fibers crushed on one side at middle.
CANELLACEÆ.							
12. Canella alba. *White Wood. Cinnamon Bark. Wild Cinnamon.*	1131	...do	Elliott's Key	...do	Coral	12746	Fibers crushed at middle and split along grain.
	1131	...do	...do	...do	...do	12292	Fibers crushed near middle; deflected from heart.
TERNSTRŒMIACEÆ.							
14. Gordonia Lasianthus. *Loblolly Bay. Tan Bay.*	230	South Carolina	Bonneau's Depot	H. W. Ravenel	Wet pine-barren	5842	Fibers crushed at knots near end.
	236	...do	...do	...do	...do	5752	Fibers crushed at 63 and at 127 millimeters from end at knots 10 millimeters in diameter.
	414	...do	Aiken	...do	Swampy	6790	Fibers crushed at 63 millimeters from end.
	414	...do	...do	...do	...do	6396	Fibers crushed at 16 millimeters knot near end.
TILIACEÆ.							
17. Tilia Americana. *Lime Tree. Bass Wood. American Linden. Lin. Bee Tree.*	2	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	4287	Fibers crushed at 19 and at 102 millimeters from end.
	2	...do	...do	...do			
	124	Michigan	Big Rapids	W. J. Beal	Gravel	4944	Fibers crushed at 127 millimeters from end.

OF THE UNITED STATES UNDER COMPRESSION.

Direction of grain.	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08	Remarks.	Office number.
	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—													
	2041	......	3221	3447	3497	3670	3847	3978	4078	4209	......	......	Began to shear fibers	346
	1724	2386	2556	2676	2805	2921	3016	3112	3189	3291	......	......	Slight shearing of fibers	346
	1152	1334	1433	1547	1651	1733	1805	1846	1900	1973	......	......	Sheared fibers	354
	1080	1329	1433	1533	1603	1667	1742	1760	1796	1873	......	......	Slight shearing of fibers	354
	975	1343	1429	1533	1588	1642	1696	1733	1753	1792	......	......	do	246
	1016	1420	1535	1651	1737	1805	1889	1941	2037	2111	......	......	Splintered at pith; slight shearing of fibers	246
	1080	1315	1420	1506	1583	1660	1674	1758	1787	1833	......	......	Indented without shearing fibers	261
	1157	1379	1465	1579	1665	1715	1774	1824	1864	1901	......	......	Sheared fibers	261[2]
	1016	1442	1583	1660	1751	1860	1910	1982	2068	2114	......	......	Slight shearing of fibers	534
	1125	1610	1769	1833	1932	2019	2105	2245	2304	2359	......	......	do	534
	884	1098	1170	1238	1315	1343	1406	1483	1524	1538	......	......	do	1178
	1111	1325	1402	1470	1538	1606	1660	1719	1740	1619	......	......	Fibers sheared	1178
	1325	1742	1882	2005	2123	2223	2318	2418	2486	2635	......	......	do	532
	1384	1647	1765	1887	2025	2078	2101	2263	2336	2404	......	......	do	532
	616	975	1098	1111	1143	1216	1247	1297	1329	1343	......	......	Indented without shearing fibers	266[1]
	953	1270	1388	1470	1542	1619	1678	1742	1787	1855	......	......	Fibers sheared	266[2]
	1080	1524	1665	1810	1901	1996	2082	2173	2245	2318	......	......	Indented without shearing fibers	260
	1010	1615	1787	1914	2032	2082	2146	2195	2223	2295	......	......	Slight shearing; short specimen, 120 millimeters long; split at both ends.	260
	907	1066	1125	1143	1175	1202	1234	1252	1297	1315	......	......	Sheared fibers.	395
	1025	1297	1388	1470	1533	1606	1674	1737	1792	1846	......	......	Slight shearing of fibers	818
	749	1025	1170	1229	1311	1370	1415	1474	1524	1565	......	......	do	818
	630	844	925	980	1043	1125	1152	1193	1220	1266	......	......	Sheared fibers	1231
	1052	1288	1397	1433	1533	1601	1656	1706	1746	1801	......	......	do	1231
	794	1080	1152	1216	1257	1302	1343	1379	1384	1442	......	......	do	1232
	885	1012	1084	1120	1186	1234	1270	1335	1352	1388	......	......	do	1232
	916	1157	1229	1293	1361	1429	1479	1520	1565	1601	......	......	do	1236
	885	1116	1166	1202	1261	1306	1352	1397	1456	1515	......	......	do	1236
	667	894	957	1016	1039	1075	1111	1116	1129	1152	......	......	do	211
	662	943	1052	1111	1157	1198	1229	1261	1288	1297	......	......	do	211
	943	1429	1010	1805	1941	2068	2159	2254	2304	2336	......	......	Slight shearing of fibers	479
	1034	1660	1882	2010	2132	2227	2341	2386	2477	2563	......	......	do	479
	3674	6577	7621	8346	8573	8822	8936	8981	9344	9571	......	......	Sheared fibers and opened grain	1131
	3311	6668	8523	0458	9753	10206	10614	10886	10090	11227	......	......	Sheared fibers and opened grain at middle and at end.	1131
	635	1125	1243	1343	1388	1452	1533	1579	1642	1701	......	......	Sheared fibers	236
	535	1021	1116	1211	1293	1347	1433	1488	1538	1597	......	......	do	236
	1089	1519	1642	1746	1867	1932	2005	2068	2146	2218	......	......	do	414
	1134	1533	1665	1760	1846	1023	1991	2059	2123	2177	......	......	do	414
	934	1157	1207	1335	1393	1442	1497	1542	1578	1619	......	......	do	2
	703	880	925	1007	1048	1111	1157	1189	1225	......	......	......	do	2
	717	852	894	957	1034	1043	1071	1093	1120	1122	......	......	do	124

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
17. Tilia Americana—continued	124	Michigan	Big Rapids	W. J. Beal	Gravel	4944	
	252	Missouri	Allenton	G. W. Letterman	Alluvial	7167	Fibers crushed at 114 millimeters from end.
	252	....do	....do	....do	....do	7235	Fibers crushed at 45 millimeters from end.
	316	Michigan	Hersey	W. J. Beal	Rich loam	6314	Fibers crushed at 51 millimeters from end.
	316	....do	....do	....do	....do		
	1039	Massachusetts	Danvers	J. Robinson	Moist gravel	5080	Fibers crushed at 76 millimeters from end.
	1039	....do	....do	....do	....do	4527	Triple flexure
17. Tilia Americana, *var.* pubescens.	745	Georgia	Bainbridge	A. H. Curtiss	Low	6305	Fibers crushed at 38 millimeters from end.
	745	....do	....do	....do	....do	0668	Fibers crushed at 127 millimeters from end.
18. Tilia heterophylla *White Bass Wood. Wahoo.*	285[1]	Kentucky	Cliffs Kentucky river.	W. M. Linney	Limestone	4917	Fibers crushed at 102 millimeters from end.
	285[2]	....do	Mercer county	....do	....do	5548	Fibers crushed at 51 millimeters from end.
	285[3]	....do	....do	....do	....do	5126	Fibers crushed at 152 millimeters from end.
	320	Tennessee	Cumberland river.	A. Gattinger	Alluvial	7666	Fibers crushed at middle
	320	....do	....do	....do	....do	8278	Fibers crushed at 114 millimeters from end.
MALPIGHIACEÆ.							
19. Byrsonima lucida *Tallowberry. Glamberry.*	1113	Florida	No-Name Key	A. H. Curtiss	Coral	6260	Fibers crushed near middle in vicinity of small knots.
	1113	....do	....do	....do	....do		
ZYGOPHYLLACEÆ.							
20. Guaiacum sanctum *Lignum-vitæ.*	476	....do	Upper Metacombe Key.	....do	....do	11930	Longitudinal split; stick warped before test.
	1133	....do	Elliott's Key	....do	....do	11648	Crushed fibers and split along grain near end.
RUTACEÆ.							
23. Xanthoxylum Clava-Herculis *Toothache Tree. Prickly Ash. Sea Ash. Pepper Wood. Wild Orange.*	735	....do	Chattahoochee	....do	Dry, sandy	7372	Triple flexure; developed intersecting "Cooper lines".
	735	....do	....do	....do	....do	7698	Crushed at middle; deflected from heart.
	1086	Texas	Palestine	C. Mohr	Damp, sandy	7707	Crushed fibers at 127 millimeters from end.
	1086	....do	....do	....do	....do	5978	Crushed fibers at knot 6 millimeters in diameter; angle of crushing, 40°.
24. Xanthoxylum Caribæum *Satin Wood.*	1140	Florida	Bahia Honda Key.	A. H. Curtiss	Coral	11158	Brittle; crushing of fibers; splintered along grain.
	1140	....do	....do	....do	....do	10751	Fractured suddenly; shattered along grain.
SIMARUBEÆ.							
28. Simaruba glauca *Paradise Tree.*	487	....do	Bay Biscayne	....do	....do	7303	Fibers crushed at middle; angle of crushing, 90°.
	487	....do	....do	....do	....do	6328	Split end to end along grain
BURSERACEÆ.							
29. Bursera gummifera *Gum Elemi. Gumbo Limbo. West Indian Birch.*	462	....do	Upper Metacombe Key.	....do	....do	2350	Fibers crushed in vicinity of knots.
	462	....do	....do	....do	....do	2595	Fibers crushed at 38 millimeters from end.
30. Amyris sylvatica *Torch Wood.*	475	....do	....do	....do	....do	11975	Split along grain
	475	....do	....do	....do	....do		
MELIACEÆ.							
31. Swietenia Mahogoni *Mahogany. Madeira.*	452	....do	....do	....do	....do	11204	Fibers crushed at 89 millimeters from end; threw off splinters.
	452	....do	....do	....do	....do	10115	Failed at 13 millimeters from end; knot 76 millimeters from end.
ILICINEÆ.							
33. Ilex opaca *American Holly.*	280	South Carolina	Waverly Mills	W. St. J. Mazyck	Sandy loam	7330	Triple flexure; knot near end
	280	....do	....do	....do	....do	6078	Failed at knot 63 millimeters from end.
34. Ilex Dahoon *Dahoon. Dahoon Holly.*	484	Florida	Bay Biscayne	A. H. Curtiss	Low, damp	5652	Failed in vicinity of knots 76 millimeters from end.
	484	....do	....do	....do	....do	5512	Fibers crushed at 114 millimeters from end.
CYRILLACEÆ.							
38. Cliftonia ligustrina *Titi. Iron Wood. Buckwheat Tree.*	338	Alabama	Cottage Hill	C. Mohr	Wet	6169	Fibers crushed at end and at 64 millimeters from end.
	338	....do	....do	....do	....do	5706	Triple flexure; fibers crushed at 127 millimeters from end; grain wavy.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF— 0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08	Remarks.	Office number.
	472	694	753	767	794	817	852	871	918	966	......	......	Sheared fibers	124
	826	935	916	1098	1139	1184	1247	1302	1338	1365	......	......	......do	252
	544	794	835	862	912	953	980	1025	1061	1095	......	......	Slight shearing of fibers	252
	612	749	803	857	930	953	998	1039	1080	1111	......	......	......do	316
	662	......	857	903	948	1002	1034	1066	1107	1148	......	......	......do	316
	612	812	839	894	925	948	989	1021	1052	1071	......	......	......do	1039
	640	821	862	903	944	984	1020	1043	1080	1107	......	......	Sheared fibers	1039
	612	789	866	889	907	948	980	1016	1039	1075	......	......	......do	745
	635	839	889	934	993	1043	1066	1120	1160	1220	......	......	......do	745
	481	694	767	817	898	889	898	912	966	990	......	......	......do	285[1]
	857	989	1057	1071	1125	1175	1202	1229	1275	1311	......	......	......do	285[2]
	798	857	898	953	989	1012	1052	1080	1139	1170	......	......	......do	285[3]
	866	1093	1161	1216	1261	1320	1374	1420	1470	1504	......	......	......do	320
	749	1039	1111	1161	1207	1247	1297	1343	1406	1438	......	......	......do	320
	1769	2926	3198	3339	3475	3529	3620	3097	3765	3819	......	......	......do	1113
	1610	2404	2858	3153	3257	3393	3515	3652	3710	3756	......	......	......do	1113
	4854	8663	11022	12565	13562	14289	14742	14946	14969	15105	16103	16194	Sheared fibers; split along grain	476
	1769	5121	8392	10614	11817	12565	13245	13653	14198	14560	15581	15740	Sheared fibers; split along grain; did not take even bearing.	1133
	1293	1996	2173	2245	2259	2304	2318	2408	2522	2567	2880	3094	Sheared fibers	735
	1111	1819	2032	2068	2164	2223	2277	2322	2368	2400	2790	2994	......do	735
	2041	3016	3157	3307	3429	3543	3647	3742	3856	3919	4626	4786	......do	1086
	1179	1882	2141	2259	2341	2363	2395	2422	2499	2563	3016	2257	......do	1086
	1905	4128	5285	5693	5987	6396	6423	6646	6895	6985	7892	7802	Sheared fibers; split along grain	1140
	2717	4513	5262	5670	5942	6214	6419	6600	6804	6976	7802	8165	Sheared fibers	1140
	861	1134	1220	1311	1315	1356	1442	1456	1488	1501	1746	1928	......do	487
	866	1184	1352	1388	1452	1520	1569	1579	1615	1647	1951	2078	......do	487
	563	720	753	803	812	843	862	885	903	934	1111	1157	Sheared fibers; specimen worm-eaten	462
	485	640	662	671	685	708	712	721	739	749	852	903	......do	462
	2767	5851	7417	8097	8699	9117	9426	9707	......	......	......	......	Split along grain at ends	475
	2926	5829	7167	8210	8890	9208	9435	9753	10024	10433	11431	......	Split at ends; sheared fibers	475
	2087	3697	4060	4332	4559	4799	4809	5035	5103	......	......	......	Sheared fibers	452
	2531	4309	4831	5035	5343	5534	5670	5851	5974	6110	6985	7349	......do	452
	1179	1792	2023	2182	2363	2490	2608	2694	2790	2980	3629	3878	Slight shearing of fibers	280
	1551	2518	2835	3075	3289	3429	3602	3760	3910	4073	4831	5171	Sheared fibers	280
	1243	1805	1905	1973	2032	2123	......	2232	2313	2395	2744	2948	......do	484
	885	1343	1452	1533	1583	1687	1774	1805	1846	1878	2200	2449	......do	484
	1338	1987	2186	2390	2576	2726	2840	2971	3085	3166	3900	4287	......do	338
	1202	1678	1882	2014	2136	2254	2350	2390	2586	2717	3193	3674	......do	338

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
RHAMNACEÆ.							
42. Reynosia latifolia. *Red Iron Wood. Darling Plum.*	454	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	13420	Split along grain
	454	...do	...do	...do	...do	.....	
43. Condalia ferrea. *Black Iron Wood.*	460	...do	...do	...do	...do	13290	Fibers crushed at knots and split along grain.
	460	...do	...do	...do	...do	12406	Fibers crushed at knots 64 millimeters from end.
45. Rhamnus Caroliniana. *Indian Cherry.*	803	...do	Saint John's river.	...do	Rich hummock	7112	Fibers crushed at 140 millimeters from end.
	803	...do	...do	...do	...do	.....	
47. Rhamnus Purshiana. *Bearberry. Bear Wood. Shittim Wood.*	993	Oregon	Portland	G. Engelmann and C. S. Sargent.	Rich, alluvial	9934	Fibers crushed near middle
SAPINDACEÆ.							
50. Æsculus glabra. *Ohio Buckeye. Fetid Buckeye.*	297	Missouri	Allenton	G. W. Letterman	Rich, moist	4531	Fibers crushed at 76 and at 102 millimeters from end; split along grain.
	297	...do	...do	...do	...do	4985	Fibers crushed near middle; grain wavy.
	386	...do	...do	...do	Alluvial	5344	Fibers crushed at 19 millimeters from end.
	386	...do	...do	...do	...do	5207	Fibers crushed at 127 millimeters from end.
52. Æsculus Californica. *California Buckeye.*	684	California	Marin county	G. R. Vasey	Rich upland	6328	Fibers crushed at 51 millimeters from end.
	684	...do	...do	...do	...do	5044	Fibers crushed at middle in vicinity of knot.
53. Ungnadia speciosa. *Spanish Buckeye.*	944	Texas	New Braunfels	C. Mohr	Limestone	6305	Crushed at knot 51 millimeters from end.
	944	...do	...do	...do	...do	.....	
54. Sapindus marginatus. *Wild China. Soapberry.*	305	...do	Dallas	J. Reverchon	Rich, damp	7802	Fibers crushed near middle
	307	...do	...do	...do	...do	8641	Triple flexure; developed intersecting "Cooper lines" at middle.
	928	...do	Austin	C. Mohr	Limestone	7212	Triple flexure; deflected about 16 millimeters without crushing.
	928	...do	...do	...do	...do	6436	Triple flexure; split along grain.
56. Hypelate paniculata. *Ink Wood. Iron Wood.*	463	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	10931	...do
	463	...do	...do	...do	...do	10387	Fibers crushed at 102 millimeters from end; angle of crushing, 60°.
57. Hypelate trifoliata. *White Iron Wood.*	464	...do	...do	...do	...do	6872	Deflected and split along grain
	464	...do	...do	...do	...do	7167	Triple flexure
60. Acer macrophyllum. *Broad-leaved Maple.*	982	Oregon	Portland	G. Engelmann and C. S. Sargent.	Rich, alluvial	6541	Fibers crushed at knot 76 millimeters from end.
	982	...do	...do	...do	...do	6418	Triple flexure; knot near end
	1023	...do	Portland Furniture Company.	...do		5520	Fibers crushed at 25 and at 76 millimeters from end.
	1023	...do	...do	...do		5919	Fibers crushed near middle and near end.
61. Acer circinatum. *Vine Maple.*	1013	...do	Portland	...do	Moist, alluvial	.....	
	1014	Washington territory.	Wilkeson	...do	...do	7349	Fibers crushed at knot at middle
64. Acer saccharinum. *Sugar Maple. Sugar Tree. Hard Maple. Rock Maple.*	298	Missouri	Allenton	G. W. Letterman	Rich upland	10931	Fibers crushed near middle and at 25 millimeters from end.
	298	...do	...do	...do	...do	.....	
	299	...do	...do	...do	...do	11186	Fibers crushed at 127 millimeters from end.
	376	Vermont	Charlotte	C. G. Pringle	Gravelly	8392	Fibers crushed at 76 millimeters from end.
	376	...do	...do	...do	...do	.....	
	409	New England	Charlestown Navy-yard.	S. H. Pook		9063	Fibers crushed at 25 millimeters from end.
	1233	Vermont	Charlotte	F. H. Horsford		11000	Fibers crushed at 39 millimeters from end at 6 millimeters knot.
	1233	...do	...do	...do		9970	Fibers crushed at end; cross-grained.
	1234	...do	...do	...do		9957	Fibers crushed at end
	1234	...do	...do	...do		9707	Fibers crushed at 25 millimeters from end.
	1235	...do	...do	...do		8890	Fibers crushed at 70 millimeters from end; specimen split before testing.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	3016	6260	7892	8890	9753	10524	11158	11658	12112	12610	......	......	Sheared fibers; split at ends	454
	3062	6396	8119	9617	10705	11885	12383	15109	13789	14470	17237	......	......do	454
	3447	6033	7689	9004	10115	11113	11612	12474	13245	13903	17509	......	......do	460
	2994	6260	8097	9480	10660	11794	12837	13789	14765	15603	......	......	......do	460
	1338	1837	2032	2073	2195	2218	2304	2390	3468	2518	2880	......	......do	803
	1247	1860	1982	2073	2153	2214	2277	2309	2350	2386	2858	3039	Sheared fibers	803
	1656	2404	2758	2930	3075	3202	3280	3339	3352	3470	3765	......	Slightly sheared fibers; split at ends	993
	490	798	885	921	971	1021	1071	1116	1157	1179	1429	......	Sheared fibers slightly	297
	975	1107	1216	1247	1293	1347	1397	1429	1515	1547	1778	1928	Sbeared fibers; split at end	297
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	680	1179	1452	1579	1701	1733	1801	1840	1928	1987	2331	2658	Sheared fibers	684
	1066	1433	1569	1651	1742	1810	1892	1973	2068	2127	2540	2835	......do	684
	1061	1592	1801	1806	2078	2109	2195	2259	2327	2431	2744	3166	......do	944
	1225	2132	2495	2576	2690	2785	2867	2939	2976	3075	......	......	Sbeared fibers; split at ends	944
	1769	3153	3289	3520	3742	3874	4037	4155	4264	4468	5262	5738	Sheared fibers	307
	2073	3103	3348	3520	3701	3874	4037	4241	4355	4518	5208	6033	Slight shearing of fibers	307
	2109	3692	4513	4944	5307	5398	5579	5974	6105	6214	7190	7553	......do	928
	2064	3366	3955	4404	4649	4872	5062	5216	5425	5566	6759	7430	......do	928
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	2707	4944	5715	6078	6410	6750	6031	7158	7376	7557	8210	8346	Sheared fibers; split at sides	464
	1796	3901	4899	5489	5874	6205	6432	6654	6805	7167	8074	8641	......do	464
	1706	2313	2422	2513	2604	2672	2812	2835	2926	2980	3289	3583	Sheared fibers	982
	1050	2617	2785	2903	3012	3116	3216	3248	3339	3493	3792	4105	......do	082
	1633	2313	2495	2563	2613	2703	2767	2858	2985	3012	2976	3697	......do	1023
	1338	1765	1996	2073	2159	2232	2259	2381	2440	2504	2880	3129	......do	1023
	1560	2576	2835	3085	3252	3420	3574	3701	3828	......	4854	5307	......do	1013
	1225	2168	2758	3039	3157	3280	......	3674	3720	3747	4468	5035	Slight shearing of fibers	1014
	2849	4355	4944	5307	5570	5874	6023	6101	6260	6328	7530	8074	Sheared fibers	298
	2359	3357	3720	4060	4287	4513	4740	4899	4067	......	......	......	Slight shearing of fibers; split at end	298
	2858	......	4626	4967	5262	5489	5603	5906	6101	6328	7485	7802	Sheared fibers	299
	2064	3157	3393	3606	3751	3892	4060	4160	4228	4364	4899	5239	......do	376
	2067	2926	3239	3420	3602	3248	3819	3983	4055	4164	4763	5104	......do	376
	1724	2313	2472	2613	2794	2840	2944	3057	3107	3202	3647	3901	......do	409
	2250	3302	3606	3801	3983	4160	4287	4118	4581	4708	5443	5987	......do	1233
	2132	2767	3057	3257	3357	3502	3611	3706	3801	3969	4430	4898	......do	1233
	2586	3583	3792	4060	4246	4382	4423	4495	4581	4609	5648	6169	......do	1234
	2540	4128	4653	4745	4040	5140	5330	5434	5530	5625	6260	6736	......do	1234
	2540	3652	3928	4063	4200	4332	4427	4522	4672	4831	5579	6078	......do	1235

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
64. Acer saccharinum—continued	1235	Vermont	Charlotte	F. H. Horsford		9970	Fibers crushed at end.
64. Acer saccharinum, *var.* nigrum. *Black Sugar Maple.*	213	do	do	C. G. Pringle	Clay	8890	Fibers crushed at 10 millimeters knot 51 millimeters from end.
	213	do	do	do	do		
	274²	Missouri	Allenton	G. W. Letterman	Low, alluvial	10070	Fibers crushed at 76 millimeters from end.
	274²	do	do	do	do		
	757	Florida	Chattahoochee	A. H. Curtiss	Clay	8255	Triple flexure; developed intersecting "Cooper lines".
	757	do	do	do	do	6895	Fibers crushed at knot 102 millimeters from end.
	1167	Missouri	Allenton	G. W. Letterman	Rich, alluvial	9321	Fibers crushed at middle; developed "Cooper lines".
	1167	do	do	do	do	9390	Triple flexure; "Cooper lines".
65. Acer dasycarpum. *Soft Maple. White Maple. Silver Maple.*	1052	Massachusetts	Topsfield	J. Robinson	Low meadow	7711	Fibers crushed at 51 and at 76 millimeters from end; knots.
66. Acer rubrum. *Red Maple. Swamp Maple. Soft Maple. Water Maple.*	20	do	Arnold Arboretum	C. S. Sargent	Drift	7688	Fibers crushed near middle.
	20	do	do	do	do		
	530	Mississippi	Kemper's mill	C. Mohr	Rich, swampy	7303	Fibers crushed at 89 millimeters from end.
	530	do	do	do	do	8437	Fibers crushed at 25 millimeters from end.
	743	Georgia	Bainbridge	A. H. Curtiss	Low	7235	Fibers crushed near middle.
	743	do	do	do	do	6759	Fibers crushed at middle and at end.
	878	Massachusetts	Danvers	J. Robinson	do	6963	Triple flexure; "Cooper lines".
	878	do	do	do	do	7380	Triple flexure; "Cooper lines"; middle bend 115 millimeters from end.
	1048	do	North Reading	do	do	7485	Fibers crushed at 89 millimeters from end.
	1048	do	do	do	do	7371	Fibers crushed at 25 and at 102 millimeters from end.
67. Negundo aceroides. *Box Elder. Ash-leaved Maple.*	290	Missouri	Allenton	G. W. Letterman	Rich bottom	5080	Fibers crushed at 76 millimeters from end.
	290	do	do	do	do	5208	Fibers crushed near middle and split longitudinally.
	311	Texas	Dallas	J. Reverchon	do	5148	Fibers crushed at 25 millimeters from middle.
	311	do	do	do	do	5080	Fibers crushed at middle.
68. Negundo Californicum. *Box Elder.*	645	California	Contra Costa county.	G. R. Vasey	Rich, moist	6613	Fibers crushed at knot near middle.
	645	do	do	do	do	7530	Fibers crushed at 32 millimeters from middle.
ANACARDIACEÆ.							
71. Rhus copallina. *Dwarf Sumach.*	736	Florida	Chattahoochee	A. H. Curtiss	Dry clay		
	736	do	do	do	do	6033	Fibers crushed at knot 76 millimetre from end.
71. Rhus copallina, *var.* lanceolata	330	Texas	Dallas	J. Reverchon	Dry, gravelly	7666	Fibers crushed at 89 millimeters from end at 3 millimeters from knot.
	330	do	do	do	do		
73. Rhus Metopium. *Poison Wood. Coral Sumach. Mountain Manchineel. Gum Wood. Hog Plum. Doctor Gum.*	467	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	7847	Fibers crushed at knot 51 millimeters from middle.
	467	do	do	do	do	9190	Fibers crushed at 127 millimeters from end.
LEGUMINOSÆ.							
77. Robinia Pseudacacia. *Locust. Black Locust. Yellow Locust.*	405		Charlestown Navy-yard.	S. H. Pook		13426	Fibers crushed at end and at 76 millimeters from end.
	405		do	do		12096	Fibers crushed near end and split along grain.
	441		do	do		10229	Fibers crushed at 10 millimeters from knot and at 51 millimeters from end.
	441		do	do			
	815	West Virginia	Grafton	C. G. Pringle		12497	Fibers crushed in vicinity of knots
	815	do	do	do		8369	
	1247	New York	Long Island	M. C. Beedle		9934	Fibers crushed in vicinity of small knot at end.
	1247	do	do	do		11294	Fibers crushed in vicinity of small knot 102 millimeters from end.
	1248	do	do	do		10274	Fibers crushed at end of specimen
	1248	do	do	do		11385	do

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	Pressure, in kilograms, required to produce an indentation, in millimeters, of— 0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08	Remarks.	Office number.
	1941	2703	2971	3175	3379	3534	3656	3788	3933	4037	4672	5353	Sheared fibers	1235
	2313	3357	3747	3924	4110	4332	4473	4617	4781	4890	5715	6283	......do	213
	1542	2-99	3392	3579	3751	3007	4028	4164	4336	4441	5262	5715	......do	213
	2812	4219	4559	4844	5080	5262	5401	5543	5670	5784	0396	6849	......do	274[2]
	1860	2744	2948	3166	3334	3465	3615	3801	3892	4028	4808	5208	......do	274[2]
	2087	3379	3611	3837	4046	4173	4377	4527	4581	4753	5353	5851	......do	757
	2223	3243	3475	3652	3792	3007	4019	4069	4300	4346	4944	5389	......do	757
	3026	3978	4377	4599	4744	4962	5080	5239	5339	5452	6328	6782	......do	1167
	1951	2840	3066	3329	3479	3629	3797	3933	4033	3724	4831	4881	......do	1167
	1315	2250	2576	2790	2899	3035	3157	3293	3397	3520	4219	4717	......do	1052
	1351	2518	2703	2840	2935	3085	3252	3381	3538	3615	4264	4536	......do	20
	2540	3837	4327	4500	4622	4753	4872	4985	5203	5298	6028	6568	......do	20
	2073	2976	3248	3379	3479	3606	3742	3833	3928	4024	4626	4879	......do	530
	1533	1896	2041	2123	2254	2427	2449	2472	2567	2685	3175	......	Sheared fibers; split at end	530
	1179	1633	1715	1842	1887	1946	2028	2037	2141	2177	2531	2722	Sheared fibers	743
	1361	1792	1860	1932	2028	2141	2214	2254	2350	2400	2722	3039	......do	743
	1796	2649	2803	3016	3121	3257	3384	3479	3665	3760	4332	4808	......do	878
	1469	2082	2268	2427	2449	2580	2703	2776	2890	2935	3493	3742	Slight shearing of fibers	878
	1805	2259	2386	2508	2613	2758	2794	2939	107	3198	3652	4037	......do	1048
	1361	2168	2404	2563	2703	2794	2858	2971	3039	3139	3901	4332	......do	1048
	862	1071	1160	1315	1352	1433	1483	1556	1619	1678	1973	2177	Sheared fibers	290
	984	1447	1610	1624	1710	1774	1855	1860	1905	1951	2168	2308	......do	290
	993	1352	1479	1529	1574	1660	1683	1733	1774	1819	2064	2223	......do	311
	1542	2250	2449	2486	2490	2531	2658	2672	2790	2704	3062	3311	......do	311
	1179	1479	1574	1633	1683	1801	1896	1982	2005	2082	2295	......	Sheared fibers; split at end	645
	1202	1520	1619	1674	1756	1860	1951	1996	2073	2114	2449	2790	Sheared fibers	645
	1134	1397	1479	1651	1637	1665	1733	1801	1805	1855	2087	2177	Sheared fibers; split at end	736
	1270	1610	1678	1805	1851	1969	1991	2046	2100	2150	2381	......	......do	736
	1111	1438	1637	1765	1878	1946	2059	2150	2159	2159	1973	2449	Sheared fibers; split stick	330
	1089	1669	1928	2028	2164	2168	2177	2218	2268	2259	......	......	......do	330
	1384	1928	2395	2749	2930	3193	3293	3434	3525	3570	3969	4346	Sheared fibers; crushed obliquely at each end	467
	1633	2858	3289	3529	3765	3901	4060	4095	4296	4395	4944	5353	Sheared fibers; split at sides	467
	2926	3856	4346	4740	5126	5353	5706	5920	6283	0396	7485	8074	Sheared fibers; split at end	405
	2676	3878	4155	4436	4763	5058	5416	5615	5869	0056	......	......	Slight shearing; split at end	405
	2291	3343	3742	4064	4296	4522	4699	4844	4980	5112	6987	......	Sheared fibers; split at end	441
	2944	4264	4559	4808	4967	5103	5307	5421	5534	5670	......	......	......do	441
	771	2019	2722	3016	3103	3207	3343	3438	......	3620	4037	......	......do	815
	1814	2341	2486	2622	2703	2835	2804	2026	3094	3216	3765	4037	Sheared fibers	816
	2132	3257	3615	3783	3978	4069	4264	4380	4500	4604	......	......	Slight shearing; split at end	1247
	1905	3243	3674	3878	4060	4237	4377	4482	4604	4662	......	......	Slight shearing; split at ends	1247
	2223	3302	3606	3792	3983	4160	4346	4427	4608	4672	5307	......	Sheared fibers; split at end	1248
	2495	3529	4128	4219	4332	4513	4626	4831	4967	5048	......	......	Sheared fibers; split at ends	1248

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
79. Robinia Neo-Mexicana. *Locust.*	1031	Colorado	Trinidad	W. B. Strong	Low, moist	10931	Fibers crushed at 51 millimeters from end.
	1031	....do	....do	....do	....do	......	......
80. Olneya Tesota. *Iron Wood. Arbol de Hierro.*	650	California	Lower Colorado valley.	G. Engelmann and C. S. Sargent.	Dry, gravelly	......	......
	650	....do	....do	....do	....do	5851	Split along grain; oblique fracture.
81. Placidia Erythrina. *Jamaica Dogwood.*	564	Florida	Upper Metacombe Key.	A. H. Curtiss	Coral	9548	Shattered one end; cross-grained.
	564	....do	....do	....do	....do	......	......
82. Cladrastis tinctoria. *Yellow Wood. Yellow Ash. Gopher Wood.*	33[3]	Kentucky	Mercer county	W. M. Linney	Limestone	9934	Crushed near middle and at end.
	33	... do	... do	... do	... do	......	......
	430	Tennessee	Nashville	A. Gattinger	Alluvial	7167	Crushed at end and at 102 millimeters from end.
84. Sophora affinis	329	Texas	Dallas	J. Reverchon	Dry, calcareous	7734	Split along grain from end to end.
	932	....do	Austin	C. Mohr	....do	10524	Triple flexure; took reversed bend near middle.
85. Gymnocladus Canadensis. *Kentucky Coffee Tree. Coffee Nut.*	296	Missouri	Allenton	G. W. Letterman	Low, rich	9208	Crushed at 13 and at 114 millimeters from end.
	519	Tennessee	Nashville	A. Gattinger	Limestone	6109	Crushed and split along grain in vicinity of knots.
	1241	Missouri	Allenton	G. W. Letterman	Alluvial	5874	......
	1242	....do	....do	... do	....do	5434	Crushed at end and at 102 millimeters from end.
	1243	....do	....do	... do	......	5343	Triple flexure
86. Gleditschia triacanthos. *Honey Locust. Black Locust. Three-thorned Acacia. Sweet Locust. Honey Shucks.*	53[2]	... do	....do	....do	Low, rich	8119	......do
	53[2]	....do	....do	....do	....do	7711	Crushed at 76 millimeters from end.
	444	Tennessee	Nashville	A. Gattinger	Dry, sandy barren	8174	Triple flexure
87. Gleditschia monosperma. *Water Locust.*	760	Florida	Chattahoochee	A. H. Curtiss	Alluvial	9889	Crushed at 89 millimeters from end at 10 millimeters from knot.
	760	.. do	....do	... do	... do	8799	Crushed at middle at knot 5 millimeters in diameter.
88. Parkinsonia Torreyana. *Green-bark Acacia. Palo Verde.*	678	Arizona	Lower Colorado river.	G. Engelmann and C. S. Sargent.	Sandy	6078	Crushed at 6 millimeters knot at middle.
	678	....do	....do	....do	....do	7280	Crushed at 64 millimeters from end.
91. Cercis Canadensis. *Redbud. Judas Tree.*	436	Tennessee	Nashville	A. Gattinger	Limestone	8119	Crushed at knot near middle
	1089	Missouri	Allenton	G. W. Letterman	Rich	8369	Crushed near middle
	1090	....do	....do	... do	....do	6704	Crushed at knot 102 millimeters from end.
	1091	....do	... do	....do	....do	6849	Crushed in vicinity of knots at middle.
93. Prosopis juliflora. *Mesquit. Algaroba. Honey Locust. Honey Pod.*	680	Arizona	Tucson	C. S. Sargent	......	9034	Split along grain from end to end; crushed near middle.
	680	....do	....do	....do	......	10841	Triple flexure
	927	Texas	Austin	C. Mohr	Rich, calcareous	7462	Crushed near middle; opened cracks along grain; split before testing.
94. Prosopis pubescens. *Screw Bean. Screw-pod Mesquit. Tornilla.*	658	California	Fort Yuma	G. Engelmann and C. S. Sargent.	Sandy	10034	Crushed at 6 millimeters knot at middle.
	658	....do	....do	....do	......	11431	Crushed near end; cross-grained.
98. Acacia Greggii. *Cat's Claw.*	607	Arizona	Santa Rita mountains.	....do	Dry, gravelly	11885	Split along grain from end to end.
100. Lysiloma latisiliqua. *Wild Tamarind.*	500	Florida	Boca Chica Key	A. H. Curtiss	Coral	7053	Crushed near middle
	1112	....do	Key Largo	....do	....do	8337	Crushed at 10 millimeters knot 102 millimeters from end.
	1112	....do	....do	....do	... do	......	......
ROSACEÆ.							
102. Chrysobalanus Icaco. *Cocoa Plum.*	480	....do	Bay Biscayne	....do	Swampy	......	......
103. Prunus Americana. *Wild Plum. Canada Plum. Horse Plum.*	68	Missouri	Allenton	G. W. Letterman	Rich upland	8663	Crushed at 25 millimeters from end in vicinity of small knots.
	68	....do	....do	....do	... do	8799	Crushed at 19 and at 89 millimeters from end.
	334	Texas	Dallas	J. Reverchon	Rich	10796	Crushed at 102 millimeters from end and at end.
104. Prunus angustifolia. *Chickasaw Plum. Hog Plum.*	435	Tennessee	Nashville	A. Gattinger	River bluff	6441	......

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	Pressure, in kilograms, required to produce an indentation, in millimeters, of—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1905	3493	387[illegible]	4155	4427	4614	4799	5013	5126	5298	5924	6192	Sheared fibers	1031
	2041	3357	3810	4037	4241	4400	4559	4786	4808	4831	5602	....	Sheared fibers; split at end	1031
	1860	3765	5398	6849	7983	9526	10614	11521	12474	13245	....	....	Slight shearing; split at end	650
	4309	8256	10387	11885	12973	14062	14787	15467	16057	16510	18008	....	......do	650
	2586	4173	4695	5126	5353	5693	5920	6033	6237	6386	....	....	Sheared fibers; opened seasoning crack	564
	2313	3992	4626	5013	5420	5702	6010	6237	6396	6600	7530	....	Sheared fibers; split at end	564
	1656	2078	2250	2350	2440	2540	2703	2762	2849	2935	3402	3756	Sheared fibers	38
	2518	2840	3216	3348	3434	3543	3624	3720	3847	3946	4527	4926	......do	38
	2676	2427	4808	5035	5262	5439	5715	5897	6074	6260	7190	7756	Sheared fibers	379
	2041	3720	4581	5062	5434	5761	5874	6105	6559	6655	7576	7847	Sheared fibers; split at end; compressed area contained 3 millimeters knot.	932
	1610	2926	3153	3357	3529	3697	3847	3933	4105	4209	4695	5162	Sheared fibers; split at end	119
	1656	2028	....	2254	2322	2472	2540	2608	2676	2835	5289	3652	Sheared fibers	1241
	1429	1928	2114	2232	2369	2427	2522	2622	2672	2758	....	....	Slight shearing; split at ends	1242
	1352	1787	1928	1991	2082	2168	2245	2318	2390	2454	2880	....	Sheared fibers; split at ends	1243
	1796	2245	2313	2404	2495	2654	2812	2939	3075	3180	3720	....	Slight shearing; split at end	53[illegible]
	1179	1905	2168	2268	2404	2495	2608	2694	2776	2862	3357	....	Sheared fibers; split at end	53[illegible]
	2041	2903	2903	3071	3193	3379	3561	3847	3946	4014	....	5512	Sheared fibers	444
	2132	3674	4219	4332	4577	4763	5035	5162	5252	5380	5934	6350	......do	760
	2019	3447	3856	4073	4264	4468	4658	4799	5026	5203	6078	6350	......do	760
	1452	2223	2699	2948	3620	3298	3484	3652	3801	3896	4527	5080	Sheared fibers and splintered at 6 millimeters knot	678
	1833	2939	3266	3479	3620	3701	3788	3001	4024	4082	4717	5035	Sheared fibers	678
	1116	1769	2132	2395	2663	2844	3044	3207	3357	3538	4173	4527	Slight shearing, caused by uneven loading; seasoning crack.	430
	1769	2291	2522	2703	2880	3026	3184	3298	3388	3520	4291	4699	Sheared fibers	1089
	1633	2527	2704	3057	3252	3352	3538	3583	3810	3882	4530	....	Sheared fibers; split at end	1090
	1452	2263	2676	2767	2875	3071	3153	3293	3343	3425	3765	4105	Slight shearing	1091
	2713	4219	4518	4790	4931	5216	5513	5648	5802	6028	6849	7394	Sheared fibers	680
	2132	3007	4468	4699	4990	5103	5330	5425	5521	5702	6486	....	Sheared fibers; split at end	680
	3611	5874	6214	6332	6532	6804	0967	7067	7117	7244	8210	8483	Sheared fibers	927
	1769	4105	4604	4967	5239	5421	5738	5860	6169	6214	6940	7508	......do	658
	2381	3924	4536	5080	5294	5625	5851	5965	6114	6314	7349	7983	......do	658
	1452	1860	1928	2037	2150	2241	2331	2368	2445	2486	2880	3130	Sheared fibers	509
	1497	2341	2685	2821	2967	3066	3171	3248	3339	3438	3937	4241	......do	1112
	1724	2654	2858	2930	3107	3252	3357	3456	3600	3652	4106	4491	......do	1112
	1724	....	3153	3484	3538	3810	3892	4150	4241	4355	5058	....	Sheared fibers; split at end	480
	1860	2522	2880	3153	3162	3257	3343	3484	3579	3697	4241	4473	Sheared fibers	68
	1796	2449	2703	2890	3030	3221	3350	3443	3620	3683	4219	4672	......do	68
	2132	3198	3520	3828	4014	4150	4332	4527	4662	4795	5670	....	Sheared fibers; split at end	334
	1134	1565	1801	1982	2132	2291	2859	2413	2540	2608	3130	3538	Sheared at corner; 6 millimeters knot	435

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
105. Prunus Pennsylvanica	233	Vermont	Charlotte	C. G. Pringle	Cold, gravelly	6532	Crushed at 3 millimeters knot 102 millimeters from end.
Wild Red Cherry. Pin Cherry. Pigeon Cherry.	233	...do	...do	...do	...do	6486	Crushed at 102 millimeters from end.
106. Prunus umbellata	006	Georgia	Altamaha river	A. H. Curtiss	Clay	7960	Cross-grained; split at end
Sloe. Black Sloe.	606	...do	...do	...do	...do		
107. Prunus emarginata, *var.* mollis	068	Washington territory.	Wilkeson	G. Engelmann and C. S. Sargent.	Low, rich	8051	Crushed fibers near middle
	068	...do	...do	...do	...do	6663	Crushed at 6 millimeters knot 25 millimeters from end.
108. Prunus serotina	15	Massachusetts	Roxbury	C. S. Sargent	Gravelly	10138	Failed at knot at end and split along grain.
Wild Black Cherry. Rum Cherry.	15	...do	...do	...do	...do	10256	Triple flexure
	115	Michigan	Lansing	W. J. Beal	...do	7235	Crushed at middle at 3 millimeters knot.
	115	...do	Dansville	...do	...do	8732	Crushed at 32 millimeters from end.
	127	Missouri	Allenton	G. W. Letterman	Rich loam	9970	Crushed at 25 millimeters from middle.
	127	...do	...do	...do	...do	8890	Triple flexure
	148	Illinois	Waukegan	R. Douglas	Gravelly	9199	Crushed at middle and at end.
	317	Michigan	Hersey	W. J. Beal	Rich	7802	Crushed at end
	317	...do	...do	...do	...do	8324	Crushed at 127 millimeters from end.
	368	Vermont	Charlotte	C. G. Pringle	Gravelly	9005	Crushed at middle
	406	Virginia or Middle States.	Charlestown Navy-yard.	S. H. Pook		6564	Crushed at end and split obliquely along grain.
	763	Florida	Chattaheochee	A. H. Curtiss	Clay	8773	Crushed at 51 millimeters from end and split obliquely along grain.
	763	...do	...do	...do	...do	9571	Crushed fibers at 38 millimeters from end.
	1053	Massachusetts	Topsfield	J. Robinson	Gravelly	8029	Crushed fibers near middle of one side of specimen.
	1053	...do	...do	...do	...do	8609	Triple flexure
109. Prunus Capuli	418	New Mexico	Pinos Altos mountains.	E. L. Greene	Alluvial	8609	Split along grain from end to end; knotty.
Wild Cherry.	418	...do	...do	...do	...do		
110. Prunus demissa	637	California	Strawberry valley	G. Engelmann and C. S. Sargent.	Low, rich	8165	Crushed at middle; 3 millimeters knot.
Wild Cherry.							
111. Prunus Caroliniana	1032	Florida	Jacksonville	A. H. Curtiss	Sandy	7847	Crushed near middle at small knots.
Wild Orange. Mock Orange. Wild Peach.	1062	Texas	Victoria	C. Mohr	Rich, moist	9503	Crushed at 16 millimeters knot 102 millimeters from end.
	1062	...do	...do	...do	...do	9617	Shattered at end; cross-grained
113. Prunus ilicifolia	1158	California	Santa Cruz	C. L. Anderson		8709	Crushed at ends; knot 4 millimeters in diameter.
Islay.	1158	...do	...do	...do			
115. Cercocarpus ledifolius	883	Utah	City Creek cañon	M. E. Jones	Rocky	10478	Cross-grained; shattered
Mountain Mahogany.	883	...do	...do	...do	...do		
117. Pyrus coronaria	808	Delaware	Kiamensi	W. M. Canby	Clay	7485	Triple flexure
American Crab. Sweet-scented Crab.	808	...do	...do	...do	...do	7756	Crushed at knot 6 millimeters in diameter, 127 millimeters from end.
	1087	Pennsylvania	Nazareth	J. Henry	Moist	5851	Crushed at knot 19 millimeters in diameter 25 millimeters from end.
	1087	...do	...do	...do	...do	6940	Crushed 76 millimeters from end in vicinity of 4 millimeters knot.
	1088	...do	...do	...do	...do	5674	Crushed at 102 millimeters from end; cross-grained.
	1088	...do	...do	...do	...do	6328	Crushed at two 6 millimeters knots 76 millimeters from end.
120. Pyrus Americana	214	Vermont	Charlotte	C. G. Pringle	Gravelly	6305	Crushed at middle; knots 3 millimeters in diameter.
Mountain Ash.	365	...do	Huntington	...do	...do	5851	Crushed at 3 millimeters knot 102 millimeters from end.
121. Pyrus sambucifolia	410	...do	Mount Mansfield	...do	...do	6123	Triple flexure
Mountain Ash.							
125. Cratægus arborescens	363[3]	South Carolina	Aiken	H. W. Ravenel	Rich	6672	Crushed at 16 millimeters knots 38 and 76 millimeters from end.
	607	Georgia	Ogeechee	A. H. Curtiss	Low	8346	Crushed at middle; knot 3 millimeters in diameter.
	607	...do	...do	...do	...do	8890	Crushed at 102 millimeters from end.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	980	1257	1247	1442	1501	1538	1628	1660	1710	1805	2078	......	Sheared fibers; split at end	233
	885	1483	1597	1724	1796	1932	1982	2073	2114	2164	......	......	Sheared fibers	233
	2699	4649	5280	5851	6214	6555	6759	6872	7145	5276	8029	8483	......do	606
	2313	3583	4073	4527	4740	5126	5285	5416	5535	......	......	......	Slight shearing; split at ends	606
	975	1021	1084	1161	1216	1306	1347	1393	1470	1483	1715	1951	Sheared fibers; split at end	968
	612	1111	1216	1252	1343	1452	1483	1542	1619	1687	2019	2078	......do	968
	3112	5398	6237	6646	6885	7063	7221	7326	7372	7376	8165	8618	Sheared fibers and splintered	15
	3107	5307	5489	5920	6237	6468	6646	6795	6972	7112	7530	8210	Sheared fibers	15
	1973	2241	2468	2540	2699	2740	2849	2980	3048	3094	3620	3878	......do	115[1]
	2019	2649	2880	3075	3202	3334	3393	3493	3674	3788	4491	4944	Sheared fibers	127
	1588	2177	2341	2536	2667	2771	2844	3026	3071	3166	3538	......	Sheared fibers; split at end	127
	1637	2381	2753	......	2880	2880	2948	3675	3198	3262	3674	3901	Sheared fibers	317
	1384	1588	1656	1765	1860	1941	2019	2087	2173	2214	......	......	Sheared fibers; split at end	317
	1225	1660	1837	1969	2078	2164	2259	2313	2427	2481	2939	3153	......do	368
	1125	2749	1483	1509	1615	1660	1710	1760	1865	1851	2150	2268	Sheared fibers	406
	1588	2078	2259	2336	2390	2513	2576	2631	2722	2753	3107	3334	......do	763
	1542	2123	2350	2495	2581	2713	2853	2890	2039	3048	......	......	Sheared fibers; split at end	763
	1724	2495	2713	2812	2971	3093	3184	3302	3420	3479	4173	4581	......do	1053
	2313	3538	3007	4173	4432	4717	4799	4931	5062	5203	5978	6341	Sheared fibers	1053
	2041	2708	4196	4445	4241	4999	5126	5376	......	......	......	......	Split at ends	418
	2041	3311	3738	4200	4445	4699	4940	5267	5466	5661	6740	7802	Sheared fibers; split at end	418
	2177	3221	3561	3792	3937	4087	4219	4346	4477	4531	5443	......	......do	637
	2313	4060	4699	5216	5534	5793	6141	6386	6568	7230	......	......	Slight shearing; split at end; short specimen, 12 centimeters long.	1032
	2223	4105	4786	5307	5557	5869	6105	6292	6522	6613	7892	......	Sheared fibers	1062
	2132	3606	3674	3969	4191	4518	4740	4890	4900	5153	6033	......	Sheared fibers; split at end	1662
	3221	4513	5126	5625	5874	6205	6482	6759	7021	7235	8302	9934	Slight shearing; 4 millimeters knot	1158
	1452	2676	3108	3611	3901	4128	4445	4740	4899	5071	6305	......	Split at end	1158
	3153	5171	6314	7122	7372	7892	8160	8850	9199	9531	12247	13598	Sheared fibers	883
	2948	5534	6804	7462	7983	8523	......	......	......	......	......	......	Split at end	883
	1678	2404	2622	2858	3030	3198	3289	3357	3561	3674	4211	4753	Sheared fibers	808
	2395	3357	......	......	......	4191	......	......	4536	4649	5434	5987	......do	808
	1792	2835	3171	3370	3583	3683	3856	4928	4173	4237	4990	......	Slight shearing; split at end	1087
	1905	3788	4513	4831	5017	5207	5334	5507	5661	5710	6396	7076	Sheared fibers; 13 millimeters knot at corner of compression area.	1087
	2449	3652	4128	4400	4572	4786	4890	5080	5298	5325	6169	6532	Slight shearing	1088
	1588	2699	3166	3170	3792	4055	4173	4318	4481	4563	5080	5603	Sheared fibers	1088
	1043	1533	1656	1751	1869	1887	2019	2096	2223	2268	2676	2812	Sheared fibers; split at ends	214
	680	1406	1678	1701	1715	1805	1941	2019	2032	2214	2608	2939	Sheared fibers	410
	957	1746	2254	2522	2703	2840	3016	3116	3248	3438	4150	4763	......do	363[3]
	1905	2699	3030	3207	3438	3574	3761	3901	4024	3729	4080	5398	......do	607
	1343	1082	2359	2567	2713	2830	2985	3193	3330	3407	4128	......	Sheared fibers; split at end	607

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
126. Cratægus Crus-galli *Cockspur Thorn. Newcastle Thorn.*	328	Massachusetts	Brookline	J. Robinson	Loam	6033	Crushed at 64 millimeters from end.
	328	...do	...do	...do	...do	5806	Shattered at end
	1093	Missouri	Allenton	G. W. Letterman	Low, wet	7349	Triple flexure; small knots
	1093	...do	...do	...do	...do	8346	Crushed at 127 millimeters from end and split along grain.
128. Cratægus subvillosa *Scarlet Haw.*	949	Texas	Victoria	C. Mohr	Alluvial	8605	Crushed at 19 millimeters from end and along one face.
	1081	Missouri	Saint Louis	H. Eggert		8618	Crushed at middle at knot 3 millimeters in diameter.
129. Cratægus tomentosa *Black Thorn. Pear Haw.*	426	Tennessee	Nashville	A. Gattinger	Limestone	7434	Crushed at each end and at middle.
	426	...do	...do	...do	...do	6795	Crushed at middle at knot 3 millimeters in diameter.
131. Cratægus spathulata *Small-fruited Haw.*	926	Louisiana	Webster parish	C. Mohr	Clay	7280	Crushed at 16 millimeters knot 102 millimeters from end.
13[illegible]. Cratægus æstivalis *May Haw. Apple Haw.*	239	South Carolina	Bonneau's Depot	H. W. Ravenel	Damp, rich	7122	Crushed at middle on one corner.
13[illegible]. Cratægus flava, *var.* pubescens *Summer Haw. Red Haw.*	767	Florida	Aspalaga	A. H. Curtiss	Dry clay	8437	Crushed along one corner; deflected from crushed side.
13[illegible]. Amelanchier Canadensis *Juneberry. Shad Bush. Service Tree. May Cherry.*	241	Kentucky	Brumfield Station	W. M. Linney	Waverly shale	11294	Crushed at 115 millimeters from end.
	849	Massachusetts	Danvers	J. Robinson	Loam	10433	Sap-wood; triple flexure
	849	...do	...do	...do	...do	10410	Crushed at 25 millimeters from middle.
HAMAMELACEÆ.							
139 Liquidambar Styraciflua *Sweet Gum. Star-leaved Gum. Liquidamber. Red Gum. Bilsted.*	546	Alabama	Kemper's mill	C. Mohr	Rich, alluvial	6795	Crushed near middle; angle of crushing, 50°.
	546	...do	...do	...do	...do	6486	Triple flexure
	1095	Arkansas	Little Rock	G. W. Letterman		7847	Crushed at 25 end at 102 millimeters from end.
	1095	...do	...do	...do		7892	Crushed at 51 millimeters from end.
	1173	New Jersey	Mount Holly	S. P. Sharples	Clay	6337	Crushed at 64 millimeters from end and at middle on opposite face.
	1173	...do	...do	...do	...do	6396	Crushed and split at end; cross-grained.
	1181	Mississippi	Yazoo River bottom.	R. Abbey	Alluvial	6940	Crushed at 64 millimeters from end; 0.75 sap-wood.
	1181	...do	...do	...do	...do	7870	Crushed at 64 millimeters from end.
	1182	...do	...do	...do	...do	8573	Crushed at middle
	1182	...do	...do	...do	...do	8210	...do
	1183	...do	...do	...do	...do	7938	Crushed at 25 millimeters from middle.
	1183	...do	...do	...do	...do	8250	Crushed at middle
RHIZOPHORACEÆ.							
140. Rhizophora Mangle *Mangrove.*	485	Florida	Bay Biscayne	A. H. Curtiss	Salt-marsh	13517	Crushed at end in vicinity of knot.
	485	...do	...do	...do	...do	14916	Crushed at middle; cross-grained.
COMBRETACEÆ.							
141. Conocarpus erecta *Button Wood.*	489	...do	...do	...do	...do	9571	Crushed at 38 millimeters from end; worm-eaten.
	489	...do	...do	...do	...do	9614	Triple flexure
142. Laguncularia racemosa *White Button Wood. White Mangrove.*	507	...do	Sugar-Loaf Sound	...do	...do	7212	Crushed near middle; cross-grained and worm-eaten.
	507	...do	...do	...do	...do	7167	Crushed at 76 millimeters from end; small knots.
MYRTACEÆ.							
144. Eugenia buxifolia *Gurgeon Stopper. Spanish Stopper.*	1118	...do	Lost Man's river	...do	Humus and coral	14198	Crushed at 127 millimeters from end.
	1118	...do	...do	...do	...do		
146. Eugenia monticola *Stopper. White Stopper.*	1135	...do	Umbrella Key	...do	Coral	8754	Split along grain, opening season cracks; split in seasoning cracks.
	1135	...do	...do	...do	...do	8930	Split and crushed near end
148. Eugenia procera *Red Stopper.*	1127	...do	Miami	...do	...do	10931	Triple flexure; developed intersecting "Cooper lines".
	1127	...do	...do	...do	...do	10567	...do
CORNACEÆ.							
151. Cornus florida *Flowering Dogwood. Box Wood.*	67	Missouri	Allenton	G. W. Letterman	Upland	9276	Triple flexure; opened cracks at end.
	67	...do	...do	...do	...do	9571	...do
	761	Florida	Chattahoochee	A. H. Curtiss	Calcareous	7031	Crushed at 102 millimeters from end; cross-grained.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1315	2313	2495	2676	2863	2980	3085	3207	3367	3397	3983	4296	Sheared fibers	328
	1314	2155	2490	2713	2863	2976	3071	3171	3198	3484	4064	4763	......do	328
	2041	3153	3656	3937	4255	4482	4695	4859	5035	5171	....	....	Slight shearing; split at end	1093
	1701	2676	3085	3379	3611	3828	3992	4119	4264	4391	5353	6033	Sheared fibers	1093
	1315	2495	3130	3484	3788	3983	4219	4391	4581	4753	4806	6350	......do	949
	2449	3674	4119	4445	4626	4922	5013	5162	6439	5534	6759	7212	Sheared fibers; split at end	1081
	1787	3257	3765	4055	4309	4482	4658	4781	4944	5035	5851	6486	Sheared fibers	426
	1293	2359	2948	3130	3379	3038	3742	3892	4119	4287	4035	5625	......do	426
	1315	2617	3006	3329	3484	3674	3910	4055	4164	4287	5262	5761	......do	926
	1433	2699	3130	3402	3583	3742	3856	4028	4101	4264	4990	5579	Sheared fibers; split at end	239
	1905	3720	4445	4831	5103	5398	5625	5874	6056	6260	7394	7983	Sheared fibers; indented on 6 millimeters knot	767
	2041	3221	3074	3992	4423	4436	4877	4990	5194	5334	6350	....	Sheared fibers; split at end	241
	1860	3221	3788	4110	4491	4708	4922	5112	5316	5489	6646	7349	Sheared fibers	849
	2449	3515	3946	4291	4536	4863	5098	5303	5484	5684	6782	....	Sheared fibers; split at end	849
	1424	1914	2019	2100	2254	2381	2477	2536	2645	2717	3166	3329	Sheared fibers	546
	1588	1833	2073	2223	2313	2395	2518	2604	2763	2799	3289	3626	......do	546
	1334	1996	2191	2250	2277	2377	2413	2486	2527	2540	2926	3121	......do	1095
	771	1315	1474	1542	1574	1674	1719	1769	1860	1932	....	....	Sheared fibers; split at end	1095
	1198	1814	1996	2006	2186	2850	2472	2531	2676	2708	3289	....	......do	1173
	2078	2844	3026	3162	3302	3438	3561	3661	3801	3042	4445	4881	Sheared fibers	1177
	1089	1506	1588	1633	1715	1766	1928	1941	1973	2014	2313	2440	......do	1181
	952	1452	1574	1609	1760	1851	1887	1941	2028	2050	2404	2531	......do	118[illegible]
	1384	1792	2006	......	2227	2300	2350	2449	2586	2649	3075	3302	......do	118[illegible]
	1043	1526	1656	1814	1914	2019	2091	2141	2291	2345	2708	2899	Sheared fibers; split at end	118[illegible]
	907	1452	1633	1923	2041	2001	2168	2273	2381	2445	2722	2926	Sheared fibers	118[illegible]
	1157	1488	1678	1837	1896	1941	2073	2155	2223	2273	....	....	Sheared fibers; split at end	118[illegible]
	1311	4173	5806	6940	7576	8066	8464	8822	9140	9453	....	....	Slight shearing; split at end	48[illegible]
	2227	4763	5987	6713	7212	7689	8052	8337	8663	8913	10637	....	Sheared fibers; split at end	48[illegible]
	2404	4173	4854	5398	5751	6678	0396	6600	6895	7085	....	....	......do	48[illegible]
	2903	4491	5216	5761	6101	6432	6759	7099	7226	7530	8790	....	......do	48[illegible]
	817	1515	1796	2050	2132	2359	2436	2531	2626	2706	......	....	Sheared fibers; split at end	50[illegible]
	1270	1973	2250	2472	2640	2708	2844	2048	3035	3116	3674	3901	Sheared fibers	501
	2336	3765	4763	5398	5851	6169	6613	6963	7204	7576	......	......	Opened seasoning cracks	111[illegible]
	4091	5761	5942	6373	6849	7076	7303	7553	7802	8029	0526	9753	Sheared fibers; split at end	111[illegible]
	2586	4527	5643	6033	6532	6795	7258	7475	7770	7983	9026	0753	Sheared fibers	1135
	3538	5080	5761	6432	6963	7439	7792	8119	8506	8786	10614	....	Sheared fibers; split at end	1127
	2313	4672	5942	6668	7235	7689	8119	8419	8714	8990	10841	11930	......do	1127
	2918	4581	5715	6146	6386	6754	7076	7326	7485	7729	8800	9798	Sheared fibers; 7 millimeters knot in compression surface.	67
	1860	3720	4513	4953	5180	5484	5761	5965	6192	6396	7802	8702	Sheared fibers; split at end	67
	2833	3162	3403	3765	4037	4241	4418	4563	4667	4844	5625	6169	......do	761

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
151. Cornus florida—continued	812	West Virginia	Grafton	C. G. Pringle	Dry	8732	Sap-wood; triple flexure; intersecting "Cooper lines"; split at end.
	812	...do	...do	...do	...do	7621	...do
	1077	Missouri	Allenton	G. W. Letterman	Gravelly	9004	Triple flexure
	1077	...do	...do	...do	...do	8981	Triple flexure; split at ends; intersecting "Cooper lines".
	1002	...do	...do	...do	Flinty	8210	Triple flexure; split at ends
152. Cornus Nuttallii. *Flowering Dogwood.*	960	Oregon	Portland	G. Engelmann and C. S. Sargent.		10387	Crushed at middle
	960	...do	...do	...do		10819	Crushed at 102 millimeters from end.
153. Nyssa capitata. *Ogeechee Lime. Sour Tupelo. Gopher Plum.*	605	Georgia	Ogeechee river	A. H. Curtiss	Swampy	6895	Crushed at 114 millimeters from end; split along grain.
	605	...do	...do	...do	...do		
154. Nyssa sylvatica. *Tupelo. Sour Gum. Pepperidge. Black Gum.*	517	Tennessee	Cumberland river	A. Gattinger		7349	Crushed on one face at 25 millimeters from middle.
	750	Florida	Chattahoochee	A. H. Curtiss	Clay	7892	Triple flexure; split at ends
	750	...do	...do	...do	...do	8119	Crushed at 3 millimeters knots at middle.
	813	West Virginia	Grafton	C. G. Pringle		8414	Crushed near middle; split along one corner.
	813	...do	...do	...do		8210	Crushed at 102 millimeters from end.
	833	Massachusetts	West Newbury	J. Robinson	Rich	7689	Triple flexure; split at ends
	833	...do	...do	...do	...do	6023	Crushed at knots 64 millimeters from end.
	834	...do	...do	...do	...do	6577	Crushed at 6 millimeters knot 25 millimeters from middle.
	834	...do	...do	...do	...do	7394	Triple flexure; split at ends
	835	...do	Chebacco pond	...do		7022	Triple flexure, deflected diagonally; split at ends.
	835	...do	...do	...do		7176	Triple flexure; split at ends; intersecting "Cooper lines".
155. Nyssa uniflora. *Large Tupelo. Cotton Gum. Tupelo Gum.*	128	South Carolina	Bonneau's Depot	H. W. Ravenel	Swampy	6396	Crushed at 12 and at 127 millimeters from end on opposite sides.
	128	...do	...do	...do	...do	6328	Triple flexure; split at ends
	550	Alabama	Stockton	C. Mohr	Alluvial	5035	Crushed near middle
	550	...do	...do	...do	...do	5715	Triple flexure
	604	Georgia	Ogeechee river	A. H. Curtiss	Swampy	6123	Triple flexure 102 millimeters from end.
	604	...do	...do	...do	...do	5489	Triple flexure; split at end
CAPRIFOLIACEÆ.							
156. Sambucus glauca. *Elder.*	681	California	Contra Costa county.	G. R. Vasey	Gravelly	4400	Shattered at end; 10 millimeters knot.
158. Viburnum Lentago. *Sheepberry. Nannyberry.*	370	Vermont	Hinesburg	C. G. Pringle	Swampy	8890	Crushed near middle; grain wavy.
159. Viburnum prunifolium. *Black Haw. Stag Bush.*	110[2]	Kentucky	Mercer county	W. M. Linney	Hudson River shale.	10160	Crushed at ends in vicinity of knots; split along grain.
	110[4]	...do	...do	...do	Trenton limestone.	10329	Crushed 38 millimeters from middle.
	739	Georgia	Bainbridge	A. H. Curtiss	Clay	7938	Crushed 26 millimeters from middle; cross-grained.
RUBIACEÆ.							
160. Exostemma Caribæum	466	Florida	Upper Metacombe Key.	...do	Coral	13381	Shattered from end to end
	466	...do	...do	...do	...do	10660	Crushed at knot at middle; split along grain.
161. Pinckneya pubens. *Georgia Bark.*	381	South Carolina	Bluffton	J. H. Mellichamp	Sandy swamp	4355	Crushed at knot 25 millimeters from middle; opened between rings.
ERICACEÆ.							
164. Vaccinium arboreum. *Farkleberry.*	343	Alabama	Citronelle	C. Mohr	Sandy	5874	Split and crushed at end; cross-grained.
	343	...do	...do	...do	...do	6895	Triple flexure, deflected diagonally.
165. Andromeda ferruginea	1033	Florida	Jacksonville	A. H. Curtiss	Hummock	7802	Crushed at 76 millimeters from end; cross-grained.
166. Arbutus Menziesii. *Madroña.*	643	California	Contra Costa county.	G. R. Vasey	Gravelly	7303	Triple flexure; split at ends
	643	...do	...do	...do	...do	7756	...do
	679	...do	Marin county	...do	...do	7530	Shattered and crushed at ends.
	679	...do	...do	...do	...do	9548	Crushed fibers at middle

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	Pressure, in kilograms, required to produce an indentation, in millimeters, of— 0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08	Remarks.	Office number.
	2041	3130	[illegible]	3761	3983	4146	4355	4527	4677	4831	5761	6328	Sheared fibers	812
	1951	3130	3606	3892	4069	4250	4400	4536	4717	4899	5987	6396	do	812
	862	2291	3606	4418	4944	5325	5715	5878	6146	6419	7599	8663	do	1077
	1951	3856	4491	4944	5243	5552	5711	5883	6114	6373	7394	......	Sheared fibers; split at end	1077
	2223	3833	4509	4944	5158	5398	5606	5779	5929	6123	7212	7938	Sheared fibers	1092
	2068	2994	2343	3615	3819	4014	4132	4323	4436	4604	5489	5829	do	960
	1814	3198	3556	3742	3946	4164	4287	4491	4572	4708	5579	6169	do	960
	1406	2177	2386	2522	2713	2858	2971	3085	3143	3289	3878	......	do	605
	1452	1814	......	2150	2254	......	2449	2608	2622	3039	3153	......	do	605
	1338	1796	1941	2064	2150	2245	2331	2400	2499	2622	3016	......	Sheared fibers; split at ends	517
	1792	2767	3130	......	3538	3756	3892	4073	4219	4400	5307	5851	Sheared fibers	750
	2291	3130	3329	3666	3792	3992	4241	4423	4536	4726	5851	6350	do	750
	1951	3749	2921	3075	3243	3375	3438	3497	3588	3670	4196	4391	do	813
	1179	1352	2019	2259	2336	2404	2495	2531	2567	2617	3039	2894	do	813
	1633	2676	2948	3062	3243	3583	3697	3919	4055	4137	5126	5887	Sheared fibers on one edge	833
	1724	2495	2744	2971	3148	3307	3447	3556	3683	3810	4581	5171	do	833
	1257	2531	2713	2899	3030	3171	3311	3420	3502	3615	4418	5013	Slight shearing	834
	1384	2245	2513	2849	2921	3107	3193	3311	3484	3579	4196	4581	Slight shearing	834
	1901	2699	3130	3357	3515	3697	3856	3983	4105	4241	5035	5851	do	835
	1837	2740	3130	3311	3529	3656	3942	3946	4064	4264	5216	5615	do	835
	2132	2622	2875	3003	3148	3329	3475	3574	3715	3828	4401	4944	Sheared fibers	128
	2313	2948	3130	3207	3348	3438	3593	3742	3042	3946	4545	4944	do	128
	1043	1529	1588	1678	1765	1860	1960	2014	2059	2132	2436	2667	do	550
	1343	1905	2041	2168	2254	2381	2472	2586	2651	2708	3085	3334	do	550
	1497	2313	2654	2803	3012	3139	3216	3348	3425	3493	4219	4491	Sheared fibers; split at end	604
	1202	1610	1783	1805	1923	1996	2118	2195	2232	2308	2699	3039	Sheared fibers	604
	1452	1928	2068	2150	2218	2291	2379	2436	2486	2536	......	......	Sheared fibers; split at end	681
......	......	......	......	......	......	......	......	......	......	......	......	......	......	370
	1996	2019	4649	4976	5252	5498	5715	6874	6033	6283	......	......	Sheared fibers; split at ends	1102
	1882	3992	4854	5207	5512	5724	5965	6232	6441	6595	......	......	Slight shearing; split at ends	1104
	2449	3438	3806	4033	4264	4463	4690	4840	4581	5162	6305	......	Sheared fibers on one edge; split at ends	739
	2948	5806	6940	7430	7938	8142	8460	8930	8981	9026	9889	10705	Sheared fibers; radial split	466
	3447	5761	6668	7067	7475	7750	7915	8074	8192	8301	......	......	do	466
	590	1021	1406	1574	1678	1792	1851	1896	1941	1982	2214	2422	Sheared fibers; 4 millimeters knot on indented area.	381
	1941	3402	3833	4164	4432	4899	6171	5398	5512	6305	6918	......	Sheared fibers	343
	1905	3243	3742	4241	4522	4740	4990	5162	5362	5189	6577	7076	Slight shearing; 10 millimeters knot at edge	343
	1792	2699	3193	3402	3611	3633	4024	4173	4300	4491	5216	5715	Sheared fibers	1033
	1315	2404	2694	2907	3048	3266	3393	3574	3729	3846	4468	5035	Sheared fibers	643
	2087	2685	2989	3243	3443	3620	3828	3092	4119	......	......	......	do	643
	1941	2858	3243	3515	3720	3851	3096	4173	4300	4118	5126	5579	do	679
	1361	2313	2640	2903	3075	3243	3393	3561	3692	3810	4491	......	Sheared fibers; split at ends	679

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
167. Arbutus Xalapensis	683	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.		7122	Crushed near middle at knots 3 millimeters in diameter.
	683	...do	...do	...do		5715	Split obliquely from middle to end, crushing fibers at middle.
169. Oxydendrum arboreum *Sorrel Tree. Sour Wood.*	353	Alabama	Cottage Hill	C. Mohr	Light, rich	7430	Crushed at 10 millimeters knot at middle.
	353	...do	...do	...do	...do	7847	Crushed at 19 millimeters knot 25 millimeters from middle.
	515	Tennessee	Nashville	A. Gattinger	Sandy rock	8799	Triple flexure
	515	...do	... do	...do	...do	......	
170. Kalmia latifolia *Laurel. Calico Bush. Spoon Wood. Ivy.*	262²	Virginia	Fancy Gap	H. Shriver	Moist	6931	Crushed at two 6 millimeters knots at end.
	262³	...do	...do	...do	...do	6849	Crushed at knot 51 millimeters from end.
171. Rhododendron maximum *Great Laurel. Rose Bay.*	263	...do	...do	...do	... do	7462	Crushed at 25 millimeters from middle.
	263	...do	...do	...do	...do	6577	Crushed at 3 millimeters knot at middle.
SAPOTACEÆ.							
175. Chrysophyllum oliviforme	492	Florida	Bay Biscayne	A. H. Curtiss	Coral	10433	Crushed at 25 millimeters from middle, deflecting diagonally.
	492	... do	...do	...do	...do	8709	Crushed at knot at middle; split obliquely.
176. Sideroxylon Mastichodendron. *Mastic.*	461	...do	Upper Metacombe Key.	...do	...do	10932	Split along grain at end; slight crushing.
	461	...do	...do	...do	...do	9889	Crushed at end; oblique split
177. Dipholis salicifolia *Bustic. Cassada.*	488	... do	Bay Biscayne	...do	...do	11952	Triple flexure
	488	...do	...do	...do	...do	12565	Crushed near middle
	500	...do	Umbrella Key	...do	...do	11272	Crushed at 64 millimeters from end and split along grain.
	509	...do	...do	... do	...do	10931	Crushed at 102 millimeters from end in vicinity of knots.
178. Bumelia tenax	746	Georgia	Bainbridge	...do	Low	7235	Split obliquely from middle to end.
179. Bumelia lanuginosa *Gum Elastic. Shittim Wood.*	930	Texas	Austin	C. Mohr	Limestone	5489	Crushed at end
	930	...do	... do	...do	...do	5012	Crushed at 102 millimeters from end at 5 millimeters knot.
	1983	Missouri	Allenton	G. W. Letterman	...do	6895	Deflected at middle; split at ends.
181. Bumelia lycioides *Iron Wood. Southern Buckthorn.*	333	Tennessee	Nashville	A. Gattinger	Alluvial	7825	Split at end; cross-grained; seasoning crack at middle.
182. Bumelia cuneata *Ants' Wood. Downward Plum. Saffron Plum.*	1124	Florida	Boca Chica Key	A. H. Curtiss	Coral	7643	Triple flexure, deflecting from knots.
183. Mimusops Sieberi *Wild Dilly.*	458	...do	Upper Metacombe Key.	...do	...do	8913	Cross-grained; split obliquely from end to end.
	458	...do	...do	...do	...do	5806	Cross-grained; split along seasoning cracks.
EBENACEÆ.							
184. Diospyros Virginiana *Persimmon.*	61	Missouri	Allenton	G. W. Letterman	Rich upland	7832	Triple flexure, deflected diagonally.
	61	...do	...do	...do	...do	7485	...do
	425	Tennessee	Nashville	A. Gattinger	Rich loam	9095	Crushed at end
	811	West Virginia	Grafton	C. G. Pringle		7394	Triple flexure
	811	...do	...do	...do		7892	Triple flexure, deflected diagonally.
	1084	Missouri	Allenton	G. W. Letterman	Rich upland	8301	Deflected at 25 millimeters from middle.
	1084	...do	...do	... do	...do	8029	... do
	1162	...do	...do	.. do	Rich	8415	Triple flexure, deflected diagonally; intersecting "Cooper lines".
	1162	... do	...do	...do	...do	7901	
STYRACACEÆ.							
186. Symplocos tinctoria *Horse Sugar. Sweet Leaf.*	347	Alabama	Cottage Hill	C. Mohr	Sandy	6140	Crushed at 6 millimeters knot 76 millimeters from end and at 3 millimeters knot at end.
	347	...do	...do	... do	...do	......	
187. Halesia diptera *Snow-drop Tree. Silver-bell Tree.*	738	Georgia	Bainbridge	A. H. Curtiss	Low	6480	Failed at 6 millimeters knot 127 millimeters from end and split along grain.
	738	...do	...do	...do	...do	7394	Triple flexure
OLEACEÆ.							
191. Fraxinus pistaciæfolia *Ash.*	660	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	...do	6441	Crushed at middle on one face
	660	... do	...do	...do	...do	5874	Crushed at middle in vicinity of 3 millimeters knot.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1520	2586	2976	3221	3411	3629	3801	3946	4105	4219	4922	5421	Sheared fibers	683
	2359	3583	3983	4250	4482	4662	4854	4990	5112	5207	6123	6623	......do	683
	1951	3062	3479	3751	3946	4237	4414	4554	4685	4831	5670	6350	......do	353
	1211	2223	2676	2971	3153	3284	3479	3633	3760	3856	4491	5058	......do	353
	1497	2214	2527	2694	2849	3021	3193	3325	3493	3611	4287	4620	Sheared fibors; split at end	515
	1560	2254	2586	2767	2921	3003	3157	3207	3393	3438	3946	......	......do	675
	2268	3289	3674	3969	4105	4237	4350	4491	4581	4690	5534	......	......do	262[2]
	2223	3447	3892	4173	4267	4432	4581	4699	4808	4890	5625	6078	Sheared fibers	263[2]
	2041	2767	2980	3107	3252	3352	3434	3502	3597	3674	4264	4491	......do	263
	1951	2468	2708	2830	2880	2994	3085	3166	3252	3302	3810	4150	Sheared fibers; split at end	263
	4219	5579	6033	6464	6791	7145	7430	7693	7974	8219	9753	......	......do	492
	1860	3765	4626	5120	5425	5742	6014	6250	6532	6736	8119	9026	......do	492
	2313	4536	5171	5586	5874	6201	6382	6677	6940	7117	......	......	Slight shearing; split at end	461
	2767	4332	4899	5307	5489	5761	5987	6123	6296	6464	7248	7847	Sheared fibers; split at end; short specimen, 121 millimeters long.	461
	2687	3420	4082	4436	4717	5035	5434	5670	......	......	......	......	Split at end	488
	2177	3493	3963	4327	4608	4844	4649	5398	5479	5648	6441	......	Sheared fibers on one edge; split at end	488
	975	2486	3425	3810	4114	4364	4604	4808	......	5103	......	......	Sheared fibers; split at end	500
	907	2269	3239	3833	4073	4400	4527	4844	5013	5207	6123	......	......do	500
	1474	2155	2431	2712	2894	3116	3293	3497	3710	3882	4854	5602	Sheared fibers	746
	1284	1923	2055	2168	2259	2381	2472	2572	2635	2703	3121	3443	......do	930
	975	1497	1606	1692	1801	1896	1978	2073	2177	2268	2703	3085	......do	930
	1769	2835	3148	3425	3633	3042	4024	4191	4350	4518	5398	5851	Sheared fibers; split at corner	1083
	880	2522	2527	3289	3520	3751	3964	4178	4364	4536	......	......	Split at ends	333
	658	2313	3720	4281	4581	4799	4944	5207	5479	5666	6577	7462	Sheared fibers	1124
	2676	4355	5307	6023	6532	6895	7235	7521	7811	8029	8936	9163	......do	458
	2359	3697	4491	5058	5470	5851	6155	6386	6713	6940	8279	9026	......do	458
	1905	3130	3674	4001	4214	4332	4527	4667	4786	4890	5625	6140	......do	61
	2041	3402	4060	4436	4695	4971	5067	5239	5362	5534	6486	7076	......do	61
	1900	3602	4459	4906	5289	5561	5869	6083	6310	6477	7666	8392	......do	425
	2767	4536	5353	5738	6005	6260	6486	6849	7049	7235	8256	8799	......do	811
	1995	3266	3901	4341	4604	4854	5080	5285	5434	5615	6668	7580	......do	811
	1746	3402	4204	4698	5035	5307	5421	5661	5811	5965	7631	7711	......do	1084
	2676	4092	4786	5194	5484	5715	5883	6042	6187	6310	7258	7756	......do	1084
	2540	4495	5557	6065	6323	6568	6736	6681	7049	7221	8170	8663	......do	1162
	1293	3039	4060	4695	5089	5421	5606	5651	6069	6246	7417	8391	Slight shearing of fibers	1162
	1637	2608	2744	2871	2967	3003	3039	3057	3085	3162	3720	3856	Sheared fibers	347
	1170	1796	1969	2064	2127	2214	2295	2381	2445	2504	2903	3230	..... do	347
	1307	2336	2753	2908	3153	3366	3497	3683	3810	3919	4491	5171	......do	738
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	1892	2227	2522	2767	2948	3080	3212	3313	3561	3674	4355	4763	Sheared fibers	660
	2132	3039	3425	3520	3787	3901	4150	4332	4508	4604	5413	6078	Sheared fibers along one edge	660

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
192. Fraxinus Americana *White Ash.*	39^{2}	Missouri	Allenton	G. W. Letterman	Low	7530	Triple flexure
	114^{1}	Michigan	Dansville	W. J. Beal	Clay	5851	do
	114^{1}	do	do	do	do	5579	Triple flexure; split at end
	114^{3}	do	Hudson	do		9526	Deflected diagonally; crushed at 25 millimeters from middle.
	114^{4}	do	Lansing	do		9934	Crushed at 25 millimeters from end.
	114^{5}	do	Dansville	do	Clay	5761	Crushed at 38 millimeters from middle; "Cooper lines."
	130	South Carolina	Bonneau's Depot	H. W. Ravenel	Wet	9208	Crushed at 64 millimeters from end.
	130	do	do	do	do	8709	Crushed at 114 millimeters from end.
	212	Virginia	Wytheville	H. Shriver		7983	Crushed at middle
	212	do	do	do		7750	Crushed at 32 millimeters from middle.
	227^{1}	Vermont	Charlotte	C. G. Pringle	Gravelly	7281	Crushed at 51 millimeters from middle; deflected diagonally.
	227^{3}	do	do	do	do	7485	Crushed at 3 millimeters knot 12 millimeters from middle.
	227^{3}	do	do	do	do	7349	Triple flexure
	267^{1}	Virginia	Wytheville	H. Shriver		6141	Crushed at 38 millimeters from middle.
	267^{3}	do	do	do		6509	Deflected diagonally; maximum bend 38 millimeters from middle.
	431	Tennessee	Nashville	A. Gattinger	Limestone	8346	Triple flexure
	551	Alabama	Kemper's mill	C. Mohr	Alluvial	7439	do
	551	do	do	do	do	6736	Deflected and fibers crushed at 76 millimeters from end.
	747	Georgia	Bainbridge	A. H. Curtiss	River-bottom	5057	Crushed at 3 millimeters knot at middle.
	747	do	do	do	do	5080	Triple flexure; split at ends
	937	Texas	Austin	C. Mohr	Rich, calcareous	7167	Crushed at end and at 76 millimeters from end in vicinity of knots.
	1045	Massachusetts	Reading	J. Robinson		8890	Triple flexure; middle bend 19 millimeters from center.
	1045	do	do	do		8686	do
192. Fraxinus Americana, *var.* Texensis.	364	Texas	Dallas	J. Reverchon	Dry, calcareous	9435	Triple flexure
	364	do	do	do	do	7892	Crushed at 6 millimeters knot 102 millimeters from end.
193. Fraxinus pubescens *Red Ash.*	229^{2}	Vermont	Charlotte	C. G. Pringle	Clay	8301	Failed at knot 64 millimeters from end; cross-grained.
	229^{3}	do	do	do	do	8065	Triple flexure
	1059	Massachusetts	Topsfield	J. Robinson	River-bottom	4513	Triple flexure, deflected diagonally.
194. Fraxinus viridis *Green Ash.*	57	Missouri	Allenton	G. W. Letterman	Rich, wet	6486	Deflected at middle
	308	Texas	Dallas	J. Reverchon	do	7349	Crushed at middle on one face
	308	do	do	do	do	5829	Triple flexure
	438	Tennessee	Nashville	A. Gattinger	Rich upland	8618	Crushed at 89 millimeters from end, splitting between rings.
	948	Texas	Victoria	C. Mohr	Rich, wet	8097	Deflected diagonally
	948	do	do	do	do	9753	Triple flexure; middle bend 38 millimeters eccentric.
	957	do	Matagorda bay	do	do	7892	Crushed at 6 millimeters knot 51 millimeters from end.
	957	do	do	do	do	7666	Triple flexure
195. Fraxinus platycarpa *Water Ash.*	536	Alabama	Stockton	do	Rich, alluvial	4014	Crushed at 70 millimeters from end.
196. Fraxinus quadrangulata *Blue Ash.*	66	Missouri	Allenton	G. W. Letterman	Dry upland	8754	Triple flexure
	66	do	do	do	do	9299	Triple flexure, deflected diagonally.
	125	Michigan	Lansing	W. J. Beal	Rich loam	6228	
	125	do	do	do	do	6327	Triple flexure; developed intersecting "Cooper lines".
	280^{1}	Kentucky	Mercer county	W. M. Linney	Limestone	9344	Deflected at middle and at 3 millimeters knot 70 millimeters from end.
	286^{3}	do	do	do	do	8428	Crushed at 3 millimeters knot 51 millimeters from end and near middle.
	291	Missouri	Allenton	G. W. Letterman	Sandy loam	6849	Crushed on one face 19 millimeters from middle.
	518	Tennessee	Nashville	A. Gattinger	Rich limestone	8609	Crushed at knots 102 millimeters from end.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1334	2078	2400	2436	2527	2744	2930	2980	3130	3207	....	....	Split at ends; short specimen, 120 millimeters long..	39[2]
	1134	1338	1488	1597	1610	1696	1719	1783	1810	1883	2155	2413	Sheared fibers....................................	114[1]
	749	1302	1334	1542	1619	1619	1724	1787	1833	1842	2205	2472	......do..	114[2]
	1996	2948	3121	3298	3488	3633	3833	3964	4033	4128	4944	5579	Split at corner of specimen; fibers not sheared.......	114[3]
	1542	1882	1982	2068	2205	2304	3368	2468	2518	2576	3039	3130	..... do..	114[4]
	1315	1842	2041	2161	2270	2427	2499	2586	2663	2690	3130	3357	Split at corner; slight shearing.....................	114[5]
	....	2109	2395	2622	2717	2939	3075	3162	3334	3488	4219	....	Slight shearing; split at end.........................	130
	1529	2654	2976	3148	3284	3434	3529	3665	3860	3937	4491	4990	Sheared fibers....................................	130
	1588	1769	1987	2273	2400	2486	2590	2762	2848	2985	3742	4491	Split at end; sheared fibers.........................	212
	1588	1741	2023	2186	2336	2504	2667	2830	2894	3057	3810	4206	Sheared fibers....................................	212
	1588	1973	2218	2277	2440	2536	2631	2776	2899	3089	3882	4382	......do..	227[1]
	1882	2985	3388	3611	3742	3964	4042	4137	4250	4359	5171	5285	......do..	227[3]
	1560	1619	2708	2903	2989	3162	3307	3425	3543	3946	....	....	Sheared fibers; split at end.........................	227[3]
	1860	2481	2744	2890	3103	3248	3388	3525	3583	3706	3856	....	Split at end..	267[1]
	2449	2848	3221	3379	3574	....	3842	3946	4092	4132	4899	5443	Slight shearing of fibers............................	267[3]
	1551	2159	2250	2463	2579	2708	2867	2976	3134	3221	3924	4300	...... do..	431
	1179	1642	1801	1932	2028	2132	2195	2241	2400	2341	2926	3130	Slight shearing of fibers; split at end..............	551
	1352	1579	1746	1887	1991	2123	2218	2336	2436	2522	3062	3429	Slight shearing of fibers............................	551
	1538	2576	2976	3157	3234	3334	3425	....	3529	3579	3901	3901	Sheared fibers....................................	747
	1433	1801	1982	2014	2214	2313	2331	2436	2481	2531	2976	3089	Slight shearing of fibers............................	747
	1905	2468	2691	2948	3152	3334	3620	3788	3901	3987	4990	5489	Slight shearing....................................	937
	2023	2622	2885	3198	3470	3751	....	4196	4559	4604	5489	6010	Slight shearing of fibers............................	1045
	2041	3357	3878	4082	4160	4305	4445	4522	4196	4300	5434	5851	Indented without shearing............................	1045
	1325	1996	2291	2608	2685	2860	3110	3207	3420	3529	4559	5353	......do..	364
	1837	2941	3384	3615	3669	4033	4287	4118	4473	4491	4763	....	Slight shearing; split stick.........................	364
	1533	2518	2799	3021	3162	3343	3484	3597	3679	3751	4377	4693	Sheared fibers....................................	229[2]
	1384	2427	2753	2948	3221	3311	3425	3484	3529	3674	4196	4423	......do..	229[2]
	1860	2867	3148	3334	3434	3620	3774	3837	3983	4073	4626	5035	Indented without shearing............................	1059
	1570	2767	3243	3357	3593	3710	3878	3933	4037	3810	4717	5035	......do..	57
	1633	1800	1951	2109	2223	2155	2064	2563	2713	2880	3583	3992	Slight shearing of fibers............................	308
	1588	2245	2409	2486	2567	2676	2749	2830	2890	2935	3348	3465	Sheared fibers....................................	308
	2041	2708	2804	3175	3379	3047	3828	3910	4055	4205	5035	5625	Slight shearing of fibers............................	438
	2041	3108	3638	3969	4200	4482	4672	4844	5121	5330	6237	6940	......do..	948
	1860	3402	3992	4281	4454	4717	4808	5035	5207	5289	6078	6595	Fibers did not shear.................................	948
	2109	3020	3293	3470	3720	3856	3987	....	4196	4332	4035	5262	Sheared fibers....................................	957
	2177	3202	3611	3842	4028	4164	4309	4454	4572	4672	5421	5987	......do..	957
	1179	1760	1932	2006	2269	2313	2377	2459	2522	2549	2912	3157	......do..	536
	2880	3901	4264	4418	4590	4722	4849	5022	5158	5316	6373	7031	Slight shearing of fibers............................	66
	2350	3020	4191	4513	4886	7180	5489	5700	5065	6128	7485	8029	......do..	66
	1452	1633	1650	1705	1724	1842	1896	1973	2028	2105	2427	2586	Sheared fibers....................................	125
	1170	1506	1574	1619	1674	1778	1873	1932	1982	2037	2381	2567	......do..	125
	1542	....	3701	3974	4150	4332	....	....	....	4967	5942	6500	Slight shearing of fibers............................	286[1]
	1225	2713	3334	3720	3882	4082	4173	4296	4427	4545	5149	....	Sheared fibers; split at end.........................	286[3]
	1073	2740	2894	2030	3071	3202	3357	3429	3479	3615	4128	4445	Indented section covers unsound knot 10 millimeters in diameter.	291
	1656	3171	3819	4164	4377	4527	4744	4835	5103	5210	6123	6849	Slight shearing of fibers............................	518

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
197. Fraxinus Oregana. *Oregon Ash.*	964	Oregon	Portland	G. Engelmann and C. S. Sargent.	Low, wet	9753	Crushed at middle
	964	do	do	do	do	7838	Crushed 25 millimeters from middle on one face.
	1001	do	Weidler's saw-mill	do		8799	Triple flexure, deflected diagonally.
	1001	do	do	do		9063	Crushed at end
	1024	do	Portland Furniture Company.	do		6441	Crushed at middle; side of specimen split off.
	1024	do	do	do		5557	Crushed at middle; angle of crushing, 75°.
	1030	do	do	do		9208	Crushed at middle; angle of crushing, 53°.
	1030	do	do	do		9798	Crushed at 51 and at 114 millimeters from end.
198. Fraxinus sambucifolia. *Black Ash. Hoop Ash. Ground Ash.*	122	Michigan	Dansville	W. J. Beal	Wet, peaty	6237	Crushed on one face 25 millimeters from middle.
	839	Massachusetts	Danvers	J. Robinson	Rich, loamy	7021	Triple flexure; middle bend 25 millimeters eccentric.
	839	do	do	do	do	6441	do
199. Forestiera acuminata. *Privet.*	737	Georgia	Bainbridge	A. H. Curtiss		6418	Split from end to end
	737	do	do	do			
201. Osmanthus Americanus. *Devil Wood.*	283	Louisiana	Amite	C. Mohr	Rich, alluvial	9058	Crushed along one face
	283	do	do	do	do	9063	Crushed at knot 64 millimeters from end.
	584	Florida	Saint John's river	A. H. Curtiss	Sandy loam	8777	Crushed at 76 millimeters from end.
	584	do	do	do	do	8119	Crushed at 102 millimeters from end.
BORRAGINACEÆ.							
204. Bourreria Havanensis. *Strong Bark.*	1137	do	Key Largo	do	Coral	10614	Crushed fibers at 38 millimeters from end.
	1137	do	do	do	do	7779	Cross-grained; oblique fracture along grain.
205. Ehretia elliptica. *Knackaway. Anaqua.*	942	Texas	New Braunfels	C. Mohr	Rich, alluvial	6078	Crushed at one corner near middle.
	942	do	do	do	do	6305	Triple flexure, deflected diagonally.
BIGNONIACEÆ.							
206. Catalpa bignonioides. *Catalpa. Catawba. Bean Tree. Cigar Tree. Indian Bean.*	540	Alabama	Stockton	do	Low, wet	6827	Crushed at end
	744	Georgia	Bainbridge	A. H. Curtiss	Clay	5625	Crushed at 38 millimeters from middle on one face.
	744	do	do	do	do	5012	Crushed at 38 millimeters from end.
207. Catalpa speciosa. *Western Catalpa.*	38	Missouri	Charleston	C. S. Sargent	Wet clay	6668	Crushed at 19 and at 102 millimeters from end.
	38	do	do	do	do	6373	Triple flexure
208. Chilopsis saligna. *Desert Willow.*	682	Arizona	Tuscon	G. Engelmann and C. S. Sargent.	Moist, gravelly	4755	Failed in vicinity of 10 millimeters knot.
VERBENACEÆ.							
210. Citharexylum villosum. *Fiddle Wood.*	490	Florida	Bay Biscayne	A. H. Curtiss	Coral	11067	Crushed near middle; angle of crushing, 55°.
	490	do	do	do	do	11060	Crushed near middle
NYCTAGINACEÆ.							
212. Pisonia obtusata. *Pigeon Wood. Beef Wood. Cork Wood. Pork Wood.*	474	do	Upper Metacombe Key.	do	do	5398	Split along grain from middle to end.
	474	do	do	do	do	4527	Crushed at knots 102 millimeters from end.
POLYGONACEÆ.							
213. Coccoloba Floridana. *Pigeon Plum.*	473	do	do	do	do	12292	Crushed at 38 millimeters from middle and at end.
	473	do	do	do	do	12383	Crushed at middle
214. Coccoloba uvifera. *Sea Grape.*	453	do	do	do	do	4355	Split from end to end; badly cracked in seasoning.
	453	do	do	do	do	3900	do
LAURACEÆ.							
215. Persea Carolinensis. *Red Bay.*	585	do	Saint John's river	do	Sandy loam	0548	Crushed at 5 millimeters knot near middle.
	585	do	do	do	do	8799	Crushed at end
215. Persea Carolinensis, *var.* palustris.	340	Alabama	Mobile county	C. Mohr	Damp, sandy	5216	Crushed at 64 millimeters from end.
	340	do	do	do	do	6532	do
217. Sassafras officinale. *Sassafras.*	71	Missouri	Allenton	G. W. Letterman	Low, rich	6069	Crushed at 51 millimeters from middle and at ends.
	71	do	do	do	do	6486	Crushed at 3 millimeters knot 38 millimeters from middle.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1452	2200	2304	2685	2849	2971	3075	3175	3248	3379	3878	....	Slight shearing of fibers; split at end	964
	1669	2359	2576	2703	2835	2935	2089	3180	3266	3357	3878	....	......do	964
	1633	2436	2595	2626	2803	2980	3021	3121	3221	3208	3629	....	......do	1001
	1814	2223	2313	2440	2622	2749	2894	3026	3130	3243	3856	4128	......do	1001
	1497	1842	1960	2118	2214	2313	2431	2531	2622	2654	3148	3470	Sheared fibers	1024
	1315	....	2064	2096	2141	2245	2345	2381	2486	2536	2903	3107	......do	1024
	1579	2223	2472	2685	2880	3094	3289	3857	3488	3525	4126	4355	Sheared fibers; split at end	1030
	1370	2277	2386	2654	2880	3016	3212	3302	3438	3561	4150	4708	Sheared fibers	1030
	1189	1674	1740	1819	1842	1887	1937	1982	2005	2082	2295	2427	Sheared fibers; split at end	122
	2273	3348	3801	3983	4119	4264	4336	4527	4613	4713	5376	5489	Slight shearing of fibers	839
	2132	2699	2849	3084	3357	3583	3819	3992	4155	4318	5285	5625	.....do	839
	871	1837	2265	2331	2368	2481	2576	2635	2717	2753	2912	3583	Sheared fibers	737
	1397	2381	2743	2930	3066	3184	3243	3375	3434	3484	4078	4287	......do	737
	2744	4355	4990	5398	5648	5920	6123	6373	6518	6659	7756	8523	......do	282
	2449	2640	2903	3212	3465	3742	3924	4150	4287	4432	5489	....	Sheared fibers; split at end; short specimen, 103 millimeters long.	282
	2223	2867	3021	3334	3506	3656	3788	4014	4110	4246	5058	5625	Sheared fibers	584
	2041	2486	2703	3062	3212	3425	3570	3710	3842	3969	4763	5262	......do	584
	2087	3756	4182	4877	4967	5216	5371	5489	5620	5702	6577	7076	......do	1137
	2132	3334	3837	4146	4436	4681	4872	4090	5171	5343	6237	6713	......do	1137
	1610	2790	3339	3611	3878	4037	4155	4336	4477	4572	5239	5851	......do	942
	1542	2608	3060	3293	3447	3651	3774	3901	4037	4150	4920	5443	......do	942
	930	1216	1334	1429	1488	1524	1579	1606	1642	1728	2028	....	Sheared fibers; split at end; specimen 120 millimeters long.	540
	735	848	871	925	944	980	1025	1066	1080	1089	1302	1433	Sheared fibers	744
	717	1061	1152	1207	1257	1302	1347	1393	1402	1438	1701	1878	......do	744
	998	1234	1352	1429	1488	1551	1619	1660	1674	1719	1960	....	Sheared fibers; split at end	38
	703	1098	1170	1229	1266	1320	1356	1402	1442	1488	1724	1941	Sheared fibers	38
	1270	1851	2105	2205	2304	2408	2558	2658	2731	2803	3375	3593	......do	682
	2076	3652	3991	4264	4491	4704	4895	5080	5162	5216	....	....	Slight shearing of fibers; split at end	490
	2948	4241	4808	5153	5362	5561	5652	5942	....	....	....	....	......do	490
	749	1302	1515	1669	1746	1778	1787	1801	1796	1805	1978	2064	Sheared fibers; split at end	474
	880	1325	1533	1669	1728	1765	1851	1878	1928	2005	2177	....	......do	474
	4128	5398	6260	7031	7303	7485	7621	8074	8392	8663	10115	10706	Sheared fibers	473
	2104	3810	4499	4080	5316	5625	5800	6123	6532	6759	....	....	Slight shearing; split at end; short specimen, 120 millimeters long.	473
...	....	....	....	....	....	....	....	....	....	....	....	....	....	....
...	....	....	....	....	....	....	....	....	....	....	....	....	....	....
	2019	3039	3230	3339	3429	3465	3534	3624	3724	3788	4309	4522	Sheared fibers	585
	1702	2608	2762	2803	2926	2994	3075	3125	3212	3252	3856	4196	......do	585
	1051	2880	3157	3330	3515	....	....	3878	3937	3987	4491	4854	......do	340
	1551	2295	2481	2558	2631	2717	2794	2858	2980	3066	3538	3878	......do	340
	1810	1805	2019	2037	2127	2155	2168	2218	2295	2318	2694	2835	......do	71
	1111	1792	2014	2068	2118	2154	2214	2322	2381	2400	2707	2808	......do	71

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
217. Sassafras officinale—continued.	387	Missouri	Allenton	G. W. Letterman	Alluvial	5751	Crushed at 51 millimeters from end.
	387	...do	...do	...do	...do	6328	Crushed at middle and at 64 millimeters from end.
	446	Tennessee	Nashville	A. Gattinger	Rich	6713	Crushed at 32 and at 89 millimeters from end.
	814	West Virginia	Grafton	C. G. Pringle		6418	Triple flexure, deflected diagonally.
	814	...do	...do	...do		6659	...do
	854	Massachusetts	Danvers	J. Robinson	Rich loam	4559	Triple flexure
	854	...do	...do	...do	...do	5851	...do
	1163	Missouri	Allenton	G. W. Letterman	Low, alluvial	6341	Triple flexure; developed intersecting "Cooper lines".
	1163	...do	...do	...do	...do	6033	Triple flexure
218. Umbellularia Californica. *Mountain Laurel. California Laurel. Spice Tree. Cajeput. California Olive. California Bay Tree.*	703	Oregon	Coos bay	G. Engelmann and C. S. Sargent.		9435	Crushed at 25 millimeters from middle.
	703	...do	...do	...do		8754	Crushed at 38 millimeters from end.
EUPHORBIACEÆ.							
219. Drypetes crocea. *Guiana Plum. White Wood.*	468	Florida	Upper Metacombo Key.	A. H. Curtiss	Coral	10410	Crushed in vicinity of small knots
219. Drypetes crocea, *var.* latifolia.	459	...do	...do	...do	...do	8256	Split suddenly from end to end
	459	...do	...do	...do	...do	8392	Split suddenly; oblique fracture
URTICACEÆ.							
222. Ulmus crassifolia. *Cedar Elm.*	324	Texas	Dallas	J. Reverchon	Rich loam	7847	Crushed at 51 millimeters from end.
	324	...do	...do	...do	...do	8414	Crushed in vicinity of small knots 102 millimeters from end.
	929	...do	Austin	C. Mohr	...do	5951	Crushed at end; cross-grained
	929	...do	...do	...do	...do	0781	Triple flexure
223. Ulmus fulva. *Red Elm. Slippery Elm. Moose Elm.*	30^{3}	Kentucky	Mercer county	W. M. Linney	Limestone	7847	Deflected and crushed at end and at 102 millimeters from end.
	30^{4}	...do	...do	...do	...do	8573	Crushed at middle
	120	Michigan	Dansville	W. J. Beal	Gravelly	0889	Crushed at 102 millimeters from end.
	134	Missouri	Allenton	G. W. Letterman	Rich, alluvial	8437	Triple flexure
	134	...do	...do	...do	...do	8392	Crushed near middle in vicinity of knot.
224. Ulmus Americana. *White Elm. American Elm. Water Elm.*	19	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	8641	Deflected; crushed at middle and end.
	19	...do	...do	...do	...do	8573	Triple flexure
	281	Missouri	Allenton	G. W. Letterman	Alluvial	7598	Triple flexure; middle bend eccentric.
	281	...do	...do	...do	...do	6895	Crushed at middle; deflected diagonally.
	958	Texas	Colorado river	C. Mohr	...do	5851	Crushed at knot 102 millimeters from end.
	958	...do	...do	...do	...do	4990	Crushed at 10 millimeters knot near middle.
	1030	Massachusetts	Danvers	J. Robinson	Gravelly	7022	Triple flexure, deflected diagonally.
	1036	...do	...do	...do	...do	5579	...do
	1049	...do	North Reading	...do	...do	0049	Triple flexure; developed intersecting "Cooper lines".
225. Ulmus racemosa. *Rock Elm. Cork Elm. Hickory Elm. White Elm. Cliff Elm.*	116	Michigan	Dansville	W. J. Beal	...do	11385	Triple flexure; middle deflection 25 millimeters eccentric.
	116^{3}	...do	Big Rapids	...do	...do	0571	...do
	116^{3}	...do	...do	...do	Low, gravelly	7847	Crushed fibers at 32 millimeters from end.
	116^{5}	...do	Hudson	...do	Alluvial	0571	Triple flexure
	314	...do	Hersey	...do	Rich loam	10387	Crushed at 25 and at 114 millimeters from end.
	314	...do	...do	...do	...do	10206	Triple flexure, deflected diagonally.
	428	Tennessee	Nashville	A. Gattinger	...do	7349	Crushed at small knot at middle
226. Ulmus alata. *Wahoo. Winged Elm.*	133	South Carolina	Bonneau's Depot	H. W. Ravenel	...do	6895	Crushed at 13 millimeters knot at middle.
	133	...do	...do	...do	...do	7847	Triple flexure, deflected diagonally.
	380	Tennessee	Davidson county	A. Gattinger	Loam	6260	Crushed at 10 millimeters knot 64 millimeters from end.
	533	Mississippi	Kemper's mill	C. Mohr	Alluvial	7008	Triple flexure
	533	...do	...do	...do	...do	7892	Triple flexure, deflected diagonally.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	**0.51**	**0.76**	**1.02**	**1.27**	**1.52**	**1.78**	**2.03**	**2.28**	**2.54**	**4.81**	**5.08**		
	1111	1488	1615	1665	1710	1760	1846	1873	1937	1982	2250	2440	Sheared fibers	387
	1071	1442	1588	1642	1669	1710	1765	1801	1801	1887	2155	......	Sheared fibers; split at end	387
	1452	1892	1914	1978	2055	2123	2155	2209	2259	2304	2608	2758	Sheared fibers	446
	1111	1882	2109	2195	2254	2350	2413	2472	2490	2513	2884	3121	......do	814
	1542	1778	1982	2164	2250	2377	2531	2672	2776	2862	3561	3946	......do	814
	1270	2068	2381	2468	2522	2558	2621	2658	2699	2741	3139	3334	......do	854
	1778	1960	2014	2078	2132	2177	2250	2330	2427	2473	2858	3062	......do	854
	1275	1833	2068	2164	2259	2413	2468	2531	2595	2635	3198	3538	Slight shearing of fibers	1163
	1665	2250	2368	2440	2490	2531	2576	2622	2667	2690	2908	3020	Sheared fibers	1163
	2019	2699	2971	3066	3193	3329	......	3561	3674	3756	4300	4672	......do	703
	1978	2744	2926	3057	3198	3334	3357	3561	3628	3674	4037	4445	......do	703
	2177	3856	4854	5466	5797	6092	6373	6577	6804	6949	8340	8845	......do	468
	3052	5670	6328	6768	7145	7439	7756	7983	8155	8237	9480	10160	......do	459
	3130	4509	5198	5615	5874	6110	6396	6509	6749	6918	8256	8799	Sheared fibers; split at end	459
	1315	1878	2259	2477	2640	2803	3030	3166	3334	3484	4300	4808	Sheared fibers	324
	2676	3303	3620	3637	4046	4237	4359	4531	4690	4899	5851	6192	......do	324
	2676	3856	4296	4635	4890	4699	5353	5516	5797	5965	7212	7983	Slight shearing of fibers	029
	2109	3765	4196	4482	4744	4953	5163	5380	5611	5797	7031	8029	Sheared fibers	929
	1678	1814	1910	2032	2223	2322	2427	2522	2667	2744	2948	......	Slight shearing of fibers; split at end	30[3]
	1093	1479	1619	1765	1855	1969	2064	2164	2277	2350	2858	3153	......do	30[4]
	1565	1932	2223	2440	2576	2667	2758	2866	2935	2994	......	......	......do	120
	1379	2277	2380	2527	2685	2709	2976	3112	3207	3260	3937	......	......do	134
	1551	2073	2300	2481	2658	2958	......	3089	3207	3334	4014	......	......do	134
	1592	2350	2699	2875	2971	3121	3212	3348	3438	3529	4250	4513	Sheared fibers	19
	1338	1905	2168	2377	2504	2645	2753	2844	2971	3057	3674	3992	......do	19
	1610	1960	2041	2180	2336	2372	2504	2567	2663	2744	......	......	Split at ends; fibers not sheared; specimen 120 millimeters long.	281
	1293	1769	1914	2601	2196	2313	2431	2549	2608	2720	3221	......	......do	281
	1610	1669	1715	1787	1882	1982	2118	2214	2331	2354	2971	3357	Sheared fibers	958
	1324	1660	1896	2014	2109	2214	2304	2409	2459	2522	2971	3266	......do	958
	1656	2449	2744	2958	3139	3261	3452	3556	3697	3774	4740	5171	Slight shearing of fibers	1036
	1796	2835	3266	3515	3697	3810	3964	4046	4109	4281	4967	5353	......do	1036
	2096	2880	3198	3434	3697	3828	4028	4182	4281	4468	5489	5874	......do	1049
	2291	3289	3674	4037	4241	4527	4695	4886	5035	5198	......	......	Split at end; fibers did not shear	116
	1338	1887	2041	2164	2268	2381	2477	2576	2658	2708	3266	......	Split at end; slight shearing of fibers	116[5]
	1179	1987	2254	2468	2613	2794	2898	3035	3125	3243	......	......	Slight shearing of fibers; split at end	116[3]
	1111	2295	2740	2971	3184	3402	3583	3738	3882	4019	4808	......	......do	116[5]
	2291	2853	3075	3266	3452	3638	3765	3919	4033	4196	4808	......	......do	314
	1996	2563	3016	3198	3366	3550	3665	3747	3946	4119	4854	......	......do	314
	1678	2875	3348	3620	3842	4073	4200	4400	4581	4672	5625	6123	Slight shearing of fibers	428
	2586	3901	4377	4677	5013	5243	5557	5697	5942	6069	7303	7689	......do	133
	1474	2912	3606	4092	4404	4044	4881	5116	5380	5579	6895	7621	......do	133
	1678	2495	2617	2708	2869	2971	3030	3202	3293	3348	3860	4106	Sheared fibers	380
	2381	3030	3257	3465	3620	3810	3992	4150	4287	4400	5353	5806	Slight shearing of fibers	533
	2336	3493	3955	4264	4522	4753	4937	5194	5358	5557	6441	7235	......do	533

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
227. Planera aquatica	758	Florida	Chattahoochee	A. H. Curtiss	Rich, alluvial	6373	Triple flexure
	758	...do	... do	...do	...do	6328	Triple flexure, deflected diagonally.
	918	...do	... do	C. Mohr	...do	6214	Crushed at 38 and at 102 millimeters from end.
228. Celtis occidentalis. *Sugarberry. Hackberry.*	75	Missouri	Allenton	G. W. Letterman	Low, rich	5679	Crushed on one face at 25 millimeters from middle.
	75	...do	... do	...do	Alluvial	6895	Crushed at knot 51 millimeters from end.
	306	Texas	Dallas	J. Reverchon	...do	5579	Crushed at middle, deflected diagonally.
	306	... do	...do	... do	.. do	6169	Triple flexure, deflected diagonally.
	375	Tennessee	Davidson county	A. Gattinger	Loam	6895	Triple flexure
	375	.. do	...do	...do	...do	7031	Triple flexure, deflected diagonally.
	873	Massachusetts	Salem	J. Robinson	.. do	5489	Triple flexure
	873	...do	...do	.. do	...do	7303	Triple flexure, deflected diagonally.
	1111	Missouri	Saint Louis	Henry Eggert	Moist loam	8278	Deflected; crushed at middle
	1111	...do	...do	...do	...do	8074	Crushed at 6 millimeters knot 102 millimeters from end.
228. Celtis occidentalis, *var.* reticulata. *Hackberry. Palo Blanco.*	632	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry	6985	Crushed at 12 millimeters knots at end and at 102 millimeters from end.
229. Ficus aurea	486	Florida	Bay Biscayne	A. H. Curtiss	Coral	3198	Triple flexure
	486	.. do	...do	...do	...do	1996	Crushed at middle and at 38 millimeters from end.
231. Ficus pedunculata. *Wild Fig. India-rubber Tree.*	508	...do	Boca Chica Key	... do	...do	4491	Split obliquely
232. Morus rubra. *Red Mulberry.*	132	Missouri	Allenton	G. W. Letterman	Rich loam	8754	Crushed at middle and at 25 millimeters from end.
	132	... do	... do	...do	...do	8483	Crushed at middle and at end; deflected diagonally.
	433	Tennessee	Nashville	A. Gattinger	...do	6827	Failed at 12 millimeters knot 102 millimeters from end.
	1244	Missouri	Allenton	G. W. Letterman	Upland	6056	Crushed at 25 millimeters from middle at 3 millimeters knot.
	1245	...do	...do	...do	...do	6169	Crushed at 19 millimeters from end in vicinity of small knots.
	1246	...do	...do	...do	...do	5987	Triple flexure
	1255	...do	...do	...do	Rich	5829	Triple flexure, deflected diagonally.
	1255	... do	...do	...do	...do	5661	Triple flexure
234. Maclura aurantiaca. *Osage Orange. Bois d'Arc.*	253	Texas	Dallas	J. Reverchon	Bottom	14107	Crushed at middle; angle of crushing, 50°.
	253	...do	...do	... do	...do	11771	Triple flexure
PLATANACEÆ.							
235. Platanus occidentalis. *Sycamore. Button Wood. Button-ball Tree. Water Beech.*	21	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	6759	Crushed at end and at 102 millimeters from end.
	21	.. do	...do	...do	...do	5579	Crushed at end and at 127 millimeters from end.
	126	Missouri	Allenton	G. W. Letterman	Rich, alluvial	8233	Crushed at 102 millimeters from end.
	126	...do	...do	...do	...do	8256	Crushed at 38 and at 127 millimeters from end.
236. Platanus racemosa. *Sycamore. Button Wood.*	696	California	Carmel river	G. R. Vasey	Clay	4491	Crushed at 13 and at 76 millimeters from end and split along grain.
	696	...do	...do	...do	...do	5888	Crushed at middle of one face
237. Platanus Wrightii. *Sycamore.*	648	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Rich, gravelly	5398	Triple flexure, deflected diagonally.
	648	... do	... do	... do	...do	5058	Triple flexure
JUGLANDACEÆ.							
238. Juglans cinerea. *Butternut. White Walnut.*	16	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	6169	Crushed at 51 and at 127 millimeters from end.
	16	...do	.. do	.. do	... do	6396	Crushed at 102 millimeters from end.
	76	Missouri	Allenton	G. W. Letterman	Moist, alluvial	7621	Crushed at 64 millimeters from end.
	76	...do	.. do	... do	...do	7666	Crushed at 51 millimeters from end.
	76²	...do	.. do	...do	Rich, moist upland.	6849	Crushed at 25 millimeters from end.
	123	Michigan	Dansville	W. J. Beal	Gravelly clay	6123	Crushed at 19 millimeters from end.
	145	Illinois	Waukegan	Robert Douglas	Alluvial	5080	Crushed at 13 millimeters from middle and at 38 millimeters from end.
	393	Michigan	Lansing	W. J. Beal	Gravelly loam	4150	Crushed at 114 millimeters from end and at end.
	1057	Massachusetts	Topsfield	J. Robinson	Drift	6373	Crushed at middle

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1397	1996	2254	2386	2549	2749	2858	2994	3107	3212	3924	4355	Sheared fibers	758
	1406	1941	2741	2350	2481	2622	2744	2830	2971	3094	3810	4273	Slight shearing of fibers	753
	1134	1633	1769	1796	1973	......	2169	2182	2245	2313	2699	2903	Sheared fibers	918
	1415	1860	1987	2123	2232	2341	2459	2563	2640	2722	......	......	Slight shearing; split at end	75
	1406	2041	2245	2427	2576	2672	2799	2894	3016	4080	3652	......	Sheared fibers	75
	2608	3493	3819	4037	4327	4531	4735	4899	4980	5180	6237	6940	Slight shearing of fibers	306
	1111	2404	3003	3216	3488	3683	3869	4033	4209	4341	5421	6033	......do	306
	1724	2699	3107	3402	3583	3837	3951	4105	4264	4350	5216	5829	Fibers did not shear	375
	1746	3039	3583	3865	4073	4332	4450	4617	4817	4944	5851	6396	......do	375
	1610	2703	3016	3175	3393	3562	3715	3924	4064	4110	4877	5307	......do	873
	1751	2749	3026	3320	3565	3742	3974	4119	4314	4445	5126	5625	Slight shearing of fibers	873
	1606	2812	3243	2976	3574	3629	3742	3837	3887	3946	4649	......	Slight shearing; split at end	1111
	1579	2993	3339	3620	3910	4069	4309	4527	4626	4758	5670	6192	Sheared fibers	1111
	2223	3493	3946	4200	4373	4536	4699	4994	5071	5262	6078	6350	......do	652
	522	817	862	880	885	885	894	894	898	903	993	1039	Sheared fibers; specimen 120 millimeters long	486
	640	907	980	1030	1075	1116	1161	1175	1211	1229	1429	1479	Sheared fibers	486
	975	1080	1243	1320	1905	2019	2064	2123	2191	2313	2694	2840	......do	508
	1751	2440	2699	2840	2926	3062	3162	3266	3320	3393	3833	4105	......do	132
	1769	2576	2753	2880	2989	3110	3266	3334	3479	3543	4037	4518	......do	132
	1524	1973	2078	2168	2218	2286	2469	2481	2608	2681	3157	3620	Sheared fibers; split at end	1244
	1960	2640	2790	2926	3016	3184	3248	3379	3534	3674	4309	4786	Sheared fibers	1245
	1905	2313	2531	2676	2875	3066	3252	3515	3652	3715	4445	4944	......do	1246
	1960	2640	2790	2926	3016	3184	3248	3379	3534	3674	4309	4786	......do	1255
	1905	2313	2531	2676	2875	3066	3252	3515	3652	3715	4445	4944	......do	1255
	2903	5080	5670	5720	5761	6010	6019	6192	6328	6423	7167	7608	......do	253
	2586	4740	5421	5606	5851	6060	6214	6396	6432	6577	6985	6895	Sheared fibers; split along grain from end to end	253
	1678	2105	2331	2486	2622	2703	2880	2985	3094	3166	3107	4423	Sheared fibers	21
....	1492	1982	2177	2341	2440	2581	2527	2885	2985	3066	3583	4082	Slight shearing of fibers	21
	1202	2404	2858	3039	3085	3134	3289	3348	3429	3488	3788	3946	Sheared fibers	126
	1565	2136	2277	2377	2440	2549	2635	2708	2762	2826	3280	......	Sheared fibers; split at end	126
	1039	1365	1501	1579	1665	1746	1814	1846	1901	1978	2313	2486	Sheared fibers	686
	753	1071	1157	1257	1306	1393	1470	1533	1578	1628	2019	2200	......do	686
	1134	1656	1855	1987	2114	2101	2263	2359	2404	2405	2894	3044	......do	648
	934	1328	1433	1520	1619	1683	1765	1842	1867	1932	2313	2540	......do	648
	908	1542	1588	1669	1742	1801	1833	1905	1087	2037	2381	2590	......do	16
	1089	1452	1506	1542	1610	1678	1719	1769	1810	1860	2127	2291	......do	16
	793	1098	1134	1202	1257	1306	1343	1356	1393	1461	1669	1792	......do	76
	1025	1257	1361	1474	1615	1656	1710	1751	1783	1846	2087	......	Sheared fibers; split at end	76
	839	1293	1361	1433	1479	1592	1637	1710	1769	1833	2168	2381	Sheared fibers	76[2]
	703	998	1102	1134	1170	1211	1243	1266	1297	1302	1479	1533	......do	123
	749	1179	1315	1400	1460	1492	1588	1628	1669	1715	1996	......	Sheared fibers; split at end	145
	408	508	590	617	635	667	690	708	717	739	866	934	Sheared fibers	393
	1021	1701	1860	1946	2023	2078	2127	2173	2223	2268	2481	2020	......do	1057

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
239. Juglans nigra. *Black Walnut.*	112	Missouri	Allenton	G. W. Letterman	Alluvial	9926	Crushed at middle
	117	Michigan	Dansville	W. J. Beal	Gravelly	9957	Crushed at 102 millimeters from end.
	318	...do	Lansing	...do	Loam	9095	Split obliquely from end to end
	325	Texas	Dallas	J. Reverchon	Alluvial	8346	Crushed at 19 millimeters from middle.
	407		Charlestown Navy-yard.	S. H. Pook		9934	Crushed at 25 millimeters from middle.
	766	Florida	Aspalaga	A. H. Curtiss	Clay	9979	Crushed at small knot 32 millimeters from middle.
	766	...do	...do	...do	...do	9684	Crushed at middle
	951	Texas	New Braunfels	C. Mohr	Moist, calcareous	8301	Crushed at 51 millimeters from end.
	951	...do	...do	...do	...do	9662	Crushed at 32 millimeters from end.
240. Juglans rupestris. *Walnut.*	415	New Mexico	Pinos Altos mountains.	E. L. Greene	Alluvial	5942	Shattered stick at end
	415	...do	...do	...do	...do	6532	Split along grain in oblique direction.
	672	California	Contra Costa county.	G. R. Vasey	...do	8256	Crushed at 51 millimeters from end.
	672	...do	...do	...do	...do	7258	Crushed at 6 millimeters knot at middle.
241. Carya olivæformis. *Pecan. Illinois Nut.*	322	Mississippi	Greenville	C. Mohr	...do	6940	Split at ends
	322	...do	...do	...do	...do	8256	Triple flexure; developed intersecting "Cooper lines".
	326	Texas	Dallas	J. Reverchon	...do	6033	Triple flexure
	326	...do	...do	...do	...do	6577	Triple flexure, deflected diagonally.
242. Carya alba. *Shell-bark Hickory. Shag-bark Hickory.*	3	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	9095	Triple flexure; 60 per cent. sap-wood; deflected from sap side.
	3	...do	...do	...do	...do	8301	Split at end
	29²	Kentucky	Danville	W. M. Linney	Shale	8868	Failed at 10 millimeters knot near middle; sap-wood.
	118²	Michigan	Hudson	W. J. Beal	Clay	11431	Crushed at end
	118³	...do	Lansing	...do	...do	11507	Crushed at 114 millimeters from end.
	152	Missouri	Allenton	G. W. Letterman	Rich upland	10160	Crushed at 38 millimeters from middle.
	249	Virginia	Wytheville	H. Shriver	Clay	10478	Triple flexure
	249	...do	...do	...do	...do	9934	...do
	531	Mississippi	Kemper's mill	C. Mohr	Alluvial	10342	Crushed at 38 millimeters from middle.
	531	...do	...do	...do	...do	8890	Crushed at knots; cross-grained
	539	...do	...do	...do	...do	10660	Crushed at 38 and at 70 millimeters from end.
	539	...do	...do	...do	...do	10514	Crushed near middle
	816	West Virginia	Grafton	C. G. Pringle	...do	11204	Crushed at 51 millimeters from end.
	816	...do	...do	...do	...do	11022	Crushed at 25 millimeters from middle.
	1056	Massachusetts	Topsfield	J. Robinson	Rich loam	9026	Triple flexure, deflected diagonally toward heart; 80 per cent. sap-wood.
	1056	...do	...do	...do	...do	8609	Triple flexure, deflected diagonally; 90 per cent. sap-wood
	1097	Missouri	Allenton	G. W. Letterman	Alluvial	10015	Triple flexure; split from end to end; 45 per cent. sap-wood.
243. Carya sulcata. *Big Shell-bark. Bottom Shell-bark.*	91²	Kentucky	Mercer county	W. M. Linney	...do		
	383	Missouri	Allenton	G. W. Letterman	...do	8301	Triple diagonal flexure: 60 per cent. sap-wood on concave side.
	383	...do	...do	...do	...do	7802	Triple flexure; 80 per cent. sap-wood on convex side.
	391	...do	...do	...do	...do	9707	Triple flexure; 30 per cent. sap-wood on concave side.
	391	...do	...do	...do	...do	9571	Triple diagonal flexure
	1082	...do	...do	...do	...do	7983	Triple flexure; 50 per cent. sap-wood.
	1082	...do	...do	...do	...do	8369	Triple flexure; 5 per cent. sap-wood.
	1164	...do	...do	...do	...do	10592	Crushed at 25 millimeters from end.
	1165	...do	...do	...do	...do	8845	Crushed at 25 millimeters from end and split along grain.
	1166	...do	...do	...do	...do	8981	Triple flexure; 95 per cent. sap-wood.
	1170	...do	...do	...do	...do	9231	Crushed at 6 millimeters from end; sap-wood.
244. Carya tomentosa. *Mocker Nut. Black Hickory. Bull Nut. Big-bud Hickory. White-heart Hickory. King Nut.*	72	Kentucky	Perryville	W. M. Linney	Utica shale	8603	Triple flexure; sap-wood
	72	...do	...do.	...do	...do	8981	...do

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—											Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1452	2268	25[illegible]	2672	2767	2890	2985	3089	3184	3266	3561	3924	Sheared fibers	112
	1560	2223	2395	2481	2576	2740	2776	2849	2912	2985	3447	3615	......do	117
	1746	2676	2894	3071	3212	3302	3497	3579	3710	3869	4400	4740	......do	318
	1769	2740	2921	3221	3388	3597	3783	3887	3955	4042	4423	....	Sheared fibers; split at end	325
	1338	1851	1969	2073	2195	2250	2359	2427	2504	2545	2980	3130	Sheared fibers	407
	1479	1951	2449	2713	2890	3003	3121	3253	3393	3456	4128	4536	......do	766
	2812	3701	3969	4082	4255	4377	4568	4649	4749	4799	5489	5738	Sheared fibers; indented section includes two 2 millimeters knots.	766
	1905	2903	3212	3438	3638	3797	3978	4118	4264	4432	5216	5897	Sheared fibers	951
	1769	2667	2903	3175	3338	3502	3697	3783	3969	4128	4899	5534	Slight shearing of fibers	951
	2019	3470	3924	4196	4336	4500	4604	4740	4840	4931	5625	6078	Sheared fibers	415
	953	1928	2245	2486	2200	2830	2053	3039	3153	3289	3882	....	Sheared fibers; split at end	415
	1043	1941	2214	2336	2440	2545	2622	2713	2762	2894	3289	3538	......do	672
	1170	2155	2468	2576	2658	2749	2808	2912	2976	3035	3438	3742	Sheared fibers	672
	1951	2967	3289	3456	3652	3765	3905	4028	4119	4228	4090	....	Slight shearing of fibers; split at end	322
	1928	3221	3878	4173	4423	4753	4944	5080	5398	5557	6192	....	Slight shearing of fibers; split at end; shaky stick	322
	794	1882	2404	2741	2071	3103	3202	3366	3447	3538	4105	4400	Indented without shearing fibers	326
	1792	3039	3447	3674	3810	4037	4196	4354	4436	4672	5285	5942	Slight shearing of fibers	326
	2200	3357	3847	4060	4363	4559	4717	4877	5035	5180	6078	6668	Slight shearing of fibers; 60 per cent. sap-wood	3
	2948	4105	4536	5035	5239	5534	5851	6078	6250	6419	7303	7756	......do	3
	2245	4042	4581	5080	5353	5652	5851	5978	6260	6373	7439	7938	Indented without shearing fibers; sap-wood	29[2]
	2245	2713	3293	3620	3819	3983	4150	4281	4427	4491	5239	5706	Sheared fibers; split at end	118
	2205	3243	3615	3837	4014	4150	4346	4482	4554	4695	5058	5376	Sheared fibers	118
....	....	....	....	....	....	....	....	....	....	....	....	....	....	......
	1406	2699	3207	3520	3797	3955	4146	4255	4463	4608	5398	6033	Slight shearing of fibers	249
	2812	4060	4300	4559	4717	4886	5017	5189	5294	5452	6486	6804	......do	249
	2019	3130	3783	4173	4495	4786	4944	5167	5394	5534	....	....	Fibers did not shear; split along grain	531
....	1429	2005	3171	3620	3933	4164	4364	4608	4744	4844	5715	....	Fibers did not shear; split at end	531
	2404	3302	3652	3851	3978	4287	4495	4695	4808	4940	5579	....	Slight shearing of fibers; split at end	539
	1656	2576	2926	3103	3293	3502	3652	3756	3978	4105	4854	5398	Slight shearing of fibers	539
	1565	2613	2939	3103	3243	3447	3529	3652	3765	3882	4536	4944	Sheared fibers	816
	1657	2590	3016	3198	3366	3511	3661	3710	3797	3887	4527	4877	......do	816
	2708	4014	4513	4917	5149	5421	5575	5761	5987	6114	7417	8142	Indented without shearing fibers; sap-wood	1056
	2994	4264	4649	4985	5353	5670	5920	6214	6477	6704	7825	8754	......do	1056
	2631	3092	4626	5071	5389	5715	5851	6033	6123	6396	7439	7825	Slight shearing of fibers; 40 per cent. sap-wood	1097
	1837	3311	3765	3924	4060	4205	4341	4427	4617	4726	5489	5693	Sheared fibers; 90 per cent. sap-wood	91[2]
	3062	4626	5171	5579	5965	6250	6555	6849	7212	7439	8437	9163	Sheared fibers; 85 per cent. sap-wood	383
....	....	....	....	....	....	....	....	....	....	....	....	....	....	......
	2132	3837	4346	4563	4967	5243	5516	5670	5756	5087	7031	7576	Slight shearing of fibers	391
	3334	4355	4854	5230	5751	5797	6150	6341	6532	6704	7825	8618	...... do	391
	2245	3607	4241	4550	4817	5013	5162	5398	5525	5756	6895	7530	Fibers did not shear	1082
	1497	3003	3470	3774	3847	4209	4495	4649	4863	5058	6101	6691	Fibers sheared; 80 per cent. sap-wood	1082
	2200	2790	4055	4382	4581	4872	5058	5203	5298	5280	6441	6713	Slight shearing of fibers	1164
	1769	2495	2744	2840	3016	3085	3289	3425	3479	3529	4037	4491	Sheared fibers	1165
	2381	3810	4332	4626	4831	5080	5271	5421	5579	5806	6040	7576	Slight shearing of fibers; 80 per cent. sap-wood	1166
....	2381	3493	3819	4073	4255	4500	4690	4877	4985	5116	6033	6782	Slight shearing of fibers; sap-wood	1170
	310[illegible]	4037	4336	4527	4708	4976	5162	5204	5475	5652	6668	7145	Sheared fibers; sap-wood	72
	2118	3221	3701	3910	4128	4291	4482	4626	4790	4908	5761	6509	......do	72

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
244. Carya tomentosa—continued	254	Missouri	Allenton	G. W. Letterman	Rich upland	11249	Triple flexure; middle deflection 25 millimeters eccentric; 0.5 sap-wood.
	289	...do	...do	...do	...do	9163	Crushed at 13 millimeters knot 102 millimeters from end.
	348	Alabama	Citronelle	C. Mohr	Sandy	9367	Triple diagonal flexure; sap-wood.
245. Carya porcina *Pig Nut. Brown Hickory. Black Hickory. Switch-bud Hickory.*	6	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	8165	Failed at knot at middle; 80 per cent. sap-wood.
	6	...do	...do	...do	...do	9695	Crushed at 32 millimeters from end.
	88	Missouri	Allenton	G. W. Letterman	Rich loam	10954	Triple flexure; sap-wood
	88	...do	...do	...do	...do	9889	Triple flexure, diagonal direction; sap-wood.
	121	Michigan	Dansville	W. J. Beal	Gravelly clay	9117	Triple flexure; middle deflection 25 millimeters from center.
	288	Missouri	Allenton	G. W. Letterman	Rich loam	8754	
	442	Tennessee	Nashville	A. Gattinger	Upland	8845	Triple flexure
	538	Alabama	Kemper's mill	C. Mohr	Alluvial	10424	...do
	1051	Massachusetts	North Reading	J. Robinson	Drift	9526	Triple flexure; middle deflection 25 millimeters from center; 0.2 sap-wood.
	1168	Missouri	Allenton	G. W. Letterman	Flinty	8392	Triple flexure; sap-wood
	1168	...do	...do	...do	...do	8392	...do
246. Carya amara *Bitter Nut. Swamp Hickory.*	153	...do	...do	...do	Rich upland	8219	Triple flexure, deflected diagonally.
	153	...do	...do	...do	...do	9117	Crushed at 3 millimeters knot 25 millimeters from middle.
	838	Massachusetts	Danvers	J. Robinson	Rich loam	7983	Triple flexure
	838	...do	...do	...do	...do	8119	...do
247. Carya myristicæformis *Nutmeg Hickory.*	237	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich, swampy	9253	Crushed at knots near middle
	237	...do	...do	...do	...do	11158	Crushed at 51 millimeters from middle; cross-grained.
248. Carya aquatica *Water Hickory. Swamp Hickory. Bitter Pecan.*	129	...do	...do	...do	Swampy	8437	Triple flexure, diagonal deflection: 80 per cent. sap-wood on convex side.
	362	Mississippi	Vicksburg	C. Mohr		7280	Triple flexure, deflected diagonally; middle bend 25 millimeters from center; sap-wood.
	362	...do	...do	...do		7439	Triple flexure; sap-wood
	749	Georgia	Bainbridge	A. H. Curtiss	Alluvial	9208	Fibers crushed at 102 millimeters from end.
	749	...do	...do	...do	...do	7892	Fibers crushed at 6 millimeters knots 102 millimeters from end.
	917	Florida	Chattahoochee	C. Mohr	...do	6509	Triple flexure, diagonal deflection.
	917	...do	...do	...do	...do	7666	Fibers crushed at 64 millimeters from end.
MYRICACEÆ.							
249. Myrica cerifera *Bayberry. Wax Myrtle.*	580	...do	Saint John's river	A. H. Curtiss	Sandy loam	7122	Triple flexure
250. Myrica Californica	665	California	Santa Cruz	G. Engelmann and C. S. Sargent.	Rich loam	7983	Crushed fibers at 51 millimeters from middle.
	665	...do	...do	...do	...do	9049	Crushed fibers at middle
CUPULIFERÆ.							
251. Quercus alba *White Oak.*	8	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	5579	Deflected and split along grain
	8	...do	...do	...do	...do	5353	Triple flexure; split along grain
	32	Kentucky	Mercer county	W. M. Linney	Limestone	9163	Triple flexure
	32²	...do	Boyle county	...do	Shale	8074	...do
	32³	...do	...do	...do	Slate	7779	Crushed fibers at end
	49	Missouri	Allenton	G. W. Letterman	Rich upland	9163	Triple flexure 19 millimeters from end.
	49	...do	...do	...do	...do	7702	Triple flexure
	49¹	...do	...do	...do	...do	8437	Triple flexure, deflected diagonally.
	49²	...do	...do	...do	...do	7825	Triple flexure
	49³	...do	...do	...do	...do	8301	Crushed fibers at end
	113	Michigan	Big Rapids	W. J. Beal	Gravelly	6781	Triple flexure
	113²	...do	Dansville	...do	Sandy	8437	...do
	113²	...do	...do	...do	...do	7307	Triple flexure, deflected diagonally.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	2404	3788	4246	4491	4662	4831	5013	5149	5280	5412	6305	6623	Sheared fibers; sap-wood	254
	2268	3243	3547	3756	3983	4200	4332	4486	4604	4708	......	......	Sheared fibers; split at end; specimen 120 millimeters long.	289
	2350	3742	4150	4445	4662	4831	5013	5216	5421	5588	6509	7167	Sheared fibers; sap-wood	348
	2540	4119	4559	4854	5171	5307	5512	5670	5851	5933	6782	7167	Slight shearing of fibers; 40 per cent. sap-wood	6
	1905	3198	3611	3810	4073	4300	4527	4672	4854	4980	......	6159	......do	6
	2948	4400	4990	5376	5661	5924	6105	6386	6577	6759	7802	8523	Fibers did not shear; sap-wood	88
	2971	4423	4990	5307	5602	5806	6010	6169	6341	6568	7756	8483	......do	88
	1170	1760	1928	2132	2259	2413	2531	2613	2703	2849	3348	3583	Slight shearing of fibers; split at end	121
......	......	......	......	......	......	......	......	......	......	......	......	......	......	288
	2041	3583	4191	4527	4831	5058	5285	5516	5702	5883	6849	7303	Slight shearing of fibers	442
	3130	4473	5017	5294	5525	5738	5969	6149	6314	6382	7521	8047	......do	538
	2586	4173	4717	5035	5307	5557	5779	5933	6159	6373	7485	8097	......do	1051
	2041	3742	4281	4527	4649	4899	5067	5248	5512	5606	6509	7054	......do	1168
	2449	4173	4695	4926	5149	5262	5579	5770	5878	6069	7031	7648	......do	1168
	1315	2744	3379	3697	3828	4032	4146	4314	4445	4545	5376	5851	......do	153
	2032	3130	3484	3751	4073	4350	4427	4672	4904	4895	5738	6292	......do	153
	2132	2094	3311	3475	3620	3751	3910	4037	4150	4219	4980	5489	......do	838
	1111	2789	3397	3797	3992	4296	4527	4681	4904	5035	......	......	Slight shearing of fibers; split at end	838
	1792	3674	4486	4899	5194	5421	5634	5738	5996	6164	7303	8006	Slight shearing of fibers	237
	2812	4082	4409	4667	4890	5108	5389	5525	5715	5851	6895	7394	Sheared fibers	237
	1474	2667	3089	3420	3538	3720	3915	3974	4223	4296	4831	5479	......do	129
	2890	4459	4990	5285	5470	5851	6023	6101	6310	6423	7190	7756	Sheared fibers; sap-wood	362
	2169	3366	3633	3910	4057	4196	4386	4522	4672	4877	5693	6169	......do	362
	2449	4028	4740	5225	5479	5696	5946	6214	......	6509	7553	7892	Sheared fibers	740
	2590	4028	4572	5013	5316	5625	5887	6023	6292	6419	7553	8210	......do	740
	1678	2903	3221	3465	3583	3738	3819	3910	3983	4119	4672	5035	......do	917
	1406	2608	3026	3216	3339	3475	3593	3620	3697	3738	4219	4513	......do	917
	1293	1073	2132	2223	2304	2486	2545	2649	2713	2758	3311	3706	......do	586
	1325	2449	2767	2976	3108	3348	3479	3615	3710	3797	4400	4740	Sheared fibers; 3 millimeters knot in indented section.	665
	1474	2232	2518	2713	2835	2926	3057	3130	3257	3379	3847	4173	Sheared fibers	665
	1343	1946	2059	2218	2313	2354	2499	2581	2672	2722	3166	3529	......do	8
	2041	3239	3388	3488	3570	3633	3742	3842	3951	4046	4445	4672	......do	8
	2404	3588	4042	4445	4808	5080	5330	5539	5711	5906	6713	7212	......do	32
	1384	2041	2201	2440	2563	2699	2867	2980	3075	3139	......	......	Slight shearing of fibers; split at end	32^{2}
	1951	2563	3035	3266	3379	3447	3583	3692	3729	3819	4219	4653	Sheared fibers	32^{3}
	1542	2767	3130	3320	3552	3774	3837	4119	4268	4400	5080	......	Slight shearing of fibers; split at end	49
	1951	3357	3484	3751	3946	4114	4332	4495	4672	4872	5851	5987	Sheared fibers	49
	1442	2722	3057	3311	3706	3701	3937	4105	4309	4482	5262	5579	Fibers did not shear	49^{1}
	2313	3221	3450	3583	3738	3865	3978	4110	4200	4296	4922	5353	Sheared fibers	49^{2}
	2313	3293	3556	3801	3969	4173	4309	4495	4686	4826	5670	6056	......do	49^{2}
	997	1774	1932	2050	2109	2168	2263	2400	2368	2427	2740	2953	......do	113
	1678	2486	2684	2890	3012	3207	3298	3397	3484	3588	4219	4513	......do	113^{2}
	1515	2341	2513	2581	2654	2713	2776	2830	3030	3075	3434	3810	......do	113^{2}

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
251. Quercus alba—continued	238	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich, damp loam	10024	Triple flexure
	238	...do	...do	...do	...do	9617	Crushed at 89 millimeters from end.
	250	Virginia	Wytheville	H. Shriver	Clay	10026	Crushed at 13 millimeters from middle.
	250	...do	...do	...do	...do	9889	Crushed at middle; split perpendicular to rings.
	251	...do	...do	...do		7576	Crushed on one face at 25 millimeters from middle.
	251	...do	...do	...do		6940	Crushed at 16 millimeters knot 51 millimeters from end.
	259[1]	...do	...do	...do	Gravelly	9730	Triple diagonal flexure
	259[2]	...do	...do	...do	...do	8437	......do
	403	Maryland	Charlestown Navy-yard.	S. H. Pook		8799	Fibers crushed in oblique lines at middle and at ends.
	403	...do	...do	...do		9049	Fibers crushed at 32 millimeters from end.
	443	Tennessee	Nashville	A. Gattinger	Rich bottom	6532	Deflected at 102 millimeters from end; split at end.
	547	Alabama	Kemper's mill	C. Mohr	Alluvial	8890	Triple flexure; middle bend 25 millimeters from center.
	547	...do	...do	...do	...do	9526	......do
	748	Florida	Chattahoochee	A. H. Curtiss	Clay	8663	Crushed fibers at 32 millimeters from end.
	749	...do	...do	...do	...do	8119	Triple flexure, deflected diagonally.
	749	...do	...do	...do	...do	7847	Triple flexure, deflected diagonally; knot at middle.
	895	Massachusetts		M. C. Beedle		7621	Crushed at 102 millimeters from end; split from end to end perpendicular to rings.
	895	...do		...do		6396	Split from end to end, opening season cracks.
	1050	...do	North Reading	J. Robinson		7485	Crushed fibers at 32 millimeters from end.
	1050	...do	...do	...do		7303	Triple flexure
	1257		Charlestown Navy-yard.	S. H. Pook		9480	......do
	1257		...do	...do		6392	Crushed fibers at 32 millimeters from end.
252. Quercus lobata. *White Oak. Weeping Oak.*	670	California	Redding	G. R. Vasey	Gravelly loam	7053	Crushed at 6 millimeters knots 31 millimeters from end.
	670	...do	...do	...do	...do	6532	Crushed at end in vicinity of knots.
253. Quercus Garryana. *White Oak.*	985	Oregon	Weidler's saw-mill	G. Engelmann and C. S. Sargent.		7892	Triple flexure; bearing defective.
	985	...do	...do	...do		8250	......do
	988	...do	Portland	...do	Rich loam	7847	Triple flexure, deflected toward heart.
	988	...do	...do	...do	...do	7430	Triple flexure, deflected from heart.
	1027	...do	Portland Furniture Company.	...do		8183	Crushed at 127 millimeters from end and split along grain.
	1027	...do	...do	...do		8483	Triple flexure
	1029	...do	...do	...do		8754	......do
	1029	...do	...do	...do		7530	......do
254. Quercus obtusiloba. *Post Oak. Iron Oak.*	37[1]	Kentucky	Harrodsburg	W. M. Linney	Shale	7462	......do
	37[2]	...do	...do	...do	...do	6541	Crushed at 6 millimeters knot at middle.
	151	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich upland	10002	Triple flexure
	151	...do	...do	...do	...do	8799	......do
	256	Missouri	Allenton	G. W. Letterman	Clay	8437	......do
	351	Alabama	Citronelle	C. Mohr	...do	6078	Triple flexure; split along grain
	351	...do	...do	...do	...do	6305	Crushed at 102 millimeters from end and split along grain.
	771	Florida	Aspalaga	A. H. Curtiss	Gravelly barrens	8618	Crushed at 6 millimeters knot 102 millimeters from end.
	771	...do	...do	...do	...do	7870	Triple flexure
255. Quercus undulata, *var.* Gambelii. *Scrub Oak.*	417	New Mexico	Pinos Altos mountains.	E. L. Greene		7430	......do
	417	...do	...do	...do		7961	Crushed at 25 millimeters from middle at 3 millimeters knot.
	525	Colorado	Engelmann's cañon	Robert Douglas	Rocky	6691	Triple flexure; split along grain
	525	...do	...do	...do	...do	4581	Crushed at knots 32 millimeters from middle (dry rot).
256. Quercus macrocarpa. *Burr Oak. Mossy-cup Oak. Over-cup Oak.*	79	Kentucky	Mercer county	W. M. Linney	Alluvial	8392	Triple flexure
	79[2]	...do	...do	...do	...do	8119	......do

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	2744	3574	[illegible]	4250	4545	4735	4976	5153	5325	5489	6613	7031	Slight shearing of fibers..............................	238
	1633	2341	2617	2880	3094	3248	3434	3629	3765	3891	4500	....	Slight shearing of fibers; split at end..............	238
	2608	3447	3760	4019	4200	4468	4658	4799	5017	5194	6214	6759	......do..	250
	1633	2200	2504	2703	2894	3153	3329	3465	....	....	....	....	Fibers did not shear; split at end..................	250
	2313	3085	3311	3447	3488	3615	3738	3833	3887	3964	4355	4899	Sheared fibers..	251
	1438	3815	3865	2567	2713	2858	3048	3166	3248	3357	3901	4400	......do..	251
	1860	2767	3016	3357	3574	3751	3933	4078	4223	4296	5103	5625	Slight shearing of fibers; split at end..............	259[1]
	1882	2405	2622	2849	3026	3162	3334	3465	3583	3692	....	....	......do..	259[2]
	2132	2449	2753	2948	3021	3166	3293	3411	3488	3583	4250	....	Sheared fibers; split at end.........................	403
	1483	1987	2205	2023	2150	2803	2967	3048	3157	3252	....	....	Split at end..	403
	1996	2980	3071	3162	3266	3343	3429	3479	3570	3633	4037	....	Sheared fibers..	443
	2427	3130	3402	3633	3978	4223	4445	4790	4990	4740	6260	7045	Slight shearing of fibers............................	547
	1951	2812	3134	3429	3683	3901	4119	4273	4450	4595	5625	6033	Slight shearing of fibers; split at end..............	547
	989	1969	2631	2976	3239	3497	3692	3856	....	....	....	....	Split at end..	748
	2499	3570	3974	4341	4672	4881	5076	5334	5525	5738	6759	7394	Indented without shearing fibers.....................	749
	1542	2604	2967	3248	3502	3697	3842	3983	4092	4240	4944	5380	......do..	749
	2109	3311	3311	3389	3561	3656	3751	3833	3887	3960	4545	4854	Sheared fibers; split at side of stick..............	895
	1179	1951	2186	2336	2440	2527	2645	2731	2817	2903	3434	3765	Sheared fibers..	895
	2313	3639	4001	4300	4536	4763	5035	5225	5271	5470	6704	7235	Slight shearing of fibers............................	1050
	1941	2699	3039	3284	3538	3720	3905	4105	4255	4404	5398	5942	Fibers did not shear.................................	1050
	1438	2985	5212	3447	3574	3701	3842	4010	4114	4246	4890	5370	Sheared fibers..	1257
	2223	2858	3289	3470	3611	3751	3892	3983	4042	4128	4513	4890	......do..	1257
	1384	2233	2581	2799	3016	3230	3388	3574	3724	3842	4617	....	Did not shear fibers; split at end..................	670
	1860	2459	2685	2862	3012	3180	3307	3438	3588	3710	4332	4854	Slight shearing of fibers; split at end..............	670
	2313	3352	3615	3837	4028	4182	4346	4495	4626	4758	5670	6214	Sheared fibers..	985
	2041	2998	3289	3484	3742	3905	4155	4300	4427	4527	5579	5878	......do..	985
	4482	3493	3742	3882	4024	4246	4305	4391	4527	4653	5330	5897	......do..	988
	1896	2676	2794	2980	3157	3257	3425	3497	3674	3792	4377	4795	......do..	988
	2214	3797	4119	4291	4491	4695	4831	4990	5126	5252	6123	6600	Sheared fibers; specimen split into two pieces.......	1027
	1588	2767	3302	3567	3788	3916	4110	4264	4427	4495	5398	....	Sheared fibers; split at end.........................	1027
	1896	3833	4110	4827	4454	4613	4753	4922	5062	5194	6069	6386	Sheared fibers..	1029
	885	2295	2812	2912	3080	3125	3261	3402	3525	3647	2850	....	Sheared fibers; split at end.........................	1029
	2245	3284	3515	3742	3992	4264	4436	4581	4749	4890	5761	6214	Slight shearing of fibers............................	37
	1928	3375	3983	4309	4604	4886	5062	5398	5570	5747	6804	7621	......do..	37
	3357	4563	5017	5234	5579	5823	6110	6314	6482	6664	7756	8119	......do..	151
	1610	2676	3316	3765	4095	4454	4763	5035	5339	5579	....	....	Split at end; fibers did not shear...................	151
	2123	3379	3842	4228	4477	4740	4944	5144	5298	5466	6396	6872	Slight shearing of fibers............................	256
	2586	3810	4237	4482	4681	4872	5062	5271	5398	5489	6396	....	Fibers did not shear; split at end..................	351
	1547	2449	2767	2921	3107	3316	3425	3538	3710	3819	4473	4990	Slight shearing of fibers............................	351
	2250	3479	3887	4110	4305	4527	4658	4744	4953	5002	5606	5860	Sheared fibers..	771
	2495	3928	4400	4704	4899	5089	5307	5466	4643	5711	6359	6600	......do..	771
	1778	2971	3257	3529	3792	4037	4219	4423	4581	4704	5398	5992	Slight shearing of fibers............................	417
	1860	2785	3112	3438	3724	3933	4250	4432	4590	4708	5534	6010	......do..	417
	2032	3447	3833	4042	4246	4436	4559	4736	4863	5013	5942	6305	Sheared fibers..	525
	2291	3747	4146	4377	4527	4644	4813	4953	5067	5216	6105	6532	......do..	525
	2141	2803	3021	3275	3484	3647	3801	3910	4033	4101	4763	5171	......do..	79
	2214	3057	3334	3470	3633	3747	3937	4105	4273	4350	5216	5606	Slight shearing of fibers............................	79[2]

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
256. Quercus macrocarpa—cont'd..	137	Missouri	Allenton	G. W. Letterman	Moist upland	8754	Triple flexure
	143	Illinois	Waukegan	Robert Douglas	Rich	7076	...do
	310	Texas	Dallas	J. Reverchon	Rich, moist	8609	Triple flexure; split at end
	310	...do	...do	...do	...do	8709	Crushed at middle of one face
	432	Tennessee	Nashville	A. Gattinger	Alluvial	7255	Triple flexure, deflected diagonally.
	831	Illinois	Winnebago county	M. S. Bebb	Loam	8256	Crushed at 19 millimeters from end.
	933	Texas	Austin	C. Mohr	Alluvial	7053	Crushed in vicinity of 3 millimeters knot.
	933	...do	...do	...do	...do	6613	Triple flexure, deflected diagonally.
	1071	Vermont	Charlotte	C. G. Pringle		7983	...do
	1072	...do	...do	...do		7326	Triple flexure
	1073	...do	...do	...do		7938	Triple flexure, deflected diagonally.
257. Quercus lyrata. *Over-cup Oak. Swamp Post Oak. Water White Oak.*	424	Tennessee	Nashville	A. Gattinger	Low	5511	Split obliquely across the grain; cross-grained.
	424	...do	...do	...do	...do	7303	Crushed and split at ends
	545	Mississippi	Kemper's mill	C. Mohr	Alluvial	8523	Crushed at middle of one face
	545	...do	...do	...do	...do	8754	Triple flexure, deflected diagonally.
	762	Florida	Chattahoochee	A. H. Curtiss	...do	7756	Crushed near middle; stick worm-eaten.
	762	...do	...do	...do	...do	9344	Crushed near middle
258. Quercus bicolor. *Swamp White Oak.*	12	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	7530	Triple flexure; split along grain
	12	...do	...do	...do	...do	7212	Crushed fibers at end
	54	Missouri	Allenton	G. W. Letterman	Alluvial	8596	Triple flexure; split along grain
	54	...do	...do	...do	...do	8596	Triple flexure
	54²	...do	...do	...do	...do	7983	Triple flexure, deflected diagonally.
	54³	...do	...do	...do	...do	8437	Fibers crushed at 64 millimeters from end.
	846	Massachusetts	West Newbury	J. Robinson	Low, swampy	7022	Triple flexure, deflected diagonally.
	846	...do	Arnold Arboretum	C. S. Sargent	Drift	7421	Triple flexure
259. Quercus Michauxii. *Basket Oak. Cow Oak.*	240	South Carolina	Bonneau's Depot	H. W. Ravenel	Alluvial	6418	Triple flexure; split along grain
	240	...do	...do	...do	...do	7756	...do
	524	Alabama	Kemper's mill	C. Mohr	...do	7847	Triple flexure
	524	...do	...do	...do	...do	7983	Triple flexure, deflected diagonally.
	755	Florida	Chattahoochee	A. H. Curtiss	...do	7938	Triple flexure at 8 millimeters knot 102 millimeters from end of concave side; split at end.
	755	...do	...do	...do	...do	8346	Triple flexure, deflected diagonally.
260. Quercus Prinus. *Chestnut Oak. Rock Chestnut Oak.*	31	Kentucky	Boyle county	W. M. Linney	Shale	8777	Crushed fibers at middle
	31¹	...do	...do	...do	...do	9208	Crushed fibers at end
	35	...do	...do	...do	Limestone	10569	Crushed fibers at 32 and at 127 millimeters from end.
	434	Tennessee	Nashville	A. Gattinger	Rocky upland	5942	Crushed and split at end
	925	Alabama	Cullman	C. Mohr	Dry, rocky	9299	Crushed fibers at 76 millimeters from end.
	925	...do	...do	...do	...do	7892	Split at end; cross-grained
261. Quercus prinoides. *Yellow Oak. Chestnut Oak. Chinquapin Oak.*	34	Kentucky	Mercer county	W. M. Linney	Limestone	7938	Triple flexure; middle bend 25 millimeters from center; deflected from heart.
	34²	...do	Boyle county	...do	Waverly shale	11022	Crushed at 5 millimeters knot 89 millimeters from end.
	273	Missouri	Allenton	G. W. Letterman	Limestone	8663	Crushed and split at end
	287	...do	...do	...do	Flinty	9270	Triple flexure, deflected from heart.
	323	Texas	Dallas	J. Reverchon	Calcareous	9163	Deflected 76 millimeters from end and split along grain.
	514	Tennessee	Nashville	A. Gattinger	Alluvial	9117	Triple flexure, deflected toward heart.
	514	...do	...do	...do	...do	9253	...do
262. Quercus Douglasii. *Mountain White Oak. Blue Oak.*	688	California	Contra Costa county.	G. R. Vasey	Clay	8709	Crushed fibers at 51 millimeters from middle.
	688	...do	...do	...do	...do	9117	Crushed fibers near middle

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	Pressure, in kilograms, required to produce an indentation, in millimeters, of— 0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08	Remarks.	Office number.
	2676	3887	4341	4817	5167	5403	5622	5915	6033	6260	7536	7938	Slight shearing of fibers	137
	749	2676	3184	3420	3588	3792	3933	4042	4178	4355	....	....	Short specimen, 120 millimeters long; split at ends	143
	1179	2254	2654	2812	3080	3230	3434	3602	3801	3910	4717	5126	Slight shearing; split at ends	310
	1678	2790	2980	3134	3356	3535	3692	3792	3937	4028	4653	5153	Slight shearing	310
	1960	2835	2935	3166	3393	3525	3638	3792	3919	3983	4881	5353	Sheared fibers	432
	1542	2549	2858	2967	3134	3248	3456	3624	3756	3901	4690	....	Slight shearing of fibers; split at end	831
	1769	2849	3148	3361	3484	3665	3779	2882	3964	4064	4763	5058	Slight shearing of fibers	933
	1678	2926	3366	3574	3715	3856	4628	4155	4237	4314	5062	5367	......do	933
	2078	3556	3996	4336	4604	4944	5635	5252	5430	5579	6577	7145	......do	1071
	2744	3456	3652	3937	4150	4341	4518	4613	4799	4969	6078	6668	......do	1072
	1996	2885	3286	3470	3701	3882	4114	4291	4391	4513	5367	5806	......do	1073
	2858	4500	5189	5606	5847	6196	6373	6500	6660	6722	7847	8119	......do	424
	2481	4165	4749	5162	6010	5869	6112	6364	6559	6695	7666	8074	Sheared fibers	424
	1452	1796	2068	2254	2422	2617	2790	2935	3662	3157	3729	....	Slight shearing of fibers; split at end	545
	2078	2971	3320	3574	3833	3996	4114	4296	4436	4590	5143	5866	Sheared fibers	545
	2041	2631	2926	3186	3366	3529	3661	3751	3882	3983	4559	4990	......do	762
	1461	2059	2313	2563	2722	2985	3157	3329	3438	3593	4336	....	Sheared fibers; split at end	762
	1905	2640	2740	2908	3694	3230	3370	3534	3615	3729	4346	....	Slight shearing of fibers; split at end	12
	1343	2673	2322	2495	2676	2844	2976	3125	3261	3348	....	....	......do	12
	1687	2776	3071	3311	3579	3742	4014	4178	4350	4554	5479	....	Fibers did not shear; split at end	54
	....	2921	3329	3683	3955	4196	4560	4717	4944	5149	6169	6450	Slight shearing of fibers	54
	2313	....	3529	3683	3792	3942	3983	4237	4332	4441	5035	5625	Sheared fibers	54[2]
	1628	2368	2586	2744	2935	3094	3248	3388	3529	3661	4355	....	Slight shearing of fibers; split at end	54[3]
	2691	3239	3652	3919	4196	4445	4604	4735	4944	5098	6978	6459	Fibers did not shear	846
	1951	3198	3538	3856	4646	4287	4626	4786	4971	5158	6123	6759	......do	846
	1946	2767	3044	3339	3547	3674	3878	4028	4146	4309	5080	....	Slight shearing of fibers; split at end	240
	2359	3030	3402	3720	3978	4150	4486	4658	4849	5008	6033	6577	Fibers did not shear	240
	1806	2540	2867	2948	3130	3280	3447	3606	3720	3842	4382	....	Fibers did not shear; split at end	524
	1202	2050	2341	2572	2776	2930	3116	3261	3375	3461	4028	4332	Fibers did not shear	524
	3057	3656	4092	4482	4744	4900	5171	5416	5615	5793	6849	7394	Slight shearing of fibers	755
	1860	2994	3434	3847	4173	4409	4672	4908	5126	5294	6260	6827	......do	755
	2155	3266	3583	3674	3901	3992	4119	4191	4300	4366	4795	....	Slight shearing of fibers; split at end	31
	1542	2177	2504	2713	2921	3075	3239	3379	3479	3638	....	....	Split at ends	31[1]
	1860	3452	3670	4042	4300	4531	4626	4886	4967	5262	5652	....	Sheared fibers	35
	2245	3329	3397	3674	3842	3983	4037	4146	4191	4246	4990	5285	......do	434
	1452	2676	3039	3270	3434	3574	3720	3856	3978	4673	4626	....	Sheared fibers; split at end	925
	1656	2980	3325	3520	3720	3878	4033	4160	4287	4436	5035	....	......do	925
	1588	2989	3311	3402	3561	3701	3842	3928	4024	4150	4831	5298	Slight shearing of fibers	34
	1624	3166	3593	3783	3992	4196	4382	4559	4708	4872	5706	....	Slight shearing of fibers; split at end	34[3]
	2613	3847	4219	4495	4854	5103	5262	5498	5670	5838	7031	7756	Sheared fibers	273
	2223	3348	3697	3951	4164	4386	4563	5753	4904	5107	5851	6600	Sheared fibers; Indented section covers 3 millimeters knot.	287
....	....	....	....	....	....	....	....	....	....	....	....	....	....	323
	1170	2767	3425	3765	3969	4164	4436	4527	4717	4877	5829	6169	Slight shearing of fibers	514
	2404	3892	4281	4559	4804	5044	5216	5398	5579	5747	6985	7439	......do	514
	2767	4808	5942	6373	6713	7008	7248	7512	7756	7928	9026	9934	......do	688
	1769	3720	4491	4990	5262	5466	5797	5942	6214	6396	7066	8392	Fibers did not shear	688

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
263. Quercus oblongifolia *White Oak.*	655	California	San Diego county	G. R. Vasey	Dry, gravelly	6260	Stick shattered at seasoning cracks.
	655	....do	....do	....do	....do	7621	Stick shattered at knots and seasoning cracks.
264. Quercus grisea *White Oak.*	698	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, rocky	7666	Crushed at 3 millimeters knot 25 millimeters from end.
266. Quercus Durandii	1103	Texas	Austin	S. B. Buckley	Damp, calcareous.	9140	Triple flexure; split along grain.
	1103	....do	....do	....do	....do	7892	Crushed at knots 51 millimeters from end.
	1103	....do	....do	....do	....do	8618	Failed at knots 51 and 76 millimeters from end.
267. Quercus virens *Live Oak.*	404	Florida	Charlestown Navy-yard.	S. H. Pook		16478	Crushed at middle and split; cross-grained.
	799	....do	Saint John's river.	A. H. Curtiss	Sandy	9707	Crushed fibers at 25 millimeters from middle and at 25 millimeters from end.
	799	....do	....do	....do	....do	9934	Triple flexure; developed intersecting "Cooper lines".
	919	Alabama	Mobile county	C. Mohr	Rich, sandy	8165	Crushed fibers at end; split along side.
	919	....do	....do	....do	....do	8936	Crushed fibers at middle, 6 millimeters from knot.
	954	Texas	Matagorda bay	....do	Sandy loam	6577	Crushed in vicinity of knots 102 millimeters from end.
	954	....do	....do	....do	....do	7439	Triple flexure
268. Quercus chrysolepis *Live Oak. Maul Oak. Valparaiso Oak.*	649	California	San Bernardino	W. G. Wright		8845	Crushed fibers at 32 millimeters from middle.
	649	....do	....do	....do		9480	Crushed fibers at end
	653	....do	Marin county	G. R. Vasey	Gravelly	9072	Crushed at knot 51 millimeters from middle.
	653	....do	....do	....do	....do	7485	Crushed at knot 64 millimeters from end.
269 Quercus Emoryi *Black Oak.*	654	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, rocky	6759	Crushed at end and split
270. Quercus agrifolia *Enceno. Coast Live Oak.*	663	California	Marin county	G. R. Vasey	Loam	6985	Crushed at two 6 millimeters knots 19 and 57 millimeters from end.
	663	....do	....do	....do	....do	7847	Crushed fibers at 57 millimeters from middle.
271. Quercus Wislizeni *Live Oak.*	685	....do	Auburn	G. Engelmann		8052	Crushed and splintered at end
	685	....do	....do	....do		9004	Crushed at end
272. Quercus rubra *Red Oak. Black Oak.*	7	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	9617	Crushed at 25 millimeters from end; opened grain.
	7	....do	....do	....do	....do	10693	Crushed at 32 millimeters from end.
	45	Kentucky	Mercer county	W. M. Linney	Shale	6895	Triple flexure, deflected parallel to rings.
	45	....do	....do	....do	....do	7621	Triple flexure, deflected parallel to rings.
	45²	....do	....do	....do	....do	6623	Crushed at 34 millimeters from end.
	89	Missouri	Allenton	G. W. Letterman	Rich loam	10765	Crushed at 102 millimeters from end.
	89	....do	....do	....do	....do	10524	Crushed at 19 and at 89 millimeters from end.
	92	Kentucky	Mercer county	W. M. Linney	Alluvial	6917	Triple flexure, deflected perpendicular to rings.
	140	Michigan	Dansville	W. J. Beal	Sandy	7122	Crushed at end; splitting of wedge-shaped piece; cross-grained.
	141	....do	....do	....do	....do	7631	Crushed at end and at 25 millimeters from middle.
	146	Illinois	Waukegan	Robert Douglas	Gravelly	5625	Crushed at 6 millimeters knot 51 millimeters from end.
	215	Vermont	Charlotte	C. G. Pringle	....do	8663	Triple flexure, deflected toward heart.
	215	....do	....do	....do	....do	9208	Crushed fibers at end
	217	....do	....do	....do	....do	9020	Triple flexure
	217	....do	....do	....do	....do	7802	Triple flexure, deflected parallel to rings.
	218	....do	....do	....do	....do	8981	Crushed fibers at end
	920	Mississippi	Enterprise	C. Mohr	Alluvial	6396	Crushed fibers at 25 millimeters from middle.
	920	....do	....do	....do	....do	6570	Crushed fibers at 51 millimeters from end
	1043	Massachusetts	North Reading	J. Robinson	Drift	9957	Triple flexure; middle bend 25 millimeters from center.
	1643	....do	....do	....do	....do	9063	Crushed at end and at 102 millimeters from end.
272. Quercus rubra, *var.* Texana *Red Oak.*	931	Texas	Austin	C. Mohr	Calcareous	9321	Crushed at knots 114 millimeters from end.
	931	....do	....do	....do	....do	9299	Triple flexure; middle deflection 25 millimeters from center.
273. Quercus coccinea *Scarlet Oak.*	752	Florida	Aspalaga	A. H. Curtiss	Clay	8074	Triple flexure, diagonal deflection.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1724	4717	6305	7340	7983	8437	8981	9390	9707	9979	1157	1293	Sheared fibers	655
	2359	4309	5171	5761	6078	6477	6795	7081	7372	7566	......	......	Split at ends; sap-wood	655
	2472	4219	4990	5398	5829	5987	6214	6419	6623	6777	7870	......	Split at end	698
	2200	3828	4354	4626	4940	5071	5353	5489	5657	5806	6377	7031	Slight shearing of fibers	1103
	2631	3856	4332	4667	4904	5216	5466	5643	5806	5987	7122	7666	......do	1103
....	......	......	......	......	......	......	......	......	......	......	......	......	......	1103
	3130	5534	6441	6782	7122	7358	7576	7802	7970	8265	9117	10047	Sheared fibers	404
	1724	3742	4415	4922	5176	5470	5706	5920	6105	6382	7666	8415	Slight shearing of fibers	799
	1701	2971	3579	3892	4259	4491	4753	4909	5285	5543	6940	7666	......do	799
	2449	4468	5080	5398	5657	5851	6060	6223	6332	6513	7402	7802	Slight shearing of fibers; split at end	919
	1769	3311	3856	4146	4436	4563	4922	5053	5280	5362	......	......	Split at end	919
	1879	3629	4400	4908	5252	5602	5874	6128	6314	6577	8097	8845	Slight shearing of fibers	954
	1610	2994	3769	4150	4391	4744	5053	5339	5584	5856	7439	8188	......do	954
	2563	4001	4445	4677	4971	5289	5557	5720	5878	6078	6985	7621	......do	649
	1633	4128	4922	5421	5625	5965	6141	6332	6609	6745	7892	8483	......do	649
	2087	3602	4187	4495	4844	5107	5280	5512	5733	5929	7212	7924	......do	653
	1910	3456	3978	4364	4877	4971	5248	5570	5702	6929	7054	8006	......do	653
	2758	4672	5693	6283	6646	......	7303	7621	7870	8192	9594	......	Slight shearing of fibers; split at end	654
	1424	2676	3393	......	4060	4377	4626	4881	5116	5312	6577	7258	Slight shearing of fibers	063
	1520	2604	3030	3212	3479	3665	3797	3960	4092	4223	5013	5670	......do	663
	2313	3856	4454	4854	5058	5421	5643	5851	6005	6250	7457	7910	......do	685
	1415	2685	3116	3402	3665	3896	4082	4264	4482	4695	5398	6305	......do	685
	1637	2295	2495	2694	2899	3157	3266	3479	3692	3783	4445	......	Slight shearing of fibers; split at end	7
	1043	2046	2395	2622	2744	2939	3075	3289	3434	3488	4033	......	......do	7
	1905	2168	2286	2400	2440	2586	2690	2785	2817	2875	3360	3674	Sheared fibers	45
	871	1651	1955	2028	2136	2286	2313	2468	2536	2599	3021	......	Sheared fibers; split at end	45
	1084	1851	1955	1987	2123	2232	2295	2350	2481	2530	2958	3357	Sheared fibers	45[1]
	1796	2976	3393	3683	3892	4033	4350	4500	4653	4854	5715	......	Slight shearing of fibers; split at end	89
	2109	2880	3153	3357	3543	3783	3083	4209	4355	4491	5398	......	......do	89
	2132	2540	2862	2971	3171	3379	3543	3650	3851	3951	4559	4990	Sheared fibers	92
	1869	2014	2164	2322	2422	2626	2803	2890	3003	3075	3774	......	Slight shearing of fibers; split at end	140
	1678	2254	2372	2518	2681	2785	2944	3021	3130	3175	3783	3901	Sheared fibers	141
	1778	2576	2722	2858	3026	3171	3293	3420	3525	3611	4309	......	Split at end	146
	1951	2404	2558	2835	3003	3588	3397	3588	3756	3937	5058	5851	Sheared fibers	215
	1111	2245	2531	2767	2890	3075	3103	3316	3393	3461	4164	......	Sheared fibers; split at end	215
	1837	2522	2699	2753	2944	3075	3166	3243	3388	3570	4264	......	Split at end	217
	1769	2454	2672	2808	2989	3121	3212	3343	3452	3570	4264	......	......do	217
	1905	2631	3012	3160	3329	3543	3665	3701	3797	3946	......	......	Split at end; short specimen, 120 millimeters long	218
	1560	1910	1951	2028	2141	2209	2263	2318	2354	2440	2894	3166	Sheared fibers	920
	1084	1678	1787	1833	1869	1978	2041	2105	2164	2209	2622	2869	......do	920
	1565	2118	2418	2549	2767	2908	2985	3134	3225	3302	......	......	Split at end	1043
	1724	2409	2708	3334	3484	3175	3307	3438	3570	3629	4445	4854	Split at end; fibers did not shear	1043
	2495	3310	4332	4772	4971	5252	5407	5489	5711	5850	6568	7349	Sheared fibers; split at end	931
	2109	3438	3882	4146	4359	4503	4844	5062	5252	5380	0668	7439	Slight shearing of fibers	931
	1120	2527	2899	3071	3234	3438	3074	4291	4037	4160	5112	5715	Fibers did not shear	752

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
274. Quercus tinctoria. *Black Oak. Yellow-bark Oak. Quercitron Oak. Yellow Oak.*	17	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	8890	Crushed at end, also at 102 millimeters from end.
	17	...do	...do	...do	...do	9081	Crushed fibers near middle
	36	Kentucky	Danville Junction	W. M. Linney	Shale	7530	Crushed 51 millimeters from end at 3 millimeters knot.
	36[2]	...do	...do	...do	...do	9617	Crushed fibers on one face at 13 millimeters from middle.
	36[3]	...do	...do	...do	Slate	7326	Deflected and split along grain from end to middle.
	74	Missouri	Allenton	G. W. Letterman	Rich upland	8890	Triple flexure, deflected parallel to rings.
	74	...do	...do	...do	...do		
	86	...do	...do	...do	...do	8256	Triple flexure, deflected from heart.
	244	Virginia	Wytheville	H. Shriver	Clay	5534	Triple flexure, deflected parallel to rings.
	244	...do	...do	...do	...do	5103	Crushed and split at end; brittle.
	247	...do	...do	...do	...do	8663	Crushed at 13 and at 76 millimeters from end.
	247	...do	...do	...do	...do	9562	Crushed at end.
	437	Tennessee	Nashville	A. Gattinger	...do	7689	Crushed at 19 millimeters from end.
275. Quercus Kelloggii. *Black Oak.*	628	Oregon	Saw-mill, Ashland	G. Engelmann and C. S. Sargent.		8233	Crushed at 51 millimeters from end.
	628	...do	...do	...do		8301	Triple flexure.
	963	...do	Eugene City	G. H. Collier		6396	Crushed and splintered at end
	963	...do	...do	...do		5806	Splintered at end
276. Quercus nigra. *Black Jack. Jack Oak.*	268	Missouri	Allenton	G. W. Letterman	Clay	7766	Triple flexure.
	339	Alabama	Citronelle	C. Mohr	Sandy	8142	Crushed in vicinity of small knots.
277. Quercus falcata. *Spanish Oak. Red Oak.*	131	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich loam	9208	Crushed at 64 millimeters from end.
	131	...do	...do	...do	...do	9163	Crushed at 25 and at 102 millimeters from end.
	245	Virginia	Wytheville	H. Shriver	Clay	9730	Crushed at 19 millimeters from end.
	245	...do	...do	...do	...do	10093	Crushed at 25 millimeters from end.
	265[2]	...do	Carroll county	...do	...do	9698	Crushed on one face at 25 millimeters from middle and at end.
	265[3]	...do	...do	...do	...do	9081	Crushed at 102 millimeters from end.
	548	Mississippi	Kemper's mill	C. Mohr	Rich loam	10006	Crushed at end and at 114 millimeters from end.
	548	...do	...do	...do	...do	9276	Crushed at 89 millimeters from end.
278. Quercus Catesbæi. *Turkey Oak. Scrub Oak. Forked-leaf Black Jack. Black Jack.*	342	Alabama	Cottage Hill	...do	Barren, sandy	6809	Triple flexure, deflected diagonally.
	342	...do	...do	...do	...do	7734	Triple flexure; split along grain.
	770	Florida	Aspalaga	A. H. Curtiss	...do	7212	Triple flexure; knot at middle.
	770	...do				7507	Crushed at end and at 3 millimeters knot 51 millimeters from end.
279. Quercus palustris. *Pin Oak. Swamp Spanish Oak. Water Oak.*	47	Missouri	Allenton	G. W. Letterman	Rich, alluvial	8437	Crushed at end
	47	...do	...do	...do	...do	8156	...do
	282	...do	...do	...do	...do	6895	Triple flexure
	282	...do	...do	...do	...do	7961	...do
280. Quercus aquatica. *Water Oak. Duck Oak. Possum Oak. Punk Oak.*	264[1]	Virginia	Carroll county	H. Shriver		7974	...do
	264[2]	...do	...do	...do		7802	Crushed at 25 millimeters from middle on one face.
	264[3]	...do	...do	...do		7530	...do
	349	Alabama	Cottage Hill	C. Mohr	Sandy loam	8709	Triple flexure
	349	...do	...do	...do	...do	8799	Crushed at 64 millimeters from end.
	511	Tennessee	Tullahoma	A. Gattinger	...do	7167	Crushed at knots at middle and at 51 millimeters from end.
	511	...do	...do	...do	...do	7371	Crushed at 6 millimeters knot 76 millimeters from end.
	742	Georgia	Bainbridge	A. H. Curtiss	Alluvial	8256	Crushed fibers at middle
	742	...do	...do	...do	...do	8596	Crushed at 89 millimeters from end in vicinity of small knots.
281. Quercus laurifolia. *Laurel Oak.*	756	Florida	Saint John's river.	...do	Sandy loam	8596	Triple flexure
	756	...do	...do	...do	...do	7684	Crushed in vicinity of 3 millimeters knot 102 millimeters from end.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	2932	2313	2495	2812	2880	3048	3075	3221	3361	3470	4173	....	Slight shearing of fibers; split at end	17
	1542	2449	2681	2849	3012	3134	3348	3434	3529	3656	4346	....	......do	17
	1637	2522	4150	3012	3162	3379	3525	3593	3747	3856	4491	....	......do	36
	2313	3166	3357	3543	3674	3742	3983	4037	4119	4187	4989	....	Split at end; fibers did not shear	36[2]
	2518	3407	3665	3842	4064	4123	4237	4490	4626	4886	....	6532	Fibers indented without shearing	36[3]
	1769	2903	3529	3819	4028	4390	4518	4649	4935	5193	6283	....	Split at end; fibers did not shear	74
	1565	3266	3992	4436	4717	5013	5398	5670	5915	6146	7212	7965	Indented without shearing fibers	74
	1928	2858	3130	3230	3383	3588	3810	3892	4064	4196	4944	....	Split at end	86
	1343	2291	2322	2386	2395	2454	2518	2563	2649	2685	3085	3248	Sheared fibers; split at end	244
	835	1569	1633	1674	1751	1842	1878	1928	1951	2978	2494	2654	Sheared fibers	244
	1315	2313	2576	2790	2976	3153	3252	3388	3574	3665	....	....	Split at ends	247
	2019	2422	2667	2867	3035	3212	3338	3443	3566	3647	4377	....	Slight shearing of fibers; split at end	247
	1547	2277	2481	2726	2880	2130	3193	3407	3547	3683	....	4899	......do	437
	1769	2672	2790	2803	2917	3003	3026	3926	3139	3225	3710	4937	Sheared fibers	628
	1642	2495	2681	2713	2776	2890	2994	3075	3193	3221	3856	....	Slight shearing of fibers; split at end	628
	989	2232	2840	2967	3066	3184	3352	3452	....	....	....	....	Shaky stick; split at ends	963
	1229	1860	2141	2313	2372	2513	2586	2617	2094	2758	....	....	......do	963
	2948	4024	4277	4495	4672	4854	5026	5262	5407	5579	6486	7021	Slight shearing of fibers	268
	2767	4110	4010	4246	4491	4699	4881	5067	5262	5407	6392	....	Sheared fibers; split at end	339
	2336	3438	3701	4042	4264	4572	4922	5044	5216	5407	6214	....	Slight shearing of fibers; split at end	131
	975	2250	2799	3953	3281	3193	3665	3828	3933	4110	4877	....	......do	131
	1987	2395	2572	2722	2803	2958	3098	3230	3302	3425	....	....	Split at end	215
	1406	1814	1887	2087	2245	2440	2622	2767	2980	3153	3933	....	Slight shearing of fibers; split at end	245
	1728	2563	2799	2885	3021	3130	3298	3402	3497	3574	....	....	Split at end; fibers not sheared	265[2]
	1384	2400	2617	2741	2835	2994	3125	3207	3339	3438	4128	....	Slight shearing of fibers; split at end	265[3]
	2436	2953	3293	3488	3638	3828	3942	4982	4178	4327	....	....	......do	548
	1751	2867	3248	3536	3697	3933	4119	4264	4386	4522	5216	....	......do	548
	2068	2753	2899	3066	3302	3429	3615	3751	3882	3983	4786	5262	Sheared fibers	342
	1792	2477	2703	2853	3026	3180	3302	3447	3579	3688	4168	....	Sheared fibers; split at end	342
	1597	2776	3221	3561	3756	4960	3815	4463	4717	4831	5851	....	Slight shearing of fibers; split at end	770
	2118	3411	3995	4259	4500	4817	5071	5303	5067	5706	6918	7666	Sheared fibers	770
	1338	2268	2640	2821	2935	3130	3202	3316	3470	3538	4287	....	Slight shearing of fibers; split at end	47
..	....	....	....	....	....	....	....	....	....	....	....	....	....	47
	1456	2068	2295	2486	2703	2880	3039	3202	3352	3393	4150	....	Slight shearing of fibers; split at end	282
	2359	2939	3075	3343	3484	3715	3847	4955	4169	4327	....	....	Fibers did not shear; split at end	282
	1624	2109	2241	2359	2486	2527	2676	2753	2640	2989	3511	....	Slight shearing of fibers; split at end	264[1]
	1406	1842	1932	2087	2155	2214	2341	2490	2454	2495	2948	....	......do	264[2]
	1678	1955	2005	2996	2173	2295	2413	2481	2595	2676	3121	....	Sheared fibers; split at end	264[3]
	1769	2676	2799	3139	3311	3484	3674	3991	4060	4173	....	....	Fibers did not shear; split at end	349
	1506	2245	2490	2744	2866	3962	3221	3388	3538	3652	4377	....	......do	349
	1542	2685	3130	3475	3092	3937	4128	4191	4445	4626	5534	....	Indented without shearing fibers	511
	1293	2313	2749	3012	3218	3393	3696	3783	3919	4037	5980	....	Slight shearing of fibers; split at end	511
	2858	3511	3851	4196	4495	4781	5013	5239	5416	5615	6849	7349	Sheared fibers	742
	1542	2926	3547	3429	4992	4314	4500	4699	4790	4949	5761	....	Slight shearing of fibers; split at end	742
	2858	3765	4219	4482	4735	5035	5262	5461	5661	5847	6736	7521	Sheared fibers	756
	1610	3039	3429	3720	3942	4164	4346	4500	4192	4364	....	....	Split at end; fibers did not shear	756 756

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks
281. Quercus laurifolia—continued.	891	Florida	Saint John's river.	A. H. Curtiss		9480	Crushed at 25 millimeters from middle.
	891	...do	...do	...do		7734	Crushed at 89 millimeters from end and at end.
282. Quercus heterophylla. *Bartram's Oak.*	1171	New Jersey	Mount Holly	S. P. Sharples	Clay	5171	Crushed at 25 millimeters knot 51 millimeters from end.
	1171	...do	...do	...do	...do	8029	Crushed at 192 millimeters from end.
283. Quercus cinerea. *Upland Willow Oak. Blue Jack. Sand Jack.*	352	Alabama	Citronelle	C. Mohr	Pine-barren	7167	Split at end and splintered at 102 millimeters from end; brittle.
284. Quercus hypoleuca	674	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, rocky	7167	Triple flexure, deflected diagonally; split at end.
	674	...do	...do	...do	...do	2222	Cross-grained; oblique split 152 millimeters long.
285. Quercus imbricaria. *Shingle Oak. Laurel Oak.*	49[2]	Kentucky	Harrodsburg	W. M. Linney	Utica shale	8029	Crushed at end
	40[2]	...do	...do	...do	...do	9026	Triple flexure, deflected parallel to rings.
	50	Missouri	Allenton	G. W. Letterman	Rich, moist	8845	Triple flexure
	135	...do	...do	...do	Rich loam	9458	Crushed at 76 millimeters from end.
286. Quercus Phellos. *Willow Oak. Peach Oak.*	512	Tennessee	Tullahoma	A. Gattinger	Moist, siliceous	5987	Crushed at 19 millimeters knot at end.
	512	...do	...do	...do	...do	6486	Triple flexure
287. Quercus densiflora. *Tanbark Oak. Chestnut Oak. Peach Oak.*	687	California	Marin county	G. R. Vasey	Gravelly	6464	Crushed at 38 millimeters from middle at 5 millimeters knot.
	687	...do	...do	...do	...do	8754	Triple flexure; middle bend 25 millimeters from middle.
288. Castanopsis chrysophylla. *Chinquapin.*	729	...do	Mendocino county	A. Kellogg		5651	Crushed at end at 3 millimeters knot.
	729	...do	...do	...do		8256	Crushed at end
289. Castanea pumila. *Chinquapin.*	573	Arkansas	Hot Springs	G. W. Letterman	Sandy loam	8156	Crushed at 51 millimeters from end.
	573	...do	...do	...do	...do	7689	Crushed at 5 millimeters knot 51 millimeters from middle.
290. Castanea vulgaris, *var.* Americana. *Chestnut.*	18	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	4137	Triple flexure, deflected parallel to rings.
	18	...do	...do	...do	...do	5298	Crushed 25 millimeters from middle at 3 millimeters knot.
	258[1]	Virginia	Fancy Gap	H. Shriver	Moist	7235	Crushed at 25 millimeters from end.
	258[2]	...do	...do	...do	...do	7485	Crushed at 192 millimeters from end.
	516	Tennessee	Nashville	A. Gattinger	Sandy	6373	Crushed at 44 millimeters from end.
291. Fagus ferruginea. *Beech.*	9	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	7847	Crushed at 32 millimeters from middle and split along grain.
	9	...do	...do	...do	...do	7076	Crushed at 64 millimeters from end.
	44[2]	Kentucky	Mercer county	W. M. Linney	Hudson River shale	7566	Crushed at 76 millimeters from end.
	44[3]	...do	...do	...do	...do	8006	Crushed at 25 and at 127 millimeters from end.
	110	Michigan	Dansville	W. J. Beal	Gravelly	8822	Crushed at end
	110	...do	...do	...do	...do	8346	Crushed at middle and at end
	765	Florida	Chattahoochee	A. H. Curtiss	...do	6496	Crushed at middle in vicinity of 13 millimeters knot.
	765	...do	...do	...do	...do	6827	Crushed at end
	853	Massachusetts	Hamilton	J. Robinson	...do	8278	Crushed at 25 millimeters from end.
	853	...do	...do	...do	...do	7235	Crushed at 19 millimeters from end.
292. Ostrya Virginica. *Hop Hornbeam. Iron Wood. Lever Wood.*	11	...do	Arnold Arboretum	C. S. Sargent	Drift	9390	Crushed at 51 millimeters from middle.
	11	...do	...do	...do	...do	9934	Triple flexure; middle bend 25 millimeters eccentric.
	877	...do	Danvers	J. Robinson	Rich loam	9707	Triple flexure
	877	...do	...do	...do	...do	6359	Crushed at 89 millimeters from end.
	1047	...do	North Reading	...do		7983	Triple flexure, deflected diagonally perpendicular to rings.
	1047	...do	...do	...do		8641	Crushed at 51 millimeters from end; opened grain.
293. Carpinus Caroliniana. *Hornbeam. Blue Beech. Water Beech. Iron Wood.*	46	Missouri	Allenton	G. W. Letterman	Damp, alluvial	6963	Deflected at middle and split at ends.
	73	Kentucky	Mercer county	W. M. Linney	Trenton limestone	9399	Triple flexure
	73	...do	...do	...do	...do	8573	...do
	1038	Massachusetts	Danvers	J. Robinson	Gravelly	6949	Cross-grained; split at knots

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	Pressure, in kilograms, required to produce an indentation, in millimeters, of— 0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08	Remarks.	Office number.
	1665	2980	3348	3674	3901	4060	4291	4463	4527	4631	5652	6056	Slight shearing of fibers	801
	1438	2685	3157	3438	3647	3847	3978	4164	4309	4436	5262	...	Slight shearing of fibers; split at end	801
	1973	2713	2921	3157	3339	3493	3652	3828	4001	4137	5013	...	do	1171
	998	1878	2155	2291	2477	2617	2713	2844	3007	3116	3788	...	do	1171
	...	2132	2622	2958	3221	3375	3593	3738	3878	4019	...	...	Split at end	352
	1610	2948	3525	3769	3978	4191	4332	4463	4559	4672	5512	...	Slight shearing of fibers; split at end	674
	1842	3402	4128	4486	4717	4944	5153	5343	5489	5643	6623	7167	Sheared fibers	674
	1851	3153	3402	3611	3788	3969	4164	4341	4513	4699	5579	6419	Indented without shearing fibers	40[2]
	1315	2586	3112	3434	3629	3878	4037	4196	4400	4572	5625	6214	do	40[2]
	1270	2245	2744	2921	3139	3343	3538	...	...	...	...	...	Split at ends	50
	2358	3216	3402	3665	3937	4205	4414	4626	4844	5035	5874	...	do	135
	1610	2835	3248	3429	3611	3801	3951	4078	4205	4300	5171	5579	Indented without shearing fibers	512
	1143	2540	2890	3125	3293	3438	3602	3756	3878	3887	4831	5398	Slight shearing of fibers	512
	1792	2939	3153	3384	3583	3701	3810	3960	4082	4164	4899	5443	Sheared fibers	687
	1860	3012	3366	3525	3602	3806	4001	4191	4318	4436	5262	5738	do	687
	1089	1452	1610	1733	1837	1892	2005	2073	2105	2173	2586	...	Sheared fibers; split at end	729
	1325	1606	1778	1892	1987	2136	2227	2286	2354	2459	2094	...	do	729
	1225	1452	1746	1774	1060	2028	2182	2223	2295	2395	...	...	Slight shearing of fibers; split at end	573
	875	1338	1524	1665	1814	1914	1978	2041	2182	2214	2608	...	do	573
	1338	1474	1642	1746	1914	2019	2118	2204	2227	2250	2903	3130	Sheared fibers	18
	925	1506	1706	1787	1846	1910	1978	2028	2073	2123	2413	2554	do	18
	880	1284	1424	1524	1610	1687	1756	1810	1887	1932	2227	...	Sheared fibers; split at ends	258[1]
	871	1461	1637	1715	1774	1860	1901	1982	2037	2091	...	...	Sheared fibers; split at end	258[2]
	...	1080	1229	1297	1347	1452	1529	1507	1647	1706	2041	...	do	516
	2223	2803	3057	3212	3407	3652	3774	3905	4037	4169	4854	5625	Sheared fibers	9
	1452	2223	2536	2713	2858	3121	3288	3420	3565	3665	4491	...	Slight shearing of fibers; split at end	9
	1111	2744	2071	3162	3284	3470	3583	3701	3797	3874	4391	4877	Sheared fibers	44[2]
	2631	3193	3329	3525	3652	3774	3874	3951	3987	4132	4740	5149	do	44[3]
	1973	2740	3134	3248	3411	3552	3611	3697	3015	4009	4581	4990	do	119
	1860	2707	3016	3293	3493	3593	3710	3850	3928	4033	...	...	Sheared fibers; split at end	119
	1542	2291	2513	2703	2866	2994	3121	3280	3348	3456	4150	4581	Sheared fibers	765
	1379	2123	2359	2490	2658	2758	2375	3048	3089	3193	3720	...	Slight shearing of fibers; split at end	765
	1683	2427	2640	2835	2985	3121	3207	3338	3443	3579	4173	...	do	853
	1452	2241	2480	2685	2840	2994	3071	3202	3138	3552	4264	...	do	853
	2223	3352	3602	3964	4146	4327	4527	4658	4854	5080	0078	...	do	11
	1678	2391	2713	2894	3130	3202	3438	3015	3774	3924	4854	...	do	11
	2132	3470	3874	4155	4386	4622	4849	5080	5252	5479	6713	...	do	877
	1973	3039	3402	3720	3983	4219	4423	4604	4808	4908	5942	...	do	877
	1547	2586	2885	3103	3348	3536	3729	3833	3987	4119	4899	5579	Slight shearing of fibers	1047
	1315	2381	2740	3017	3184	3398	3588	3742	3937	4046	4090	5570	do	1047
	1542	2072	2935	3139	3329	3403	3606	3665	3792	3910	...	...	Split at ends	46
	1792	2767	3012	3200	3515	3706	3955	4060	4273	4355	5489	6010	Slight shearing of fibers	73
	1501	2454	2785	3060	3438	3593	3801	3978	4119	4246	5307	...	Sheared fibers; split at ends	73
	1247	2576	2935	3193	3339	3593	3774	3802	4037	4146	4944	5470	Sheared fibers	1038

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
BETULACEÆ.							
294. Betula alba, *var.* populifolia .. *White Birch. Old-field Birch. Gray Birch.*	10	Massachusetts ...	Arnold Arboretum	C. S. Sargent	Drift	6123	Triple flexure parallel to rings....
	10	....do	....do	....do	....do	5307	Crushed at 6 millimeters knot 102 millimeters from end.
	848	... do	Danvers	J. Robinson	Gravelly..........	5262	Crushed and split at middle ......
295. Betula papyrifera............ *Canoe Birch. White Birch. Paper Birch.*	223	Vermont..........	Charlotte	C. G. Pringle......	....	......	....
	223	....do	....do	....do	....	......	....
	722	Montana..........	Missoula..........	Sereno Watson ...	Wet	8340	Crushed at 102 millimeters from end.
	722	....do	... do	....do	....do	6713	Crushed at 25 millimeters from middle; deflected diagonally.
	836	Massachusetts....	Townsend	J. Robinson	....	7983	Crushed at 32 millimeters from middle on one face.
	836	....do	....do	....do	....	6890	Crushed at 25 millimeters from end.
	990	Alaska	Chilcoot inlet	Paul Schultze	....	6486	Crushed at middle at 3 millimeters knot.
	990	... do	....do	....do	....	6577	Crushed 76 millimeters from end at 3 millimeters knot.
	1065	Vermont	Charlotte	C. G. Pringle......	....	8346	Crushed at 8 millimeters knot at middle.
	1065	....do	....do	....do	....	7485	Crushed at 6 millimeters knot at middle.
	1066	....do	... do	....do	....	7485	Crushed at 38 millimeters from end.
	1066	... do	....do	....do	....	7552	Crushed at 6 millimeters knot 38 millimeters from end.
	1067	....do	....do	....do	....	7847	Crushed at 76 millimeters from end and at end.
	1067	....do	....do	....do	....	9662	Crushed at 38 millimeters from middle.
296. Betula occidentalis............ *Black Birch.*	528	Colorado..........	Engelmann's cañon	Robert Douglas...	Wet, sandy.......	5670	Crushed at middle; opened grain three-fourths the length of stick.
	629	California	Strawberry valley.	G. Engelmann and C. S. Sargent.	Wet, peaty	6849	Crushed at middle and split along grain.
297. Betula lutea .... *Yellow Birch. Gray Birch.*	843	Massachusetts....	Danvers	J. Robinson.......	Gravelly..........	8279	Crushed at 51 millimeters from end.
	843	....do	....do	... do	....do	10070	......do ....
	1068	Vermont	Charlotte	C. G. Pringle......	... do	9934	......do ....
	1068	....do	....do	....do	....do	10093	Triple diagonal flexure perpendicular to rings.
	1069	.. do	... do	....do	....do	10623	Crushed at 64 millimeters from end.
	1069	....do	....do	....do	....do	10841	......do ....
	1070	... do	....do	....do	....do	9208	Crushed at 3 millimeters knot 25 millimeters from middle.
	1070	....do	....do	....do	....do	10206	Crushed at middle ....
298. Betula nigra .... *Red Birch. River Birch.*	136	Missouri..........	Allenton..........	G. W. Letterman..	Moist loam	7339	Crushed at 5 millimeters knot at middle.
	136	....do	....do	....do	....do	7122	Crushed at 10 millimeters knot 32 millimeters from end.
	841	Massachusetts....	North Andover ...	J. Robinson.......	Alluvial	7249	Triple flexure perpendicular to rings.
	841	....do	... do	....do	....do	7666	Crushed at 44 millimeters from middle.
	842	....do	....do	....do	....do	6600	Triple flexure toward heart........
	842	....do	....do	....do	....do	6069	Crushed at 6 millimeters knot 38 millimeters from end.
299. Betula lenta .... *Cherry Birch. Black Birch. Sweet Birch. Mahogany Birch.*	4	....do	Arnold Arboretum	C. S. Sargent	Drift	9072	Crushed at 31 millimeters from middle; deflected diagonally.
	4	....do	....do	....do	....do	8823	Triple flexure; middle bend 32 millimeters eccentric.
	221	Vermont	Charlotte	C. G. Pringle......	Gravelly..........	11022	Crushed at 89 millimeters from end.
	221	....do	... do	....do	....do	10931	Crushed at middle ....
	844	Massachusetts....	Danvers	J. Robinson.......	....do	9480	Crushed at 102 millimeters from end.
	844	....do	....do	....do	....do	10115	Crushed at 19 millimeters from middle.
300. Alnus maritima...... .... *Seaside Alder.*	810	Delaware	Pepper's mills	W. M. Canby	Wet, sandy	......	....
301. Alnus rubra .... *Alder.*	967	Alaska	Sitka	Paul Schultze	....	6976	Crushed at 32 millimeters from middle.
	967	....do	....do	....do	....	6033	Crushed at middle ....
	991	Washington territory.	Puyallup	G. Engelmann and C. S. Sargent.	....	6010	Crushed at 70 millimeters from end.
	991	....do	....do	....do	....	6829	Triple flexure; middle bend 51 millimeters eccentric.
	1025	Oregon	Portland Furniture Company.	....do	....	6759	Crushed at 25 millimeters from middle.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1179	1619	1778	1846	1955	2055	2168	2223	2322	2390	2971	3198	Sheared fibers	10
	1048	1547	1597	1701	1769	1877	1937	1991	2078	2173	......	......	Slight shearing of fibers; split at end	10
	1406	2223	2332	2409	2495	2549	2604	2654	2703	2748	3311	......	.... do	848
	1179	1669	1787	1868	1932	2014	2105	2150	2209	2254	2676	2903	Sheared fibers; indented section covers 3 millimeters knot.	223
	830	1093	1170	1325	1356	1460	1565	1615	1696	1783	2087	......	Slight shearing of fibers; split at end	223
	1656	1973	2114	2236	2295	2391	2531	2649	2731	2799	3334	3765	Sheared fibers	722
	1189	1978	2223	2350	2495	2649	2740	2844	2948	3016	3529	3946	Slight shearing of fibers; indented section covers 3 millimeters knot.	722
	1134	1701	1878	2028	2118	2250	2345	2431	2545	2635	3198	3629	Slight shearing of fibers; split at end	836
	1343	1941	2064	2214	2295	2440	2549	2676	2771	2867	3470	3901	......do	836
	1384	2028	2168	2304	2391	2531	2676	2785	2862	2935	3543	3847	Sheared fibers	990
	930	1470	1583	1687	1796	1864	1941	2023	2091	2177	2676	2994	......do	990
	1270	......	2064	2313	2427	2490	2554	2676	2748	2799	3288	......	Sheared fibers; split at end	1065
	1261	1746	1883	2005	2077	2182	2295	2391	2513	2595	3207	......	......do	1065
	975	1338	1529	1592	1710	1796	1883	1932	2028	2114	2563	2858	......do	1066
	1021	1488	1633	1715	1819	1892	1951	2046	2673	2200	2667	......	Slight shearing of fibers; split at end	1066
	1179	1533	1656	1769	1892	1978	2150	2209	2304	2391	2939	3357	Slight shearing of fibers	1067
	794	1325	1447	1579	1683	1705	1846	1941	2023	2082	2567	......	Slight shearing of fibers; split at end	1067
	930	1637	2168	2340	2450	2599	2685	2744	2862	2930	3348	3652	Sheared fibers; split at end	528
	749	1320	1424	1533	1597	1669	1751	1805	1892	1937	2395	2699	Slight shearing of fibers	629
	1746	2359	2586	2722	2867	3030	3121	3243	3357	3561	4332	4536	......do	843
	1742	2622	2858	3062	3139	3311	3470	3574	3661	3774	4423	4590	......do	843
	1529	1987	2214	2404	2477	2576	2731	2794	2880	2998	3652	......	Sheared fibers; split at end	1068
	1315	1769	1987	2168	2282	2345	2504	2572	2669	2776	......	......	Slight shearing of fibers; split at end	1068
	1216	2028	2254	2449	2567	2708	2758	2894	2908	3071	3606	......	Sheared fibers; split at end	1069
	1343	1887	2118	2254	2368	2481	2590	2654	2749	2799	......	......	Split at ends; fibers did not shear	1069
	1842	2495	2699	2858	2948	3107	3221	3343	3456	3574	4241	4672	Sheared fibers	1070
	1021	1542	1733	1851	2000	2132	2241	2345	2463	2567	3130	......	Split at end; fibers did not shear	1070
	1225	2168	2472	2685	2790	2889	3016	3085	3162	3216	3742	4014	Slight shearing of fibers	136
	1216	1497	1637	1760	1851	1982	2064	2205	2308	2345	......	2880	Sheared fibers; split at end	136
	889	1343	1642	1801	1923	1982	2046	2159	2182	2232	2581	2912	Sheared fibers	841
	894	1379	1542	1660	1765	1855	1910	1987	2037	2082	2563	2709	Slight shearing of fibers	841
	1547	2123	2254	2377	2522	2626	2717	2803	2894	2989	3674	4105	......do	842
	1120	1515	1624	1737	1851	1896	2000	2087	2141	2205	2209	2948	......do	842
	2136	3561	4114	4386	4572	4753	4990	5112	5257	5443	6396	6922	......do	4
	1497	2440	2713	2894	3130	3230	3397	3574	3656	3815	4626	......	......do	4
...	......	......	......	......	......	......	......	......	......	......	......	......	......	......
...	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	1665	2685	3089	3334	3497	3720	3856	4073	4205	4305	5216	5761	Slight shearing of fibers	844
	1179	2336	2731	3030	3261	3411	3583	3801	3955	4101	5022	5761	......do	844
	1270	1810	1932	2023	2068	2164	2218	2259	2341	2400	2812	......	Sheared fibers; split at end	810
	1089	1270	1347	1397	1474	1492	1547	1619	1628	1665	1932	2041	Sheared fibers	967
	1002	1724	1923	1990	2032	2127	2177	2254	2308	2354	2803	3039	......do	967
	1774	2664	2223	2377	2481	2572	2636	2753	2808	2930	3574	3910	......do	991
	975	1257	1851	1910	2032	2168	2282	2295	2350	2427	2427	3198	......do	991
	767	1361	1515	1015	1669	1756	1896	1946	1987	2078	2449	2722	......do	1025

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
301. Alnus rubra—continued	1025	Oregon	Portland Furniture Company.	G. Engelmann and C. S. Sargent.		7258	Crushed at 102 millimeters from end.
302. Alnus rhombifolia *Alder.*	635	do	Ashland	do		7022	Crushed at 25 millimeters from middle.
	717	Montana	Missoula	Sereno Watson	Wet	4990	Crushed at 114 millimeters from end at 3 millimeters knot.
	717	do	do	do	do	4899	Crushed at 102 millimeters from end on one face.
	979	Oregon	Drain	C. S. Sargent	Moist loam	5171	Crushed at 25 millimeters from middle.
	979	do	do	do	do	6396	Triple flexure
303. Alnus oblongifolia *Alder.*	694	California	San Bernardino	W. G. Wright		4445	Crushed at 89 millimeters from end at 3 millimeters knot.
	694	do	do	do		4459	Crushed at 102 millimeters from end at 3 millimeters knot.
305. Alnus incana *Speckled Alder. Hoary Alder. Black Alder.*	374	Vermont	Hinesburg	C. G. Pringle	Wet loam	4617	Crushed at 25 millimeters from middle.
SALICACEÆ.							
306. Salix nigra *Black Willow.*	232	do	Shelburne	do	Wet, sandy	4545	Triple flexure perpendicular to rings.
	855	Massachusetts	Topsfield	J. Robinson	Wet loam	2277	Crushed at 5 millimeters knot 51 millimeters from end; cross-grained.
307. Salix amygdaloides *Willow.*	908	Colorado	Cañon City	E. Weston		3493	Crushed at 6 millimeters knot at middle.
	908	do	do	do		4355	Triple flexure; split along grain between rings.
	911	do	do	do		5171	Crushed at 51 millimeters from end; split along grain between rings.
	911	do	do	do		3878	Crushed at 5 millimeters knot 51 millimeters from middle.
308. Salix lævigata *Willow.*	690	California	Santa Cruz	G. Engelmann and C. S. Sargent.	Moist, sandy	5012	Triple flexure
	690	do	do	do	do	5216	do
309. Salix lasiandra, *var.* lancifolia.	640	do	Strawberry valley	do	Moist, rich	4373	Crushed at 51 millimeters from end in vicinity of knots.
	981	Oregon	Portland	F. Skinner	Alluvial	5942	Crushed 13 millimeters from middle at 2 millimeters knot.
	981	do	do	do	do	6056	Crushed at 89 millimeters from end and at end.
309. Salix lasiandra, *var.* Fendleriana.	889	Utah	City Creek cañon	M. E. Jones	Gravelly	4581	Crushed at 19 millimeters from middle at 3 millimeters knot.
313. Salix flavescens	721	Montana	Pattee's cañon, Missoula.	Sereno Watson	Rich, moist	6532	Crushed near middle on one face.
	721	do	do	do	do	6532	Crushed at 3 millimeters knot 76 millimeters from end.
313. Salix flavescens, *var.* Scouleriana. *Black Willow.*	972	Washington territory.	Seattle	G. Engelmann and C. S. Sargent.	Moist, sandy	8074	Crushed at middle
	972	do	do	do	do	6895	Crushed at 5 millimeters knot near middle.
314. Salix Hookeriana	966	Oregon	Winchester bay	do	Sandy saline	7031	Triple flexure, deflected diagonally.
	966	do	do	do	do	6623	Triple flexure
316. Salix lasiolepis *Willow.*	669	California	Santa Cruz	G. Engelmann and S. C. Sargent.	Sandy loam	6169	Crushed near middle on one face.
318. Populus tremuloides *Aspen. Quaking Asp.*	272[2]	Colorado	Alpine	T. S. Brandegee	Damp	4249	Crushed at 51 and at 114 millimeters from end; split along grain.
	272	do	do	do	do	4717	Triple flexure parallel to rings
	1035	Massachusetts	Danvers	J. Robinson	Gravelly	6260	Crushed at 38 millimeters from middle on one face.
	1035	do	do	do	do	5942	do
319. Populus grandidentata *Poplar.*	847	do	do	do	do	5625	Crushed at 89 millimeters from end.
	847	do	do	do	do	6829	Triple flexure; middle bend 38 millimeters eccentric.
320. Populus heterophylla *River Cottonwood. Swamp Cottonwood.*	522	Tennessee	Nashville	A. Gattinger	Alluvial	4527	Crushed at 16 millimeters knot 102 millimeters from end.
321. Populus balsamifera *Balsam. Tacamahac. Balm of Gilead.*	961	Alaska	Chilcoot inlet	Paul Schultze	do	4672	Crushed at 6 millimeters knot 25 millimeters from end.
	961	do	do	do	do	5579	Triple flexure; middle bend 32 millimeters eccentric.
321. Populus balsamifera, *var.* candicans.	1054	Massachusetts	Topsfield	J. Robinson	Gravelly	4527	Crushed at 76 millimeters from end.
	1054	do	do	do	do	4309	Triple flexure perpendicular to rings.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	953	1243	1352	1461	1529	1628	1715	1760	1805	1910	2254	....	Sheared fibers; split at end	1025
	916	1529	1665	1769	1851	1937	1996	2068	2132	2200	2486	2686	Sheared fibers	635
	631	953	1043	1071	1080	1120	1152	1179	1234	1279	1442	1547	......do	717
	490	857	903	948	998	1043	1084	1129	1166	1229	1497	1047	......do	717
	690	944	1052	1084	1125	1193	1270	1315	1347	1388	1669	1860	......do	979
	667	1030	1111	1175	1229	1288	1347	1397	1415	1463	1678	1878	......do	979
	930	1089	1120	1202	1257	1302	1361	1402	1443	1489	1765	2064	......do	694
	658	939	998	1080	1120	1207	1225	1266	1311	1343	1624	1774	....	694
....	......	......	......	......	......	......	......	......	......	......	......	......	....	....
	907	1293	1397	1569	1628	1719	1824	1896	1941	2032	2395	....	Slight shearing of fibers; split at end; specimen 120 millimeters long.	232
	644	993	1143	1297	1361	1442	1529	1574	1642	1733	2155	2518	Slight shearing of fibers	855
	953	1084	1202	1252	1347	1393	1447	1524	1574	1619	2019	2232	......do	908
	1043	1220	1361	1438	1479	1547	1642	1674	1733	1814	2168	2449	......do	908
	409	907	1016	1075	1166	1234	1306	1347	1393	1452	1774	2005	......do	911
	953	1016	1080	1094	1184	1216	1257	1306	1352	1624	1833	....	......do	911
	885	1315	1424	1488	1569	1651	1719	1814	1923	1951	2395	2685	Sheared fibers	690
	1202	1851	1987	2128	2218	2286	2350	2482	2504	2500	3029	3379	......do	690
....	1134	1497	1560	1619	1674	1760	1801	1846	1892	1928	2214	2322	......do	640
	1030	1207	1270	1388	1447	1547	1569	1624	1674	1715	2032	2232	......do	961
	635	880	943	1016	1080	1120	1170	1220	1266	1302	1570	1778	......do	961
	993	1107	1170	1266	1311	1384	1438	1488	1533	1579	1905	2177	Slight shearing of fibers	889
	671	1229	1379	1479	1565	1615	1724	1787	1833	1865	2132	....	Slight shearing of fibers; split at end	721
	771	1252	1397	1565	1597	1674	1729	1801	1855	1928	2313	2654	Sheared fibers	721
	862	1021	1384	1615	1678	1719	1810	1960	2010	2078	2481	....	Slight shearing of fibers; split at end	972
	1021	1687	1982	2168	2359	2466	2567	2685	2731	2858	3311	....	Sheared fibers; split at end; indented section covers 6 millimeters knot.	972
	1066	1529	1633	1700	1769	1851	1937	1996	2069	2116	2541	....	Slight shearing of fibers; split at end	966
....	......	......	......	......	......	......	......	......	......	......	......	......	....	966
	1406	1851	2064	2168	2241	2291	2391	2454	2518	2595	2971	3311	Sheared fibers	669
	948	1134	1202	1257	1279	1311	1352	1388	1393	1397	1010	1740	......do	272[2]
	658	735	739	758	771	807	839	848	862	898	1025	1111	......do	272[3]
	821	1397	1565	1637	1710	1756	1824	1905	1982	1991	2268	2586	......do	1035
	802	1267	1261	1315	1365	1411	1470	1524	1569	1578	1800	2019	......do	1035
	640	885	934	080	1030	1075	1120	1161	1170	1211	1474	1656	......do	847
	658	844	880	903	057	998	1034	1080	1129	1170	1402	1533	......do	847
	885	1084	1184	1288	1384	1438	1511	1547	1633	1669	1960	....	Sheared fibers; split at end; specimen 120 millimeters long.	622
	817	1080	1125	1170	1238	1288	1348	1384	1393	1415	1651	1792	Sheared fibers	961
	885	1030	1075	1125	1166	1166	1179	1220	1201	1306	1488	1660	......do	961
	889	943	1052	1116	1157	1198	1201	1302	1320	1301	1656	1683	Slight shearing of fibers	1054
	522	730	807	852	903	957	1002	1043	1084	1125	1315	1533	......do	1054

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
322. Populus angustifolia. *Black Cottonwood.*	552	Colorado	Manitou Springs	Robert Douglas	Sandy loam	4332	Failed at 6 millimeters knot 25 millimeters from middle.
323. Populus trichocarpa. *Black Cottonwood. Balsam Cottonwood.*	1012	Oregon	Saint John's Barrel Factory, Portland.	F. Skinner		5851	Crushed at 38 millimeters from middle.
	1012	do	do	do		6214	Crushed at 51 millimeters from end.
	1028	do	Portland Furniture Company.	G. Engelmann and C. S. Sargent.		6102	Crushed at 38 millimeters from middle.
	1028	do	do	do		6713	Crushed at 25 millimeters from middle.
324. Populus monilifera. *Cottonwood. Necklace Poplar. Carolina Poplar. Big Cottonwood.*	255	Missouri	Allenton	G. W. Letterman	Alluvial	4763	Triple flexure
	304	do	do	do	do	4264	Crushed at middle and opened along grain.
	304	do	do	do	do	4541	Crushed at 102 millimeters from end.
	309	Texas	Dallas	J. Reverchon	do	6260	Crushed at 38 millimeters from end.
	309	do	do	do	do	6214	Crushed at middle
	754	Florida	Chattahoochee	A. H. Curtiss	do	6192	Crushed at 6 millimeters knot 38 millimeters from middle.
	754	do	do	do	do	7326	Crushed at 25 millimeters from middle.
325. Populus Fremontii. *Cottonwood.*	659	California	Sacramento valley	G. R. Vasey	do	5987	Crushed at 38 millimeters from middle at 3 millimeters knot.
	659	do	do	do	do	6123	Crushed at 38 millimeters from end.
325. Populus Fremontii, *var.* Wislizeni. *Cottonwood. White Cottonwood.*	646	do	San Bernardino	W. G. Wright	do	5625	Crushed at 25 millimeters from middle.
	646	do	do	do	do	5216	Triple flexure; middle bend 19 millimeters eccentric.
	909	Colorado	Cañon City	do		6759	Crushed at 89 millimeters from end.
	909	do	do	do		6713	Crushed at 5 millimeters knot 64 millimeters from end.
	909	do	do	do		5466	Crushed at 25 millimeters from end in vicinity of 5 millimeters knot.
	909	do	do	do		5919	Triple flexure
CONIFERÆ.							
326. Libocedrus decurrens. *White Cedar. Bastard Cedar. Post Cedar. Incense Cedar.*	634	California	Saw-mill, Strawberry valley.	G. Engelmann and C. S. Sargent.		5618	Crushed at 25 millimeters from middle.
	634	do	do	do		6115	Crushed at 102 millimeters from end; split whole length of specimen.
	662	do	Saw-mill, San Bernardino mountains.	W. G. Wright		8754	Crushed at middle
	662	do	do	do		5299	Crushed at end; opened along grain.
327. Thuya occidentalis. *White Cedar. Arbor-vitæ.*	379	Vermont	Monkton	C. G. Pringle	Cold, peaty	4626	Crushed at 25 millimeters from end.
	379	do	do	do	do	4545	Crushed at 13 and at 57 millimeters from end.
	782	New Brunswick		Intercolonial railway.		5534	Crushed at 25 and at 102 millimeters from end.
	782	do		do		5035	Triple flexure
	783	do	Bridgeton	Ed. Sinclair		5579	Crushed at 13 and at 102 millimeters from end.
	783	do	do	do		5398	Triple flexure; middle bend 25 millimeters eccentric.
	790	Province of Quebec	Amqui	A. Grant		4355	Crushed at 89 millimeters from end and at end.
	790	do	do	do		4785	Triple flexure; small knots at middle.
	792	do		Grand Trunk railway.		2994	Crushed at 51 millimeters from end.
	792	do		do		3221	Crushed at 25 millimeters from end.
	796	do		do		4545	Crushed at 32 millimeters from end.
	796	do		do		5103	Triple diagonal flexure
	874	Maine	Mattawamkeag	J. Robinson		5965	Crushed at 89 millimeters from end.
	874	do	do	do		6532	Triple flexure
	1099	Wisconsin	Eau Claire	H. C. Putnam	Drift	4423	Split at knot at middle; sides swelled.
	1099	do	do	do	do	5806	Crushed at 51 millimeters from end; split along grain.
328. Thuya gigantea. *Red Cedar. Canoe Cedar.*	1017	Oregon	Weidler's saw-mill, Portland.	G. Engelmann and C. S. Sargent.		6895	Crushed at worm-hole 51 millimeters from end; split along grain.
	1017	do	do	do		8301	Crushed at 32 millimeters from middle; sudden fracture.
	1021	do	Portland Furniture Company.	do		6396	Crushed at 83 millimeters from end.
	1021	do	do	do			

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	454	944	[illegible]	1166	1225	1306	1343	1356	1397	1442	1669	1905	Slight shearing of fibers	552
	749	907	1002	1043	1080	1120	1161	1184	1225	1261	1474	....	Sheared fibers	1012
	504	712	793	817	889	934	948	993	1030	1039	....	....	Slight shearing of fibers; split at end	1012
	930	998	1093	1166	1216	1279	1338	1365	1429	1474	....	....	......do	1028
	449	712	789	852	889	939	998	1043	1084	1125	1384	....	......do	1028
	....	595	653	680	726	766	807	848	852	875	1030	1179	Sheared fibers	255
	666	898	939	980	998	1043	1080	1120	1166	1198	1315	1452	......do	304
	408	608	685	726	780	830	875	903	948	984	1179	....	Slight shearing of fibers; split at end	304
	1588	2254	2395	2436	2490	2567	2622	2703	2753	2807	3302	....	......do	309
	522	1043	1157	1229	1315	1356	1447	1488	1538	1597	2032	....	......do	309
	862	1320	1488	1542	1628	1687	1801	1851	1896	1946	2223	....	Sheared fibers; split at end	754
	839	1143	1220	1306	1352	1397	1442	1488	1529	1574	1837	....	....	754
	934	1216	1311	1352	1438	1515	1569	1619	1665	1728	2087	....	Sheared fibers; split at end	659
	703	998	1179	1252	1325	1388	1442	1556	1588	1647	2023	....	......do	659
	2064	2971	3143	3216	3307	3375	3420	3479	3529	3574	4037	....	......do	646
	653	1125	1220	1338	1397	1470	1574	1660	1724	1805	2177	2495	Sheared fibers	646
	1120	1311	1411	1438	1533	1637	1719	1756	1801	1869	2177	....	Slight shearing of fibers; split at end	909
	658	925	1061	1107	1189	1239	1279	1352	1397	1442	1701	1833	Sheared fibers; split at end	909
	635	835	880	930	975	1016	1071	1120	1166	1211	1433	1610	......do	912
	817	1052	1116	1179	1243	1288	1338	1397	1447	1488	1760	....	......do	912
	1071	1179	1216	1270	1315	1365	1402	1438	1442	1465	1628	1769	Sheared fibers	634
	1007	1202	1284	1447	1470	1492	1538	1574	1583	1597	1787	1896	......do	634
	956	1334	1393	1493	1533	1578	1619	1669	1710	1751	1941	2046	Sheared fibers; split along indented face	662
	1071	1805	1828	1864	1928	2000	2087	2182	2250	2490	2622	....	Sheared fibers; split at end	662
	522	703	744	785	812	835	875	894	903	984	1034	1134	Sheared fibers	379
	508	703	717	721	730	739	753	762	798	807	934	993	......do	379
	821	1012	1098	1116	1161	1175	1202	1225	1261	1270	1429	1542	......do	782
	490	857	898	934	939	948	966	979	989	1007	1116	1229	Sheared fibers; split along indented face	782
	621	880	948	1007	1030	1034	1066	1075	1089	1112	1243	1288	Sheared fibers	783
	494	821	975	1034	1071	1080	1102	1116	1120	1134	1216	1243	Sheared fibers; indented face covers 3 millimeters knot.	783
	631	989	1016	1030	1057	1075	1107	1116	1129	1161	1311	1488	Sheared fibers	790
	680	839	934	957	989	1016	1030	1043	1075	1098	1215	1325	......do	790
	549	721	767	789	812	852	875	884	894	912	1043	1076	.... do	792
	404	599	626	635	649	662	676	680	694	708	794	839	......do	792
	671	866	907	962	1002	1043	1075	1116	1157	1170	1397	....	......do	796
	703	871	898	939	984	1025	1039	1057	1075	1102	1261	1325	......do	796
	594	789	807	866	893	907	930	939	957	980	....	....	Sheared fibers; split at end	874
	717	953	993	1025	1039	1048	1057	1075	1089	1116	1216	1293	Sheared fibers	874
	572	944	1034	1075	1084	1125	1161	1193	1220	1270	1497	1610	......do	1099
	658	889	953	1016	1057	1107	1152	1207	1252	1266	1447	1542	......do	1099
	712	803	876	916	984	1034	1071	1093	1116	1161	....	....	Slight shearing of fibers; split at end	1017
	1080	1089	1117	1315	1415	1501	1497	1778	1406	1383	1746	1769	Sheared fibers	1017
	567	685	753	803	844	857	898	912	939	966	1110	....	Sheared fibers; split at end	1021
	980	1148	1107	1143	1211	1260	1288	1334	1370	1384	1579	1728	Sheared fibers	1021

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
329. Chamæcyparis sphæroidea. *White Cedar.*	350	Alabama	Cottage Hill	C. Mohr	Sandy, wet	4400	Crushed at 25 millimeters from end.
	350	....do	....do	....do	....do	4105	......do
	850	Massachusetts	Beverly	J. Robinson	Swampy	4060	Crushed at 76 millimeters from end at 3 millimeters knot.
	850	....do	....do	....do	....do	3756	Crushed at middle in vicinity of 3 millimeters knots.
	851	....do	....do	....do	....do	4014	Crushed at end; opened grain
	851	....do	....do	....do	....do	4581	Crushed at 3 millimeters knot 51 millimeters from end.
	852	....do	....do	....do	....do	4173	Crushed at 32 millimeters from end; opened between rings.
	852	....do	....do	....do	....do	4105	Crushed at 25 and at 127 millimeters from end.
330. Chamæcyparis Nutkaensis. *Yellow Cypress. Sitka Cypress.*	969	Alaska	Sitka	Paul Schultze		5897	Triple diagonal flexure parallel to rings.
	969	....do	....do	....do		7031	Crushed at 38 millimeters from end.
	983	British Columbia	Saw-mill, Victoria	G. Engelmann and C. S. Sargent.		8210	Crushed at 64 millimeters from end.
	983	....do	....do	....do		7779	Triple flexure; middle bend 38 millimeters eccentric.
	994	Alaska	Peril strait	Paul Schultze		7711	Crushed at 25 millimeters from end.
	994	....do	....do	....do		7439	Crushed at 13 millimeters knot 38 millimeters from middle.
	1000	....do	Weidler's saw-mill, Portland.	G. Engelmann and C. S. Sargent.		7217	Crushed at 31 millimeters from end.
	1000	....do	....do	....do		6967	Crushed at 25 and at 102 millimeters from end.
331. Chamæcyparis Lawsoniana. *Port Orford Cedar. Oregon Cedar. White Cedar. Lawson's Cypress. Ginger Pine.*	701	Oregon	Dean & Co.'s saw-mill, Marshfield.	....do		7235	Crushed at 25 and at 51 millimeters from end; split along grain.
	707	....do	....do	....do		7462	Crushed at end and at 102 millimeters from end.
	707	....do	....do	....do		7666	Crushed at 51 millimeters from end.
332. Cupressus macrocarpa. *Monterey Cypress.*	675	California	Monterey	....do	Gravelly loam		
	675	....do	....do	....do	....do		
333. Cupressus Goveniana	691	....do	Marin county	G. R. Vasey	Dry ridges	5693	Triple flexure
	691	....do	....do	....do	....do	7349	......do
	1100	....do	Calistoga	W. F. Fisher	....do	5253	Crushed at middle; end shattered; split along grain.
	1100	....do	....do	....do	....do	4672	Split along grain; shattered
338. Juniperus occidentalis. *Juniper.*	624	....do	Yreka plains	G. Engelmann and C. S. Sargent.			
	624	....do	....do	....do			
338. Juniperus occidentalis, *var.* conjugens. *Juniper.*	939	Texas	Austin	C. Mohr	Limestone	9049	Shattered stick at 127 millimeters from end and at end.
	939	....do	....do	....do	....do		
	1102	....do	....do	S. B. Buckley	....do	9662	Triple diagonal flexure perpendicular to rings.
	1102	....do	....do	....do	....do	6804	Split obliquely; cross-grained and knots.
339. Juniperus Virginiana. *Red Cedar. Savin.*	327	....do	Dallas	J. Reverchon	Calcareous	7172	Crushed at 102 millimeters from end and split along grain.
	327	....do	....do	....do	....do	7439	Triple flexure; middle bend 32 millimeters eccentric.
	734	Florida	Chattahoochee	A. H. Curtiss	....do	7915	Crushed at 25 and at 127 millimeters from end.
	734	....do	....do	....do	....do	7240	Crushed at 3 millimeters knot 25 millimeters from end.
	800	....do	Saint John's river	....do	Sandy loam	7031	Crushed at 10 millimeters knot 13 millimeters from end.
	800	....do	....do	....do	....do	5715	Opened grain at 6 millimeters knot near middle.
	837	Massachusetts	Danvers	J. Robinson	Drift	5126	Triple diagonal flexure parallel to rings.
	837	....do	....do	....do	....do	4944	..... do
	1055	....do	Topsfield	....do	Gravelly	5851	Crushed in vicinity of 13 millimeters knot at middle.
	1055	....do	....do	....do	....do	7076	Crushed at middle; deflected
	1249	Tennessee	Wilson county	A. E. Baird		8256	Crushed at knot at middle.
	1250	....do	....do	....do		5879	Crushed at knot near end.
	1253	....do	....do	....do		6577	Triple diagonal flexure perpendicular to rings; opened grain.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—											Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	340	581	72[illegible]	762	863	812	848	857	875	889	1607	1125	Sheared fibers	350
	646	984	1634	1075	1116	1166	1211	1234	1270	1270	1452	1574	......do	350
	680	889	939	962	993	1630	1061	1084	1111	1120	1306	1452	......do	850
	626	953	1139	1184	1243	1279	1293	1302	1315	1329	1429	1429	......do	850
	463	735	862	871	880	894	903	921	944	962	1034	1089	......do	851
	522	698	803	821	835	830	844	857	886	889	998	1080	......do	851
	644	1025	1193	1315	1365	1415	1474	1506	1565	1610	1865	1973	Slight shearing of fibers	852
	544	975	1125	1311	1356	1411	1483	1551	1579	1642	1928	2132	......do	852
	549	885	971	1012	1625	1057	1093	1120	1129	1157	1306	1406	Sheared fibers	969
	522	7,6	993	1048	1080	1120	1166	1175	1216	1234	1466	1520	Slight shearing of fibers	969
	721	1176	1302	1393	1488	1547	1588	1642	1724	1760	2028	....	Sheared fibers; split at end	983
	930	1592	1787	1842	1860	1919	1060	2009	2032	2087	2313	....	Slight shearing of fibers; split at end	983
	749	1247	1320	1393	1442	1492	1547	1592	1647	1687	1996	....	......do	994
	1125	1442	1515	1597	1683	1333	1774	1819	1860	1896	2214	....	Slight shearing of fibers; split at end; 3 millimeters knot.	904
	1326	1837	1082	2073	2114	2164	2214	2259	2406	2331	2586	2790	Sheared fibers	1000
	1542	2032	2118	2205	2254	2400	2354	2404	2481	2513	2835	2994	......do	1600
	866	1429	1526	1529	1579	1579	1651	1687	1728	1746	1928	2155	......do	761
	696	953	1080	1120	1176	1211	1229	1275	1306	1329	....	....	Split along grain	707
	610	989	1116	1161	1202	1207	1266	1311	1325	1361	....	....	......do	707
	1656	3311	....	3742	3860	3951	4051	4164	4187	4214	4717	4967	Sheared fibers	675
	1709	3266	3511	3620	3724	3767	3860	3001	4014	4078	....	....	Sheared fibers; split at ends	675
	1406	2540	3016	3311	3425	3515	3647	3729	3783	3842	4241	4527	Slight shearing of fibers; indented section covers two 3 millimeters knots.	691
	1805	2413	2558	2572	2619	2672	2703	2739	2803	2821	....	....	Slight shearing of fibers; split at corner	691
	594	1574	2118	2404	2563	2626	2681	2731	2799	2817	3166	3348	Sheared fibers	1100
	1728	2427	2558	2622	2771	2853	2944	3012	3094	3134	3666	3901	......do	1160
	1343	2431	2925	3134	3262	3367	3393	3434	3484	3515	3882	....	Sheared fibers; split at ends; worm-eaten	624
	1616	2459	2622	2681	2758	2826	2899	2953	3016	3094	3574	4001	......do	624
	1778	3593	4291	4653	4817	4944	5103	5158	5221	5294	5987	6305	Sheared fibers	939
	1474	3134	4046	4359	4513	4649	4854	4953	5080	6668	....	....	Sheared fibers; split at end	939
	1746	3402	4633	4264	4414	4626	4726	4795	4899	4962	5579	....	Sheared fibers; split at ends	1102
....	....	....	....	....	....	....	....	....	....	....	....	....	....	1102
	1087	2014	2668	2186	2250	2304	2346	2305	2449	2504	2994	3202	Sheared fibers	327
	1207	1932	2132	2182	2214	2236	2259	2304	2341	2350	2586	....	Sheared fibers; split at end	327
	1587	2381	2699	2844	2896	2935	3636	3066	3094	3139	3438	....	......do	734
....	....	....	....	....	....	....	....	....	....	....	....	....	....	......
	1384	2091	2291	2341	2363	2454	2486	2549	2590	2608	2989	3221	Sheared fibers	860
	1043	1760	1969	2628	2082	2118	2150	2173	2214	2286	2527	2672	......do	800
	839	1438	1583	1765	1733	1765	1778	1796	1810	1824	1951	2074	......do	837
	817	1270	1424	1511	1533	1574	1570	1628	1651	1665	1878	1906	......do	837
	1061	1928	2245	2 59	2518	2540	2572	2617	2649	2681	3030	......	Sheared fibers; split at end	1055
....	....	....	....	....	....	....	....	....	....	....	....	....	....	......
	1588	2790	3066	3188	3334	3443	3565	3588	3674	3720	4264	....	Slight shearing of fibers; split at end	1249
	1202	2404	2694	2840	2985	3039	3153	3202	3293	3348	3961	4196	Sheared fibers	1250
....	....	....	....	....	....	....	....	....	....	....	....	....	....	......

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
340. Taxodium distichum *Bald Cypress. Black Cypress. Red Cypress. White Cypress. Deciduous Cypress.*	535	Alabama	Stockton	C. Mohr	Alluvial	8029	Crushed at 64 millimeters from end.
	535	...do	...do	...do	...do	7031	Crushed at 51 millimeters from end.
	542	...do	Mobile	...do		6759	Crushed at 38 millimeters from middle.
	542	...do	...do	...do		6759	Crushed at 25 millimeters from end.
	741	Florida	Chattahoochee	A. H. Curtiss		6328	...do
	741	...do	...do	...do		5697	Crushed at end
341. Sequoia gigantea *Big Tree.*	657	California	Tulare county	G. Engelmann and C. S. Sargent.	Granite	6341	Crushed at middle
	657	...do	...do	...do	...do	6078	...do
342. Sequoia sempervirens *Redwood.*	673	...do	Russian river	C. S. Sargent		6917	Crushed at 25 millimeters from middle.
	673	...do	...do	...do		7391	Crushed at middle
	710	...do	Santa Cruz	Turner, Kennedy & Shaw.		7122	Crushed at 76 millimeters from end.
	711	...do	...do	...do		6523	Crushed at middle; shattered
	711	...do	...do	...do		7979	Crushed at 64 millimeters from end; threw off two splinters.
	712	...do	Mendocino county	J. Kentfield & Co.		5262	Crushed at 51 millimeters from end.
	712	...do	...do	...do		5307	Crushed at 38 millimeters from middle.
	713	...do	...do	...do		7122	...do
	713	...do	...do	...do		5942	Crushed at 25 millimeters from middle in vicinity of 2 millimeters knots
	714	...do	...do	...do		7349	Crushed at middle and at 38 millimeters from end; opened grain.
	715	...do	...do	...do		6305	Crushed at 102 millimeters from end; split from end to end; grain curly.
343. Taxus brevifolia *Yew.*	978	Oregon	Portland	G. Engelmann and C. S. Sargent.	Moist, rich	6668	Failed at 19 millimeters knot at middle.
	978	...do	...do	...do	...do	8799	Crushed near middle at 3 millimeters knot.
345. Torreya taxifolia *Stinking Cedar. Savin.*	62	Florida	Chattahoochee	C. S. Sargent	Alluvial	7258	Crushed at 6 millimeters knot 51 millimeters from middle; opened grain.
	62	...do	...do	...do	...do	7349	Crushed at 19 millimeters from end.
	277	...do	...do	A. H. Curtiss	Calcareous	7008	Triple diagonal flexure perpendicular to rings.
	277	...do	...do	...do	...do	7838	Triple diagonal flexure
346. Torreya Californica *California Nutmeg. Stinking Cedar.*	651	California	Marin county	G. R. Vasey	Stony	5579	Crushed at 64 millimeters from middle at 5 millimeters knot.
	651	...do	...do	...do	...do	5670	Triple flexure
347. Pinus Strobus *White Pine. Weymouth Pine.*	1	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	5398	Crushed at 51 millimeters from middle.
	1	...do	...do	...do	...do	5239	Crushed at 61 millimeters from end.
	222	Vermont	Charlotte	C. G. Pringle	Wet, swampy	6214	Crushed at 76 millimeters from end.
	777	New Brunswick		Intercolonial railway.		4427	Crushed at 10 millimeters knot 38 millimeters from middle.
	777	...do		...do		4219	Crushed at 10 millimeters knot 51 millimeters from end.
	788	...do	Bridgeton	Ed. Sinclair		6169	Crushed at 51 and at 114 millimeters from end.
	788	...do	...do	...do		6305	Crushed at 102 millimeters from end.
	789	Province of Quebec	Amqui	A. Grant		5806	Crushed at 13 millimeters from end.
	789	...do	...do	...do		4695	Crushed at end
	797	...do		Grand Trunk railway.		5842	Crushed at 64 millimeters from middle.
	797	...do		...do		5625	Crushed at end and at 32 millimeters from middle.
	1044	Massachusetts	Reading	J. Robinson	Drift	5534	Crushed at 45 millimeters from middle.
	1044	...do	...do	...do	...do	4967	Crushed at 83 millimeters from end.
348. Pinus monticola *White Pine.*	975	British Columbia	Hastings' saw-mill, Burrard inlet.	G. Engelmann and C. S. Sargent.		6123	Crushed at 76 millimeters from end.
	987	Oregon	Cascade mountains.	C. S. Sargent	Moist loam	4981	Triple flexure parallel to rings
	987	...do	...do	...do	...do	4944	Crushed at 13 millimeters from end.
349. Pinus Lambertiana *Sugar Pine.*	638	California	Saw-mill, Strawberry valley.	G. Engelmann and C. S. Sargent.		6441	Crushed at three places near ends.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	494	785	866	916	939	1002	1066	1093	1139	1175	1334	......	Sheared fibers; split at end	535
	449	767	839	889	921	944	1007	1034	1052	1080	1247	1338	Slight shearing of fibers	535
	885	1424	1597	1678	1742	1787	1824	1864	1905	1941	2205	......	Slight shearing of fibers; split at end	542
	889	1220	1306	1352	1415	1483	1529	1551	1588	1619	1882	2087	Sheared fibers; split at corner	542
	463	1043	1325	1452	1483	1529	1569	1610	1619	1642	1796	1932	Sheared fibers	741
	889	1120	1202	1257	1320	1356	1415	1447	1483	1529	1792	1987	......do	741
	839	953	980	1030	1084	1098	1134	1148	1161	1184	1320	1460	......do	657
	862	953	971	1052	1098	1166	1225	1288	1329	1442	1524	1701	......do	657
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	563	852	921	953	984	1002	1025	1030	1034	1061	1179	......	Sheared fibers; split at end	710
	780	1012	1906	1075	1080	1084	1107	1157	1193	1221	1370	1452	Sheared fibers; split along grain	711
	626	762	880	939	948	998	1039	1035	1039	1048	......	......	Slight shearing of fibers; split along grain	711
	617	780	821	866	898	934	944	962	984	1007	1116	......	Sheared fibers; split along grain	712
	793	1048	1061	998	953	975	962	1034	1075	1098	1210	1306	Sheared fibers	712
	857	1306	1111	1116	1189	1325	1393	1442	1470	1501	1633	1792	......do	713
	749	839	871	921	957	1002	1043	1080	1098	1120	1260	......	Sheared fibers; split at end	713
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	1774	2440	2731	2853	2926	3003	......	......	......	......	......	......	Split at ends	715
	2223	3652	4037	4150	4296	4360	4430	4518	4581	4631	5103	5489	Sheared fibers	978
	2359	3665	3878	4024	4150	4255	4386	4473	4613	4726	5421	5851	......do	978
	1650	2331	2613	2835	2971	3121	3266	3357	3488	......	......	......	Split at ends	62
	1021	2341	2840	3035	3125	3270	3365	3456	3515	3661	4287	4527	Sheared fibers; split at ends	62
	1257	1923	2118	2209	2254	2313	2345	2363	2386	2440	2713	......	Sheared fibers; split at end	277
	1013	1529	1633	1683	1742	1796	1851	1896	1941	1964	2245	2413	Sheared fibers	277
	1021	1452	1628	1710	1805	1842	1896	1941	2046	2087	2481	2676	Sheared fibers; split at end	651
	1071	1293	1941	2050	2118	2205	2250	2259	2304	2341	2586	2767	Sheared fibers	651
	953	1135	1211	1261	1297	1347	1370	1393	1429	1447	1588	1778	......do	1
	640	1111	1343	1393	1447	1483	1511	1524	1538	1551	1724	1769	Sheared fibers; split at end	1
	998	1542	1883	1950	2087	2227	2304	2427	2454	2563	2971	3130	Slight shearing of fibers	222
	521	885	1048	1075	1111	1116	1120	1134	1152	1161	1270	1329	Sheared fibers	777
	......	......	953	962	980	1012	1021.	1052	1093	1111	1270	1384	......do	777
	671	962	1043	1080	1125	1160	1207	1220	1247	1297	1520	1660	......do	788
	780	930	1030	1075	1120	1161	1207	1247	1270	1293	1424	......	Sheared fibers; split at end	788
	499	708	762	803	844	852	866	889	898	921	1043	1157	Sheared fibers	789
	526	780	885	912	944	957	980	993	1025	1039	1175	1270	......do	789
	930	1075	1152	1207	1261	1320	1361	1411	1488	1520	1792	2023	......do	797
	531	802	944	971	984	1025	1034	1066	1116	1148	1203	1397	......do	797
	866	1216	1252	1302	1329	1347	1370	1384	1397	1420	1529	1601	......do	1044
	590	903	962	980	1002	1048	1071	1075	1093	1116	1243	1361	......	1044
	680	953	1052	1093	1139	1189	1234	1275	1311	1347	1547	......	Sheared fibers; split at end	975
	712	871	962	1025	1075	1120	1161	1166	1184	1220	1424	1565	Sheared fibers	987
	662	857	925	975	998	1034	1075	1098	1120	1143	1293	1384	......do	987
	535	1034	1216	1275	1311	1338	1356	1388	1424	1456	1610	1724	......do	638

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
349. Pinus Lambertiana—cont'd	668	California		G. R. Vasey		5080	Crushed at 38 millimeters from end.
	730	...do	Lassen's peak	Sierra Lumber Company.		4626	Triple flexure
350. Pinus flexilis *White Pine.*	819	Colorado	Forest City	T. S. Brandegee	Gravelly	6123	Crushed at 25 millimeters from end.
	819	...do	...do	...do	...do	0123	Crushed at 76 millimeters from end.
	913	Nevada	Danville	A. Triple	...do	4527	Crushed at 10 millimeters knot 76 millimeters from end.
351. Pinus albicaulis	992	British Columbia	Silver Mountain valley, Fraser river.	G. Engelmann and C. S. Sargent.		4740	Triple flexure
	992	...do	...do	...do		5851	...do
352. Pinus reflexa *White Pine.*	661	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.		8029	Crushed at 38 and at 89 millimeters from end; opened grain.
	661	...do	...do	...do		7621	Crushed at 32 millimeters from end; split obliquely along grain.
353. Pinus Parryana *Piñon. Nut Pine.*	656	California	San Diego county	G. R. Vasey		5262	Crushed at 64 millimeters from end at 16 millimeters knot.
	656	...do	...do	...do		5570	Triple flexure
355. Pinus edulis *Piñon. Nut Pine.*	397	Colorado	Cañon City	E. Weston	Gravelly	5570	Crushed at end at 5 millimeters knot.
356. Pinus monophylla *Piñon. Nut Pine.*	882	Utah	Lewiston	M. E. Jones	Rocky	4037	Split obliquely along grain
	915	Nevada	Danville	A. Triple	Gravelly	4740	Failed at 13 millimeters knots at middle.
357. Pinus Balfouriana	631	California	Scott mountains	G. Engelmann and C. S. Sargent.	Rocky	4763	Failed at 19 millimeters knot 76 millimeters from end.
	631	...do	...do	...do	...do	6033	Crushed at 3 millimeters knots at middle.
357. Pinus Balfouriana, *var.* aristata *Foxtail Pine. Hickory Pine.*	821	Colorado	Forest City	T. S. Brandegee		5489	Crushed at 32 millimeters from end; cross-grained.
	821	...do	...do	...do		5126	Crushed at end
	914	Nevada	Prospect mountain	A. Triple	Rocky	5012	Crushed at middle and at 3 millimeters knot 25 millimeters from middle.
358. Pinus resinosa *Red Pine. Norway Pine.*	315	Michigan	Hersey	W. J. Beal		7756	Crushed at 51 millimeters from end.
	315	...do	...do	...do		8301	Crushed at 64 millimeters from end.
	785	New Brunswick	Bridgeton	Ed. Sinclair		7167	Crushed at 10 millimeters knot 25 millimeters from end.
	785	...do	...do	...do		8165	Crushed at end
	1074	Vermont	Charlotte	C. G. Pringle		6023	Crushed at 25 and at 114 millimeters from end.
	1075	...do	...do	...do		5942	Crushed at 25 and at 76 millimeters from end.
	1076	...do	...do	...do		7349	Crushed at 51 millimeters from end.
	1076	...do	...do	...do		6886	Crushed at 6 millimeters knot at middle.
359. Pinus Torreyana	990	California	San Diego county	G. Engelmann	Sandy	4400	Crushed at 25 and at 102 millimeters from end.
	996	...do	...do	...do	...do	4876	Triple flexure; middle bend 51 millimeters eccentric.
	996	...do	...do	...do	...do	......	
360. Pinus Arizonica *Yellow Pine.*	1154	Arizona	Santa Rita mountains.	C. G. Pringle	Rocky	7485	Crushed at 25 millimeters from end.
	1154	...do	...do	...do	...do	7349	Crushed at end
	1155	...do	...do	...do	...do	5330	Shattered at end
	1155	...do	...do	...do	...do	6350	Crushed at 51 millimeters from end.
	1156	...do	...do	...do	...do	5080	Crushed at 25 millimeters knot at end.
	1156	...do	...do	...do	...do	4914	...do
361. Pinus ponderosa *Yellow Pine. Bull Pine.*	619	Dakota	Deadwood	Robert Douglas	Gravelly	7915	Crushed at 51 millimeters from end.
	626	Oregon	Saw-mill, Ashland	G. Engelmann and C. S. Sargent.		7530	Crushed at 76 millimeters from end.
	630	California	Strawberry valley	...do	Low, wet, swampy	3629	Triple flexure perpendicular to rings; knots.
	630	...do	...do	...do	...do	3765	...do
	632	...do	Saw-mill, Strawberry valley.	...do		8256	Triple flexure
	636	...do	...do	...do		5942	Crushed at 51 millimeters from end.
	689	...do	Saw-mill, San Bernardino.	W. G. Wright		7756	...do

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1116	1311	1338	1406	1438	1483	1497	1524	1547	1579	1837	1982	Sheared fibers	668
	658	871	944	962	984	1021	1061	1084	1120	1139	1261	1334	do	730
	670	1302	1525	1619	1637	1696	1728	1760	1774	1796	1973	2032	do	819
	662	1270	1406	1483	1529	1574	1615	1642	1687	1724	1941	2078	do	819
	1098	1689	1824	1955	2014	2119	2173	2227	2400	2341	2667	2858	Sheared fibers; opened grain at end and along one face.	913
	866	1325	1406	1474	1501	1542	1583	1624	1665	1687	1932	2096	Sheared fibers	992
	1066	1642	1796	1892	1932	2023	2073	2114	2159	2209	2495	2735	do	992
	1261	1710	1905	1973	2032	2073	2123	2159	......	......	......	......	Split at end; indented section covers 9 millimeters knot.	661
	1134	1869	1932	2005	2053	2118	2182	2209	2223	2273	2576	2758	Sheared fibers	661
	2023	2676	3157	3243	3411	3520	3611	3679	3738	3833	4400	4854	Slight shearing of fibers	656
	1497	2386	2698	2735	2840	2920	2998	3985	3216	3266	3856	4264	Sheared fibers	656
	1905	2790	3030	3216	3388	3493	3674	3856	3992	4146	5013	......	Sheared fibers; split at end	397
	1792	2123	2345	2481	2540	2654	2717	2753	2821	2894	......	......	do	882
	953	2169	2595	2744	2885	3921	3125	3212	3311	3857	3892	3720	Sheared fibers	915
	871	2014	2459	2658	2713	2753	2880	2921	2953	2985	3339	3538	do	631
	1211	1311	1860	1923	1987	2023	2050	2091	2136	2168	2932	2676	do	631
	1442	2136	2286	2391	2477	2576	2645	2703	2771	2799	3311	3515	do	821
	1116	1506	1569	1619	1674	1705	1751	1801	1833	1842	2168	2381	do	821
	1397	2090	2105	2209	2268	2359	2431	2527	2622	2681	2948	3479	do	914
	671	1034	1157	1220	1288	1338	1379	1415	1442	1470	1678	......	Slight shearing of fibers; split at end	315
	862	1170	1275	1325	1365	1424	1483	1547	1574	1619	1860	......	do	315
	744	1116	1343	1433	1479	1497	1551	1584	1624	1665	1901	2923	Sheared fibers	785
	898	1406	1583	1647	1796	1724	1765	1787	1801	1837	2032	2168	do	785
	594	930	1025	1080	1134	1166	1207	1234	1279	1311	1497	......	Sheared fibers; split at end	1074
	793	989	1034	1111	1157	1202	1238	1266	1293	1329	1520	1633	Sheared fibers	1075
	953	1243	1379	1429	1461	1520	1569	1601	1633	1669	1923	2087	do	1076
	862	1025	1111	1170	1234	1288	1343	1370	1415	1452	1706	......	Sheared fibers; split at end	1076
	1270	2060	2177	2259	2327	2386	2431	2449	2499	2554	2948	8166	Sheared fibers	996
	1338	2486	2155	2223	2201	2350	2400	2477	2572	2595	3016	3261	do	996
	1452	2132	2291	2359	2449	2486	2527	2495	2518	2536	......	......	Sheared fibers; split at end	996
	1021	1987	1710	1796	1864	1946	1991	2041	2118	2141	1973	......	do	1154
	1034	1669	1837	1892	1941	1991	2028	2073	2100	2576	2835	2929	Sheared fibers	1154
	1089	1365	1429	1488	1524	1560	1015	1690	1692	1719	1996	2205	do	1155
	1016	1574	1687	1724	1774	1805	1833	1882	1896	1905	......	......	Sheared fibers; split at end	1155
	930	1397	1524	1579	1597	1691	1010	1637	1651	1656	1778	1892	Sheared fibers	1156
	907	1361	1388	1406	1429	1456	1497	1524	1538	1565	1805	1910	do	1156
	689	971	1093	1161	1207	1257	1302	1338	1361	1402	1610	......	Sheared fibers; split at end	619
	1157	1724	1851	1870	1905	1978	2046	2082	2118	2155	2336	2540	Sheared fibers	626
	1452	2400	2468	2518	2608	2667	2749	3803	2853	2903	3266	3438	do	630
	998	1698	1765	1833	1851	1883	1932	1946	1969	1982	2214	2381	do	630
	1134	1343	1456	1533	1601	1669	1733	1787	1851	1901	2177	......	Slight shearing of fibers; split at end	632
	1021	1179	1189	1275	1325	1343	1365	1411	1483	1529	1769	1706	Sheared fibers	636
	998	1429	1512	1624	1687	1769	1790	1846	1896	1932	2200	......	do	689

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
361. Pinus ponderosa—continued	718	Montana	Saw-mill, Missoula	S. Watson		6463	Crushed at end
	718	do	do	do		6477	Crushed at 51 millimeters from end; 13 millimeters knot at end.
	731	California	Lassen's peak	Sierra Lumber Company.		7349	Crushed at middle
	907	Colorado	Cañon City	E. Weston		3892	Triple diagonal flexure; knots near middle.
	916	do	do	do		4173	Triple diagonal flexure; 6 millimeters knot at middle bend.
362. Pinus Jeffreyi *Bull Pine. Black Pine.*	633	California	Scott mountains	G. Engelmann and C. S. Sargent.	Dry, gravelly	5443	Crushed at middle at 6 millimeters knot.
	633	do	do	do	do	6577	Triple diagonal flexure parallel to rings; middle bend 6 millimeters eccentric.
	667	do	Saw-mill, San Bernardino.	W. G. Wright		6759	Oblique split 178 millimeters long, separating stick.
	667	do	do	do		7938	Crushed at 51 millimeters from end.
363. Pinus Chihuahuana	664	Arizona	Santa Rita mountains.	G. Engelmann and C. S. Sargent.	Dry, gravelly	5035	Triple diagonal flexure
	664	do	do	do	do	5761	Shattered end; crushed at 102 millimeters from end.
364. Pinus contorta *Scrub Pine.*	997	British Columbia	Vancouver's island	do	do	7802	Crushed at 102 millimeters from end.
	997	do	do	do	do	9934	Crushed at 51 millimeters from end.
365. Pinus Murrayana *Tamarack. Black Pine. Lodge-pole Pine. Spruce Pine.*	293	Colorado	Forest City	T. S. Brandegee	Moist, sandy loam.	4626	Crushed at 38 millimeters from end.
	293	do	do	do	do	4037	Crushed at 10 millimeters knot 19 millimeters from end.
	563	do	do	C. S. Sargent	do	6214	Crushed at 89 millimeters from end.
	625	California	Scott mountains	G. Engelmann and C. S. Sargent.	do	5648	Crushed at 10 millimeters knot 102 millimeters from end.
	625	do	do	do	do	6115	Crushed at 5 millimeters knot at middle.
366. Pinus Sabiniana *Digger Pine. Bull Pine.*	644	do	Contra Costa county.	G. R. Vasey	Gravelly	5262	Triple flexure; middle bend 25 millimeters eccentric.
	644	do	do	do	do	5511	Failed at 13 millimeters knot at middle.
367. Pinus Coulteri	1157	do	San Bernardino	W. G. Wright	Dry, gravelly	4808	Crushed at 16 millimeters knot 38 millimeters from middle.
	1157	do	do	do	do	6940	Crushed at 76 millimeters from end.
368. Pinus insignis *Monterey Pine.*	676	do	Monterey	G. R. Vasey	Gravelly loam	6827	Crushed at 38 millimeters from end at 5 millimeters knot.
	676	do	do	do	do	6532	Crushed at 51 to 71 millimeters from end.
369. Pinus tuberculata *Knob-cone Pine.*	576	do	Mount Shasta	G. Engelmann and C. S. Sargent.	Gravelly	4672	Crushed at 102 millimeters from end.
	576	do	do	do	do	3742	Crushed at knots at middle and near end.
370. Pinus Tæda *Loblolly Pine. Old-field Pine. Rosemary Pine.*	82	Florida	Duval county	A. H. Curtiss	Moist, sandy	9154	Crushed at 76 millimeters from end.
	82	do	do	do	do	9185	Crushed at 51 millimeters from end.
	355	Alabama	Cottage Hill	C. Mohr	Low, rich	4445	Triple flexure
	355	do	do	do	do	4876	do
	388	North Carolina	Wilmington	E. Kidder	Loam	7[illegible]94	Crushed at 76 millimeters from end.
	388	do	do	do	do	8437	Crushed at 38 millimeters from end in vicinity of knots.
	389	do	do	do	do	5398	Crushed at middle in vicinity of 5 millimeters knot.
	389	do	do	do	do	5783	Crushed at middle in vicinity of knot.
371. Pinus rigida *Pitch Pine.*	13	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	6123	Crushed at 102 millimeters from end.
	13	do	do	do	do	7676	Triple flexure parallel to rings
	1046	do	North Reading	J. Robinson	do	4808	Crushed at 64 millimeters from end.
	1046	do	do	do	do	4740	Triple flexure
372. Pinus serotina *Pond Pine.*	83	Florida	Duval county	A. H. Curtiss	Moist, sandy loam.	7938	Triple flexure perpendicular to rings.
	83	do	do	do	do	8219	Triple flexure parallel to rings
373. Pinus inops *Jersey Pine. Scrub Pine.*	621	South Carolina	Aiken	H. W. Ravenel	Dry, sandy	5086	Triple flexure, contained 7 knots 3 to 6 millimeters in diameter.
	622	do	do	do	do	6577	Crushed in vicinity of 3 millimeters knot 51 millimeters from end.
	1169	Indiana	New Albany	M. J. Robinson		5829	Crushed at end at 13 millimeters knot.
	1169	do	do	do		5489	Crushed at 13 millimeters knot 76 millimeters from end.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1021	1166	1211	1261	1297	1311	1347	1361	1397	1438	1678	1878	Sheared fibers	718
	857	1225	1302	1325	1365	1402	1452	1479	1542	1579	1760	1928	......do	718
	1202	1769	1905	1082	2023	2068	2114	2155	2186	2218	2540	2685	......do	731
	885	1538	1769	1819	1860	1928	2000	2096	2123	2182	2495	2694	......do	007
	685	1492	1728	1833	1901	1987	2028	2091	2141	2182	2136	2849	......do	910
	1261	1879	2023	2173	2259	2309	2345	2368	2418	2431	2699	......	Sheared fibers; split at end	633
	1579	1769	1882	1946	1969	2014	2064	2082	2118	2150	......	......	......do	633
	862	1315	1379	1479	1547	1606	1651	1687	1751	1773	2064	2223	......do	667
	771	1293	1483	1569	1624	1665	1715	1755	1796	1842	2087	2277	Sheared fibers	667
	249	953	1769	1937	2000	2105	2168	2223	2286	2354	2812	......	Sheared fibers; split at ends	664
	1021	2177	2676	2853	2939	3012	3071	3116	3175	3293	3765	......	Slight shearing of fibers; split at ends	664
	1565	1787	1905	2000	2078	2164	2250	2309	2372	2440	......	......	Slight shearing of fibers; split at end	997
	1202	1996	2341	2586	2685	2830	2894	2994	3075	3166	......	......	Sheared fibers; split at end	997
	885	1071	1202	1229	1252	1270	1279	1288	1293	1311	1497	1669	Sheared fibers	293
	667	1061	1143	1170	1198	1220	1243	1252	1275	1288	1497	1579	......do	293
	1270	1374	1501	1588	1665	1715	1774	1846	1910	1964	2223	2404	......do	563
	898	1266	1438	1492	1529	1565	1579	1661	1647	1665	1814	......	Sheared fibers; split at end	625
	807	1052	1152	1193	1252	1302	1329	1374	1406	1433	1610	1787	Sheared fibers	625
	1202	1778	1010	1982	2041	2087	2168	2200	2259	2313	2667	2849	......do	644
	1479	2014	2214	2332	2363	2413	2499	2545	2599	2654	3107	......	Slight shearing of fibers; split at end	644
	1080	1225	1352	1397	1470	1533	1574	1615	1651	1687	2023	2214	Sheared fibers	1157
	753	1247	1374	1424	1479	1547	1574	1619	1669	1715	1973	2186	......do	1157
	817	1496	1569	1624	1665	1701	1715	1737	1746	1760	1969	2066	......do	676
	953	1456	1619	1674	1710	1746	1778	1819	1833	1869	2118	......	Sheared fibers; split at end	676
	599	1093	1306	1379	1424	1456	1489	1524	1538	1569	1769	1905	Sheared fibers	576
	767	1166	1261	1297	1320	1347	1379	1397	1429	1470	......	1746	......do	576
	......	1179	1347	1393	1456	1520	1574	1637	1656	1669	......	......	Split at ends; fibers did not shear	82
	1207	1982	2218	2372	2436	2518	2563	2635	2672	2713	2994	......	Sheared fibers; split at ends	82
	1157	1447	1529	1592	1656	1706	1737	1796	1819	1855	......	......	Split at end; fibers did not shear	355
	1243	1764	1919	2050	2118	2223	2263	2322	2368	2418	2758	2953	Indented without shearing of fibers	355
	880	1093	1161	1216	1275	1347	1442	1497	1647	1597	1905	......	Sheared fibers; split at ends	388
	862	1120	1193	1275	1325	1406	1456	1547	1597	1637	1996	......	Split at end; fibers did not shear	388
	1247	1433	1497	1560	1633	1674	1701	1733	1774	1796	2019	2182	Sheared fibers	389
	925	1520	1678	1801	1855	1901	1928	1073	2005	2037	2223	2336	......do	389
	1828	2223	2295	2341	2449	2531	2595	2658	2740	2844	3289	3526	......do	13
	1542	2518	2844	3089	3207	3302	3357	3488	3579	3692	4219	4491	......do	13
	939	1270	1343	1374	1393	1402	1433	1452	1492	1520	1678	1796	......do	1046
	703	1170	1270	1424	1442	1483	1501	1529	1551	1565	1787	1883	......do	1046
	2654	3479	3751	3901	4010	4150	4250	4359	4409	4522	5216	5851	......do	83
	2658	4255	4854	5239	5401	5679	5729	5625	5534	5552	5761	......	Sheared fibers; split along grain	83
	1520	2132	2318	2395	2477	2558	2608	2058	2703	2749	3030	3202	Sheared fibers	621
	1043	1678	2023	2127	2186	2241	2277	2309	2341	2368	2613	......	Sheared fibers; split at end	622
	1211	1796	2032	2096	2164	2195	2236	2250	2268	2286	2572	2635	Sheared fibers	1169
	1116	2073	2350	2431	2504	2527	2599	2649	2600	2731	......	......	Slight shearing of fibers; split at end	1169

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
373. Pinus inops—continued	1172	New Jersey	Mount Holly	S. P. Sharples	Clay	6033	Crushed at middle on one face
	1172	do	do	do	do	5579	Triple diagonal flexure
374. Pinus clausa *Sand Pine. Scrub Pine. Spruce Pine.*	270	Florida	Apalachicola	A. H. Curtiss	Dry, sandy barrens	5715	Triple flexure parallel to rings; knots at middle.
	270	do	do	do	do	6341	Crushed at knots at middle
375. Pinus pungens *Table-mountain Pine. Hickory Pine.*	321	Virginia	Wytheville	H. Shriver	Clay	5087	Triple flexure perpendicular to rings.
	321	do	do	do	do	5353	Crushed at 89 millimeters from end; split at end.
376. Pinus muricata *Obispo Pine. Bishop's Pine.*	671	California	Marin county	G. R. Vasey	Gravelly	8663	Crushed at 114 millimeters from end at 3 millimeters knot.
	671	do	do	do	do	7621	Crushed at 102 millimeters from end.
377. Pinus mitis *Yellow Pine. Short-leaved Pine. Spruce Pine. Bull Pine.*	278	Florida	Chattahoochee	A. H. Curtiss	Clay	4763	do
	278	do	do	do	do	7983	Crushed at small 2 millimeters knots 25 millimeters from middle.
	319	Louisiana	Amite	C. Mohr	Sandy loam	10138	Crushed at 6 millimeters knot 25 millimeters from middle.
378. Pinus glabra *Cedar Pine. Spruce Pine. White Pine.*	142	South Carolina	Bonneau's Depot	H. W. Ravenel	Rich upland	5466	Triple flexure
	142	do	do	do	do	5398	Crushed at 51 millimeters from end.
	544	Mississippi	Gainesville	C. Mohr	Low, sandy	3130	Crushed at 76 millimeters from end at 16 millimeters knot.
	544	do	do	do	do	2903	Triple flexure
	764	Florida	Chattahoochee	A. H. Curtiss	Low, wet	5353	Triple flexure parallel to rings
	764	do	do	do	do	5375	Crushed 32 millimeters from middle in vicinity of knot.
379. Pinus Banksiana *Gray Pine. Scrub Pine. Prince's Pine.*	394	Michigan	Baldwin	W. J. Beal	Low, sandy	5194	Crushed at end at 13 millimeters knot.
	394	do	do	do	do	4944	Triple flexure; opened grain
	780	New Brunswick		Intercolonial railway.		5080	Crushed at 6 millimeters knot 76 millimeters from end.
	780	do		do		7756	Crushed and opened between rings at end.
	879	do		do		8188	Crushed at 89 millimeters from end.
	879	do		do		6813	Crushed at 3 millimeters knot at middle.
380. Pinus palustris *Long-leaved Pine. Southern Pine. Georgia Pine. Yellow Pine. Hard Pine.*	81	Florida	Duval county	A. H. Curtiss	Sandy loam	8302	Split obliquely; stick broke in two pieces.
	81	do	do	do	do	10977	Crushed at 13 to 76 millimeters from end.
	85	do	do	do	Moist, sandy	8618	Triple flexure parallel to rings
	85	do	do	do	do	9321	Crushed at 13 millimeters from end.
	243	do	Saw-mill, Saint John's river.	do		11204	Crushed at 19 millimeters from end.
	243	do	do	do		10160	Crushed at middle
	302	South Carolina	Aiken	H. W. Ravenel	Dry, sandy	7847	Crushed near middle
	302	do	do	do	do	8165	Crushed at 51 millimeters from end.
	357	Alabama	Cottage Hill	C. Mohr	Sandy loam	10478	Crushed at 38 millimeters from end.
	357	do	do	do	do	10047	Crushed at 38 millimeters from middle.
	358	do	Citronelle	do	do	10569	Crushed at end
	358	do	do	do	do	11839	Triple flexure
	359	do	Chunchula	do	do	11930	Crushed and splintered at end
	359	do	do	do	do	10931	Crushed at middle
	360	do	do	do	do	11008	Crushed at 32 millimeters from end.
	300	do	do	do	do	10931	Crushed at 64 millimeters from middle.
	301	do	do	do	do	10660	Crushed at 38 millimeters from end.
	361	do	do	do	do	10931	Crushed at 76 millimeters from end.
	384	Florida	Saw-mill, Cedar Keys.	A. H. Curtiss		9775	Crushed at 76 millimeters from end and shattered.
	384	do	do	do		9934	Crushed at 51 millimeters from end.
	385	do	do	do		8663	Crushed at 38 millimeters from end.
	385	do	do	do		9017	Crushed at 89 millimeters from end.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	PRESSURE, IN KILOGRAMS, REQUIRED TO PRODUCE AN INDENTATION, IN MILLIMETERS, OF—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	1247	2404	2812	3075	3248	3343	3411	3456					Split at end	1172
	1384	2082	2254	2304	2400	2440	2513	2572	2604	2640	2991	3198	Sheared fibers	1172
	1243	1941	2100	2218	2400	2377	2436	2477	2536	2576	2880		Sheared fibers; split at ends	279
	1134	1429	1656	1715	1801	1814	1846	1860	1869	1923	2132	2359	Sheared fibers	279
	1252	1687	1833	1910	1951	2032	2118	2191	2250	2331	2767		Sheared fibers; split along grain	321
	953	1452	1615	1705	1733	1756	1787	1801	1824	1910	2291	2495	Sheared fibers	321
	1429	1901	2050	2136	2232	2286	2345	2386	2431	2490	2767		Sheared fibers; split at end	671
	862	1325	1515	1601	1669	1756	1787	1842	1901	1946	2304		do	671
	1080	1429	1551	1624	1706	1756	1810	1887	1951	2009	2341		Slight shearing of fibers; split at end	278
	1393	2177	2481	2613	2676	2762	2781	2790	2785	2790	3139		Sheared fibers	278
	1157	1538	1624	1724	1810	1864	1928	1987	2037	2096			Slight shearing of fibers; split at end	319
	1043	1769	1941	2028	2096	2154	2209	2250	2295	2345	2699	2917	Sheared fibers	142
	1030	1470	1506	1565	1606	1619	1647	1665	1687	1701	1860	1051	do	142
	862	1198	1311	1335	1415	1442	1479	1500	1533	1565	1746	1879	do	544
	690	1148	1284	1338	1393	1429	1438	1470	1483	1515	1633	1851	do	544
	1043	1515	1592	1660	1728	1760	1810	1851	1901	1941	2186	2336	do	764
	1370	1674	1787	1864	1928	1982	2005	2014	2068	2096	2404	2785	do	764
	707	1247	1393	1470	1520	1569	1615	1660	1683	1715	1996	2141	do	394
	544	1452	1633	1778	1851	1978	2019	2064	2091	2146	2454	2653	do	394
	1134	1442	1501	1583	1637	1710	1778	1814	1882	1923	2336	2585	Sheared fibers; 3 millimeters knot in indented section.	780
	807	1315	1520	1628	1687	1719	1760	1810	1842	1855	2032		Sheared fibers; split at end	780
	857	1300	1406	1415	1424	1438	1524	1597	1628	1609	1769	1951	Sheared fibers	879
	1071	1293	1361	1443	1529	1574	1642	1687	1765	1792	2064		Sheared fibers; split at end	879
	1769	2268	2499	2022	2681	2799	2885	2948	3021	3062	3221	3866	Sheared fibers	81
	1388	1860	1996	2087	2168	2259	2313	2386	2440	2480			Slight shearing of fibers; split at end	81
	1442	1624	1728	1778	1873	1941	1901	2050					Split at end; fibers did not shear	85
	998	1615	1778	1860	1919	1987	2046	2150	2236	2286	2699		Sheared fibers; split at end	85
	1588	1960	2064	2109	2191	2273	2322	2363	2409	2440			Slight shearing of fibers; split at end	243
	1951	2803	3012	2994	2812	2880	3075	3193	3257	3302	3946		Sheared fibers; split at end	243
	1479	1882	1882	1905	2023	2259	2522	2622	2703	2903			Sheared fibers; opened seasoning cracks	302
	1125	1452	1515	1637	1710	1792	1864	2431	2486	2581	2971		Slight shearing of fibers; split at end	302
	1134	1442	1569	1746	1706	1892	1973	2041	2114	2168			do	357
	1760	2395	2558	2622	2635	2649	2676	2903	3025	3134			Sheared fibers; split at end	357
	1406	1683	1833	1941	2037	2127	2182	2254	2295	2350			Split at end; fibers did not shear	358
	1860	2767	2971	3039	3139	3289	3388	3484	3529	3633	4150		Slight shearing of fibers; split at end	358
	1951	2296	2495	2640	2808	2890	3071	3198	3270				Split at end; fibers did not shear	359
	2223	3202	3447	3184	3502	3543	3683	3756	3842	3896			Split at end; slight shearing of fibers	359
	1551	1837	2037	2214	2422	2540	2676	2758	2885	2998			do	360
	2041	2921	2971	2812	3153	2817	2994	3193	3316	3452			Sheared fibers; split at end	360
	1883	3048	3438	3661	3751	3887	3878	3933	4014	4101	4808	5216	Sheared fibers	361
	1610	1960	1990	2136	2270	2341	2422	2486	2581	2654	3030		Slight shearing of fibers; split at end	361
	1406	1542	1706	1778	1914	2000	2082	2132	2177	2263	2740		do	384
	1452	2549	2885	3026	3116	3166	3216	3298	3357	3411			Sheared fibers; split at end	384
	1270	1905	2078	2218	2295	2350	2436	2522	2572	2635	3107		Slight shearing of fibers; split at ends	385
	1311	1810	2023	2155	2250	2300	2359	2440	2495	2595	2813		do	385

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
380. Pinus palustris—continued	390	North Carolina	Wilmington	E. Kidder		10266	Crushed at middle and at 25 millimeters from middle.
	390	...do	...do	...do		9957	Crushed at 51 millimeters from end.
381. Pinus Cubensis *Slash Pine. Swamp Pine. Bastard Pine. Meadow Pine.*	84	Florida	Duval county	A. H. Curtiss	Moist, sandy	9063	Crushed at 51 millimeters from end and at end.
	84	...do	...do	...do	...do	8637	Triple flexure.
	356	Alabama	Cottage Hill	C. Mohr	...do	12792	Crushed at 32 and at 102 millimeters from end.
	356	...do	...do	...do	...do	13585	Crushed at 76 millimeters from end.
	493	Florida	Bay Biscayne	A. H. Curtiss	Coral	8550	Split obliquely along grain; seasoning cracks.
	493	...do	...do	...do	...do	11136	Crushed at 25 millimeters from middle.
382. Picea nigra *Black Spruce.*	231	Vermont	Charlotte	C. G. Pringle	Cold, peaty	8210	Crushed at 3 millimeters knot 76 millimeters from end.
	231	...do	...do	...do	...do	6668	Crushed at 3 millimeters knots at middle and at end.
	373	...do	Huntington	...do	Gravelly	6242	Crushed at 83 millimeters from end.
	776	New Brunswick	Bay of Fundy	Intercolonial railway.		6305	Crushed at 6 millimeters knot 51 millimeters from middle.
	776	...do	...do	...do		6305	Crushed at middle at 6 millimeters knot.
	794	Province of Quebec	Danville	Grand Trunk railway.		5851	Triple flexure; middle bend 25 millimeters eccentric.
	704	...do	...do	...do		6373	Crushed at 25 millimeters from end.
	880	New Brunswick	Bridgeton	Ed. Sinclair		6464	Crushed at 13 millimeters from middle.
	880	...do	...do	...do		6260	Crushed at middle on one face.
383. Picea alba *White Spruce.*	513	New Hampshire	Stratford	C. G. Pringle	Gravelly	4672	Crushed at 5 millimeters knot 51 millimeters from end.
	513	...do	...do	...do	...do	5117	Crushed at 13 millimeters knot at middle.
	620	Dakota	Terry's peak	R. Douglas	...do	5336	Crushed at 51 millimeters from middle.
	620	...do	...do	...do	...do	5443	Crushed at 3 millimeters knot 51 from end.
	773	New Brunswick	Bay of Fundy	Intercolonial railway.		5715	Crushed at 16 millimeters knot 25 millimeters from middle.
	773	...do	...do	...do		4518	Crushed at 16 millimeters knot 102 millimeters from end.
	784	...do	Bridgeton	Ed. Sinclair		5987	Crushed at 45 millimeters from middle.
	784	...do	...do	...do		5978	Crushed at 51 millimeters from end.
	791	Province of Quebec	Amqui	A. Grant		5670	Crushed at 76 millimeters from end.
	791	...do	...do	...do		6260	Crushed at 64 millimeters from end.
384. Picea Engelmanni *White Spruce.*	292	Colorado	Forest City	T. S. Brandegee	Damp	4037	Triple flexure parallel to rings.
	292	...do	...do	...do	...do	3883	Crushed at 16 millimeters knot 89 millimeters from end.
	575	...do	...do	C. S. Sargent	Peaty	5262	Triple flexure.
	822	...do	...do	T. S. Brandegee	...do	3901	Crushed at 102 millimeters from end; cross-grained
385. Picea pungens *White Spruce. Blue Spruce.*	269	...do	Alpine	...do	Damp	4046	Crushed at 102 millimeters from end at 10 millimeters knot.
	276[1]	...do	...do	...do	...do	3792	Crushed at 16 millimeters knot 76 millimeters from end.
	276[2]	...do	...do	...do	...do	4545	Crushed at 38 millimeters from end and at middle at 3 millimeters knots.
386. Picea Sitchensis *Tide-land Spruce.*	970	Alaska	Sitka	Paul Schultze		6568	Triple flexure parallel to rings.
	970	...do	...do	...do		6146	Triple flexure perpendicular to rings.
	977	British Columbia	Saw-mill, Burrard inlet.	G. Engelmann and C. S. Sargent.		5715	Crushed at 64 millimeters from end.
	977	...do	...do	...do		5570	Crushed at 76 millimeters from end.
	1015	Oregon	Weidler's saw-mill, Portland	...do		6486	Crushed at middle; angle of crushing, 85°.
	1019	...do	Saw-mill, Astoria.	...do		5216	Crushed at 76 millimeters from end; angle of crushing, 85°.
	1019	...do	...do	...do		5625	Crushed at 76 millimeters from end.
	1026	...do	Portland Furniture Company.	...do		5017	Crushed at 13 and at 102 millimeters from end.
	1026	...do	...do	...do		4527	Triple flexure.
387. Tsuga Canadensis *Hemlock.*	5	Massachusetts	Arnold Arboretum	C. S. Sargent	Drift	5987	Triple flexure parallel to rings.
	5	...do	...do	...do	...do	5706	Crushed at 51 millimeters from end.
	219	Vermont	Charlotte	C. G. Pringle	Gravelly	7702	Triple flexure.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	Pressure, in kilograms, required to produce an indentation, in millimeters, of— 0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08	Remarks.	Office number.
	1315	1474	1637	1814	1887	1973	2155	2223	2277	2350	....	....	Slight shearing of fibers; split at ends	390
...	1542	1941	1987	2141	2313	2431	2563	2654	2785	2944	....	....	Sheared fibers; split at ends	390
	1111	1406	1515	1560	1592	1687	1710	1737	1796	1824	....	....	Slight shearing of fibers; split at ends	84
	1293	1769	1846	1892	1932	1982	2078	2159	2277	2331	2785	....	......do	84
	1229	1452	1588	1706	1796	1951	2041	2123	2236	2304	....	....	......do	356
	2313	3393	3783	3983	4073	4237	4264	4300	4418	4527	....	....	Sheared fibers; split at ends	356
	2880	3892	4400	4786	5080	5252	5579	5761	5851	6214	....	....	Sheared fibers; split at end; indented section covers 10 millimeters knot.	493
	1837	2722	3130	3298	3438	3456	3710	3801	3887	3901	4146	4246	Sheared fibers	493
	826	1261	1466	1442	1429	1520	1569	1666	1628	1660	1851	....	Sheared fibers; split at ends	231
	925	1225	1488	1542	1588	1637	1678	1719	1778	1810	....	....	Slight shearing of fibers; split at ends	231
	590	807	944	989	1066	1120	1166	1202	1234	1257	1452	1619	......do	373
	644	1089	1225	1261	1279	1302	1325	1347	1370	1397	1560	1724	Sheared fibers	776
	749	1089	1238	1302	1352	1379	1402	1438	1479	1511	1742	....	Sheared fibers; split at end	776
	725	962	1030	1071	1102	1125	1170	1211	1225	1247	1429	1506	Sheared fibers	794
	671	1007	1061	1071	1098	1129	1161	1202	1220	1243	1388	1506	......do	794
	635	962	1039	1080	1116	1143	1160	1202	1225	1252	1370	1488	......do	880
	635	939	1034	1093	1125	1161	1193	1207	1238	1275	1488	1579	......do	880
	776	1061	1152	1179	1202	1225	1261	1293	1315	1334	1588	....	......do	513
	735	1120	1257	1325	1388	1420	1438	1456	1506	1542	1678	1824	Slight shearing of fibers	513
	726	1139	1311	1397	1447	1488	1524	1542	1565	1579	1724	....	Sheared fibers; 3 millimeters knot covered by indented section.	620
	676	1084	1220	1343	1393	1438	1488	1533	1574	1637	1937	3132	Sheared fibers	620
	563	798	880	907	957	1012	1043	1080	1116	1152	1325	....	Slight shearing of fibers; split at end	773
	631	939	1061	1093	1125	1143	1175	1220	1266	1302	1438	1560	Sheared fibers	773
	662	817	894	989	1007	1030	1080	1098	1111	1134	1379	....	Sheared fibers; split at end	784
	644	916	962	966	993	1039	1061	1071	1098	1125	1261	1379	Sheared fibers	784
	817	966	1021	1071	1125	1170	1220	1270	1320	1347	1533	....	Sheared fibers; split at end	791
	640	984	1043	1071	1139	1184	1229	1261	1302	1325	1492	1637	Sheared fibers	791
	567	1080	1170	1234	1275	1325	1361	1393	1415	1447	1579	1733	......do	292
	953	1379	1515	1507	1665	1710	1751	1765	1778	1814	....	....	Sheared fibers; 10 millimeters knot covered by indented section.	292
	572	835	844	857	862	866	898	944	948	953	1043	1139	Sheared fibers	575
	590	903	984	1025	1066	1098	1120	1152	1175	1207	1320	....	Sheared fibers; split st end	822
	907	1279	1402	1461	1524	1565	1619	1656	1669	1683	1882	2009	Sheared fibers	269
	640	912	948	962	984	1016	1034	1052	1066	1098	1275	1370	......do	270[1]
	1016	1148	1234	1257	1293	1334	1379	1397	1443	1470	1637	1778	......do	270[2]
	889	1184	1302	1415	1479	1529	1606	1660	1728	1760	2087	....	Sheared fibers; split at end	970
	717	1325	1574	1628	1706	1765	1829	1892	1969	2068	2395	2531	Sheared fibers	970
	626	749	807	871	944	966	993	1098	1161	1252	....	....	Slight shearing of fibers; split at end	977
	758	1143	1257	1320	1347	1388	1400	1424	1433	1456	1715	....	Sheared fibers	977
	458	626	690	749	789	830	866	903	939	966	....	....	Split at end; fibers did not shear	1015
	721	794	848	898	957	1021	1048	1120	1139	1161	1433	....	Slight shearing of fibers; split at end	1619
	726	907	925	934	971	1016	1048	1080	1116	1101	1352	....	Sheared fibers; split at end	1019
	866	1043	1120	1170	1198	1220	1279	1325	1356	1415	1633	....	Sheared fibers	1026
	631	907	980	1025	1052	1071	1111	1125	1152	1160	1302	1397	......do	1026
	871	1007	1684	1198	1275	1297	1306	1352	....	....	....	....	Slight shearing of fibers; split at end	5
	771	817	848	894	921	1002	1107	1170	1216	1257	1542	1732	Sheared fibers	5
	558	771	866	953	993	1016	1952	1129	1120	1161	1311	....	Slight shearing of fibers; split at end	219

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
387. Tsuga Canadensis—continued.	219	Vermont	Charlotte	C. G. Pringle	Gravelly	7892	Crushed at 51 millimeters from middle.
	772	New Brunswick		Intercolonial railway.		4649	Crushed at middle at 3 millimeters knot.
	772	...do		...do		5307	Triple flexure perpendicular to rings.
	775	...do	Bay of Fundy	...do		5489	Crushed at 45 millimeters from middle.
	775	...do	...do	...do		5738	Triple flexure; middle bend 51 millimeters eccentric.
	778	...do		...do		5035	Crushed and shattered at end in vicinity of knots.
	778	...do		...do		5058	Crushed at middle at 10 millimeters knot.
	787	...do	Bridgeton	Ed. Sinclair		5851	Crushed at 76 millimeters from end; opened grain from end to end.
	787	...do	...do	...do		6301	Triple flexure perpendicular to rings.
	793	Province of Quebec	Danville	Grand Trunk railway.		7403	Crushed at 6 millimeters knot 64 millimeters from end.
	793	...do	...do	...do		8346	Crushed at 13 to 25 millimeters from end.
	817	West Virginia	Grafton	C. G. Pringle		6323	Crushed at 19 millimeters from middle.
	817	...do	...do	...do		6101	Crushed at 32 millimeters from middle.
	1040	Massachusetts	Danvers	J. Robinson	Moist loam	6827	Crushed at 76 millimeters from end.
	1040	...do	...do	...do	...do	5516	Triple flexure
	1042	...do	North Reading	...do		6486	Crushed at 76 millimeters from end.
	1042	...do	...do	...do		5126	Crushed at 51 millimeters from middle.
388. Tsuga Caroliniana. *Hemlock.*	623	North Carolina	Hendersonville	A. H. Curtiss	Dry, rocky	6450	Crushed at 5 millimeters knot near middle.
389. Tsuga Mertensiana. *Hemlock.*	971	Washington territory.	Wilkeson	G. Engelmann and C. S. Sargent.	Rich loam	9185	Crushed at 76 millimeters from end.
	995	Alaska	Sitka	Paul Schultze		7621	Crushed at 6 millimeters knot 45 millimeters from end.
	995	...do	...do	...do		9435	Crushed at 51 millimeters from middle.
390. Tsuga Pattoniana	980	British Columbia	Silver peak, near Fraser river.	G. Engelmann and C. S. Sargent.	Gravelly loam	5806	Triple flexure; middle bend 38 millimeters eccentric at 3 millimeters knot.
	980	...do	...do	...do	...do	6341	Crushed at 3 millimeters knot at middle.
391. Pseudotsuga Douglasii. *Red Fir. Yellow Fir. Oregon Pine. Douglas Fir.*	271[2]	Colorado	Alpine	T. S. Brandegee	Moist	6613	Triple flexure
	627	California	Saw-mill, Strawberry valley.	G. Engelmann and C. S. Sargent.		9117	Crushed at 51 millimeters from middle.
	627	...do	...do	...do		9390	Crushed at end and at 102 millimeters from end.
	702	Oregon	Saw-mill, Marshfield.	...do		5489	Triple flexure perpendicular to rings.
	704	...do	...do	...do		9026	Crushed at 51 millimeters from end.
	705	...do	E. B. Dean's saw-mill, Marshfield.	...do		8709	Triple flexure
	706	...do	...do	...do		20550	Crushed at 89 millimeters from end.
	708	...do	...do	...do		9979	Crushed at 45 millimeters from end.
	708	...do	...do	...do		11022	Crushed at 25 millimeters from end at 3 millimeters knot.
	709	...do	...do	...do		7303	Crushed at 76 millimeters from end.
	709	...do	...do	...do		7212	Crushed at 76 millimeters from middle.
	720	Montana	Saw-mill, Missoula	S. Watson		7240	Crushed at 51 millimeters from end; shattered end.
	720	...do	...do	...do		8936	Triple flexure; middle bend 38 millimeters eccentric.
	732	California	Lassen's peak	Sierra Lumber Company.		8029	Crushed at 19 millimeters from end.
	732	...do	...do	...do		7802	Crushed at end
	881	Utah	Salt Lake	M. E. Jones	Rocky	6895	Crushed at 3 millimeters knots 38 millimeters from end.
	881	...do	...do	...do	...do	6305	Crushed at 13 millimeters knot at middle.
	973	British Columbia	Saw-mill, Burrard inlet.	C. S. Sargent		7235	Crushed at middle
	973	...do	...do	...do		7779	Crushed at 38 millimeters from end.
	974	...do	...do	...do		8600	Crushed at 51 millimeters from end.
	974	...do	...do	...do		9026	...do
	986	...do	Saw-mill, Victoria	G. Engelmann and C. S. Sargent.		7576	Triple flexure
	989	Oregon	Saw-mill, Portland	...do		7689	Crushed at group of knots 25 millimeters from middle.
	1008	British Columbia	Saw-mill, Burrard inlet.	...do		7756	Crushed and shattered at end

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	Pressure, in kilograms, required to produce an indentation, in millimeters, of—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	667	852	....	894	975	1002	1006	1116	1152	1179	1220	1429	Slight shearing of fibers; split at end	219
	885	998	1120	1320	1397	1415	1438	1460	1511	1628	1760	......	Sheared fibers; split at end	772
	767	1166	1257	1315	1433	1492	1551	1637	1710	1778	2078	......	Sheared fibers; split from end to end	772
	1139	1343	1474	1538	1628	1724	1778	1851	1910	1969	2404	2722	Slight shearing of fibers; split at end	775
	993	1198	1288	1352	1442	1547	1615	1687	1737	2096	2313	......	......do	775
	730	944	1021	1075	1107	1157	1170	1211	1234	1252	1361	1497	Sheared fibers	778
	794	1311	1415	1411	1415	1447	1479	1538	1628	1674	1837	1996	......do	778
	925	1474	1461	1461	1465	1583	1637	1795	1751	1769	1996	2141	......do	787
	499	857	984	998	1048	1089	1143	1170	......	......	......	......	Split at end	787
	1338	1833	2041	2218	2241	2245	2245	2250	2254	2241	2282	......	Slight shearing of fibers; split at end	793
	1111	1452	1551	1669	1733	1792	1833	1828	......	......	......	......	......do	793
	544	708	780	803	844	857	871	907	921	939	1034	......	Sheared fibers; split from end to end	817
	522	703	785	826	852	871	898	948	989	1002	1120	1184	Sheared fibers	817
	572	1034	1129	1103	1247	1288	1325	1365	1402	1456	1710	......	Slight shearing of fibers; split at end	1040
	1338	1860	1837	1937	2068	2141	2259	2309	2354	2381	2676	......	Sheared fibers; split at ends	1040
	476	857	1093	1225	1306	1352	1397	1415	1415	1420	1520	1687	Sheared fibers	1042
	658	771	817	871	894	939	989	1021	1034	1071	......	......	Slight shearing of fibers; split at ends	1042
	1184	1180	1842	1928	1996	2032	2078	2091	2123	2141	2336	2495	Slight shearing of fibers; split at end	623
	563	848	971	1048	1093	1139	1170	1220	1261	1302	1529	......	Slight shearing of fibers; split at ends	971
	912	1179	1315	1397	1461	1533	1597	1656	1733	1769	2223	......	......do	905
	1406	2032	2132	2223	2313	2395	2495	2558	2640	2681	3053	......	Sheared fibers; split at ends	995
	862	1315	1438	1501	1551	1592	1647	1687	1737	1769	2019	2227	Sheared fibers	980
	1089	1438	1533	1665	1778	1828	1910	1960	1996	2068	2381	2595	......do	980
	1406	1951	2118	2277	2345	2436	2467	2531	2576	2599	2899	......	Sheared fibers; split at end	271[1]
	866	1170	1279	1311	1325	1361	1400	1447	1479	1501	1715	......	Slight shearing of fibers; split at end	627
	739	1089	1166	1221	1284	1320	1356	1406	1434	1461	1665	......	......do	627
	1306	2141	2440	2576	2667	2758	2799	2890	2930	......	......	......	Slight shearing of fibers; split at end; 10 millimeter knot on indented section.	702
	1338	2096	2209	2322	2391	2472	2245	2590	2645	2731	......	......	Slight shearing of fibers; split at end	704
	1161	1533	1656	1710	1742	1778	1833	1896	1932	1987	2223	2359	Sheared fibers; split at end	705
	866	1120	1189	1257	1293	1352	1374	1411	1465	1501	1742	......	......do	706
	1769	2201	2522	2676	2817	2971	3094	3257	3411	3557	4105	......	......do	708
	1134	2078	2308	2409	2499	2595	2672	2740	2821	2917	......	......	......do	708
	1080	1207	1247	1297	1352	1370	1384	1406	1483	1511	1724	1833	Sheared fibers	709
	1229	1179	1089	1293	1429	1529	1642	1706	1765	1824	1951	2023	......do	709
	1035	1198	1238	1306	1370	1411	1447	1497	1538	1574	1814	2005	......do	720
	971	1438	1513	1506	1515	1547	1628	1674	1719	1774	......	......	......do	720
	862	1107	1220	1266	1320	1361	1433	1483	1506	1556	......	......	Slight shearing of fibers; split at end	732
	1533	2200	2295	2313	2245	2109	2132	2246	2359	2436	......	......	Sheared fibers; split at end	732
	1833	1941	2482	2545	2595	2635	2713	2758	2821	2912	3266	3561	......do	881
	1315	1032	2118	2254	2300	2345	2409	......	......	......	......	......	Slight shearing of fibers; split at end	881
	862	957	993	916	1012	1016	1084	1161	1116	1143	1460	1579	Sheared fibers	973
	1093	1814	1082	1941	1860	1778	1569	1565	1637	1733	2495	2722	......do	973
	885	1216	1225	1202	1229	1338	1411	1461	1524	1374	1824	......	Sheared fibers; split at end	974
	767	1080	1152	1202	1252	1302	1343	1365	1402	1433	1588	1687	......do	974
	780	862	953	1002	1048	1080	1120	1139	1170	1193	1311	......	......do	986
	953	1320	1470	1547	1588	1047	1674	1728	1765	1801	2136	......	......do	980
	839	1089	1207	1302	1347	1397	1452	1488	1533	1569	......	......	Fibers did not shear	1008

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
391. Pseudotsuga Douglasii—cont'd	1008	British Columbia	Saw-mill, Burrard inlet.	G. Engelmann and C. S. Sargent.		8981	Crushed at 38 millimeters from middle.
	1011	Oregon	Oregon Railway and Navigation Company.	do		8799	Crushed at 3 millimeters knot at middle.
	1011	do	do	do		6804	Crushed at 16 millimeters knot 76 millimeters from end.
	1016	do	Weidler's saw-mill, Portland.	do		8981	Crushed at 89 millimeters from end.
	1016	do	do	do		9798	Crushed at [illegible] millimeters from middle.
	1018	do	Saw-mill, Astoria	do		10002	Crushed at 51 millimeters from end.
	1018	do	do	do		9662	Crushed at 38 millimeters from end.
	1020	do	Portland Furniture Company.	do		7892	do
	1020	do	do	do		7666	Triple flexure
	1022	do	do	do		8346	Crushed at 51 millimeters from end.
	1022	do	do	do		8392	Crushed at 51 millimeters from middle.
391. Pseudotsuga Douglasii, *var.* macrocarpa. *Hemlock.*	642	California	Saw-mill, San Bernardino.	W. G. Wright		6872	Split obliquely; pieces flew from machine.
	642	do	do	do		7938	Crushed at 103 millimeters from end; opened grain.
392. Abies Fraseri *Balsam. She Balsam.*	523	North Carolina	Roan mountain	Walcott Gibbs	Peaty loam	5874	Crushed at 6 millimeters knot 31 millimeters from end.
	523	do	do	do	do	5239	Crushed at 10 millimeters knot 25 millimeters from middle.
393. Abies balsamea *Balsam Fir. Balm of Gilead Fir.*	377	Vermont	Monkton	C. G. Pringle	Peaty	5851	Crushed at 25 millimeters from middle.
394. Abies subalpina *Balsam.*	449	Colorado	Forest City	T. S. Brandegee	Moist, sandy loam	4854	Crushed at middle at 25 millimeters knot.
	449[1]	do	do	do	do	4400	Crushed at 6 millimeters knot 38 millimeters from middle; split along grain.
	449[1]	do	do	do	do	3856	Crushed at 10 millimeters knot at middle; split along grain.
	449[2]	do	do	do	do	5661	Crushed at 38 millimeters from end.
	829	do	do	do	do	5398	Crushed at middle
	829	do	do	do	do	4808	Crushed and shattered at end
395. Abies grandis *White Fir.*	1010	Oregon	Portland	G. Engelmann and C. S. Sargent.	Rich, alluvial	6033	Crushed at 25 millimeters from middle.
	1010	do	do	do	do	6477	Crushed at 19 millimeters from middle.
396. Abies concolor *White Fir. Balsam Fir.*	529	Colorado	Engelmann's cañon	Robert Douglas	Rocky	4309	Crushed 51 millimeters from end (at end bearing transverse test); split along rings.
	529	do	do	do	do	4967	Split at 10 millimeters knots 25 millimeters from middle.
	639	California	Strawberry valley	G. Engelmann and C. S. Sargent.	Alluvial	6350	Triple flexure
	639	do	do	do	do	5670	Triple flexure perpendicular to rings; opened grain.
	733	do	Lassen's peak	Sierra Lumber Company.		8618	Crushed at middle
	733	do	do	do		7507	Crushed at 38 millimeters from end.
398. Abies amabilis	1004	British Columbia	Silver peak, near Fraser river.	G. Engelmann and C. S. Sargent.	Rich, sandy loam	7838	Crushed at 25 millimeters from middle.
	1004	do	do	do	do	7122	Crushed at middle
399. Abies nobilis *Red Fir.*	965	Oregon	Cascade mountains.	do	Rich	7235	Crushed at 51 millimeters from end.
	965	do	do	do	do	7276	Crushed at 25 millimeters from middle.
400. Abies magnifica *Red Fir.*	647	California	Soda Springs	G. Engelmann and C. S. Sargent.	Gravelly loam	7258	Crushed at 51 millimeters from end.
	647	do	do	do	do	6668	Triple flexure; middle bend 25 millimeters eccentric.
401. Larix Americana *Larch. Black Larch. Tamarack Hackmatack.*	220[1]	Vermont	Charlotte	C. G. Pringle	Cold, swampy	12621	Crushed at 25 millimeters from middle.
	226[1]	do	do	do	do	10387	Triple flexure; middle bend 25 millimeters eccentric.
	226[2]	do	do	do	do	6849	Crushed at 6 millimeters knot at middle; split from end to end.
	226[3]	do	do	do	do	8165	Crushed at middle; split
	774	New Brunswick	Bay of Fundy	Intercolonial railway.		7892	Crushed at 13 millimeters knot 51 millimeters from end; opened between rings.
	774	do	do	do		9005	Crushed at 64 millimeters from middle at 25 millimeters knot.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	Pressure, in kilograms, required to produce an indentation, in millimeters of— 0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08	Remarks.	Office number.
	1315	2087	2254	2241	1906	1978	1960	2073	2227	1987	2676	2903	Sheared fibers	1008
	771	1306	1433	1479	1520	1556	1588	1606	1633	1660	1452	1565	......do	1011
	925	1166	1216	1275	1334	1388	1429	1447	1488	1524	1724	....	Sheared fibers; split at end	1011
	885	1107	1157	1202	1257	1302	1352	1393	1429	1438	1642	....	Fibers did not shear; split at end	1016
	817	998	1048	1675	1125	1184	1234	1284	1343	1388	....	....	Slight shearing of fibers; split at end	1016
	1043	1211	1297	1343	1303	1456	1537	1615	1669	1737	2078	....	......do	1018
	889	1129	1189	1229	1284	1329	1384	1447	1483	1506	....	....	......do	1018
	730	780	807	839	944	1002	1039	1071	1102	1134	1361	....	......do	1020
	671	862	953	930	1002	1111	1157	1198	1211	1252	1429	1624	Sheared fibers	1020
	817	848	885	907	962	993	1030	1080	1107	1143	1306	....	Slight shearing of fibers; split at end	1022
	1179	1452	1497	1406	1293	1315	1470	1651	1751	1805	1987	2313	Sheared fibers	1022
	1080	1551	1633	1610	1615	1692	1778	1846	1910	1960	2177	2409	......do	642
	1157	1520	1583	1624	1669	1728	1746	1760	1824	1842	2082	2186	......do	642
	540	830	984	1061	1093	1125	1157	1170	1193	1202	1379	1442	.... do	523
	499	835	939	975	1002	1039	1080	1116	1129	1166	1306	1379	......do	523
	644	866	993	1107	1202	1257	1306	1365	1397	1447	....	....	Slight shearing of fibers; split at end; 4 millimeters knot in indented section.	377
	780	880	993	1048	1093	1125	1184	1211	1238	1266	1442	1588	Sheared fibers	449
	726	1016	1080	1111	1139	1175	1211	1247	1261	1284	1474	1597	......do	449[1]
	794	925	930	944	980	1007	1039	1061	1116	1116	1270	1374	......do	449[1]
	504	821	894	939	975	1012	1034	1052	1080	1102	1270	....	Sheared fibers; split at end	449[2]
	590	817	866	889	894	....	....	....	....	....	....	....	Split at end	820
	563	826	957	989	1007	1030	1039	1052	1039	1057	1170	1225	Sheared fibers; split at ends	820
	631	817	839	839	857	912	962	1012	1066	1098	1225	1379	......do	1010
	499	617	669	712	762	803	817	844	866	885	....	....	Slight shearing of fibers; split at end	1010
	769	1002	1093	1125	1143	1166	1170	1179	1193	1202	1302	....	Sheared fibers; split at end	529
	522	776	894	971	1002	1025	1052	1084	1098	1116	1225	....	......do	529
	749	1134	1189	1198	1216	1247	1279	1320	1338	1361	1610	1769	Sheared fibers	639
	852	1116	1207	1270	1320	1347	1402	1438	1465	1511	1746	1905	......do	639
	1134	1243	1338	1438	1533	1592	1692	1769	1824	1869	....	....	Fibers did not shear; split at end	733
	1134	1179	1229	1270	1275	1325	1470	1533	1592	1624	1860	....	Sheared fibers; split at end	733
	594	844	880	939	998	1080	1116	1157	1210	1257	1429	....	......do	1004
	680	862	930	1002	1061	1098	1129	1166	1193	1234	1452	....	......do	1004
	1356	1565	1701	1842	1941	2105	2218	2263	2345	2413	2858	3221	Slight shearing of fibers; split at end	965
	1184	1610	1696	1778	1892	1969	2050	2123	2173	2214	2586	....	Sheared fibers; split at end	965
	844	1016	1093	1148	1175	1207	1252	1275	1311	1325	1474	1651	Sheared fibers	647
	1021	1583	1760	1860	1914	1982	2059	2073	2118	2141	2404	2586	......do	647
	1270	1769	2087	2241	2391	2472	2540	2581	2640	2717	2948	3130	Slight shearing of fibers; split at ends	226[1]
	1225	1533	1628	1778	1869	1946	1987	2050	2114	2164	2449	....	Slight shearing of fibers; split at end; specimen 120 millimeters long.	226[1]
	1030	1533	1728	1860	1982	2073	2150	2263	2381	....	....	....	Fibers did not shear; split at end; specimen 120 millimeters long.	226[3]
	1724	2358	2699	2875	2939	3026	3039	3502	3506	3612	....	....	Slight shearing of fibers; shattered stick; specimen 120 millimeters long.	226[2]
	852	1143	1247	1343	1388	1429	1442	1470	1497	1538	1746	....	Slight shearing of fibers; split at end	774
	791	1134	1279	1352	1447	1470	1474	1483	1506	1538	1769	....	......do	774

TABLE V.—BEHAVIOR OF THE PRINCIPAL WOODS OF THE

Species.	Office number.	State.	Locality.	Collector.	Soil.	Longitudinal compression: Ultimate strength, in kilos.	Remarks.
401. Larix Americana—continued..	781	New Brunswick ..	Bay of Fundy	Intercolonial railway.	....	8147	Triple flexure....................
	781	....do	....do	... do	....	8142	Crushed at 25 millimeters from middle.
	786	....do	Bridgeton	Ed. Sinclair	....	9390	......do ....
	786	....do	....do	....do	....	7666	Crushed at 51 millimeters from middle.
	795	....do	Danville	Grand Trunk railway.	....	9480	Crushed at 64 millimeters from middle.
	795	....do	....do	....do	....	8437	Crushed at middle................
	840	Massachusetts....	Wenham	J. Robinson	Swampy	6967	Triple flexure parallel to rings; intersecting "Cooper lines".
	840	....do	... do	... do	....do	7530	Crushed at 102 millimeters from end on one face.
402. Larix occidentalis............ *Tamarack.*	719	Montana..........	Missoula..........	S. Watson	....	9367	Triple flexure....................
	719	....do	....do	... do	....	10047	Crushed at 64 millimeters from end.
	984	Washington territory.	Fulda............	W. Siksdorf.......	Moist............	11648	Crushed at 51 millimeters from end at 3 millimeters knot.
	984	....do	....do	....do	....do	12633	Crushed at 3 millimeters knot 19 millimeters from end.
	1006	....do	....do	.. do	....do	11785	Crushed at 25 millimeters from middle.
	1006	... do	....do	... do	....do	10660	Crushed at 96 millimeters from end; opened grain.
PALMACEÆ.							
405. Washingtonia filifera .... *Fan-leaf Palm.*	1159	California.........	Agua Caliente	W. G. Wright.....	Dry, gravelly	1461	Split obliquely; fracture 228 millimeters long.
	1159	....do	....do	....do	....do	5896	Split obliquely; fracture 305 millimeters long.

UNITED STATES UNDER COMPRESSION—Continued.

Direction of grain.	Pressure, in kilograms, required to produce an indentation, in millimeters, of—												Remarks.	Office number.
	0.25	0.51	0.76	1.02	1.27	1.52	1.78	2.03	2.28	2.54	4.81	5.08		
	993	1125	1220	1311	1388	1461	1538	1601	1674	1774	2313	2586	Slight shearing of fibers	781
	1270	1765	1905	2041	2159	2254	2345	2422	2504	2572	3198	....	Slight shearing of fibers; split at end	781
	862	934	1025	1075	1125	1189	1229	1261	1302	1325	....	....	......do	786
	703	1202	1270	1325	1347	1433	1533	1624	1692	1778	2087	2313	......do	786
	730	1111	1189	1288	1329	1388	1429	1442	1461	1501	....	....	......do	795
	1002	1315	1429	1506	1551	1656	1769	1860	1905	1941	....	....	......do	795
	1315	1733	1842	1987	2082	2168	2227	2313	2422	2472	3085	....	Sheared fibers; split at end; indented section covers 6 millimeters knot.	840
	1179	1769	1892	1946	2028	2168	2259	2390	2490	2536	3030	....	Slight shearing of fibers; split at end	840
	953	1574	1774	1860	1928	2000	2019	2050	2118	2186	2541	2713	Sheared fibers	719
	1211	1452	1579	1696	1796	1860	1946	1987	2082	2118	2449	....	Slight shearing of fibers; split at end	719
	1315	1451	1547	1619	1710	1792	1910	1987	2046	2123	2563	....	......do	984
	1633	2336	2350	2345	2400	2545	2681	2803	2948	3094	....	....	......do	984
	1656	2681	3134	3348	3375	3470	3652	3756	3901	4051	....	....	......do	1006
	1406	1669	1905	2046	2159	2300	2391	2506	2549	2672	....	....	Fibers did not shear	1006
	318	508	576	617	658	680	708	735	758	776	945	1048	Sheared fibers	1159
	812	1207	1325	1397	1442	1497	1551	1610	1628	1656	1932	1996	Slight shearing of fibers	1159

PART III.

THE FORESTS OF THE UNITED STATES

IN THEIR

ECONOMIC ASPECTS.

THE FORESTS OF THE UNITED STATES IN THEIR ECONOMIC ASPECTS.

GENERAL REMARKS.

The maps of relative average forest density joined to this report are intended to illustrate the present productive capacity of the forest covering of the country (map No. 16, portfolio). They are based, except in the case of the extreme western states and territories, upon the returns of enumerators. In states originally wooded all land not accounted for in the returns as cleared or treeless, or otherwise known to be destitute of tree covering, is treated as forest. The county is taken as the unit, and is seldom divided, unless varied topography or different natural features in different parts makes further subdivision desirable. In the western states and territories, where topography determines forest distribution, county lines are disregarded, and the estimates are based upon special reports of census experts, or upon the published reports of the various government surveys, maps, etc. The condition and productive capacity of the forest covering have been carefully investigated at many points in each county or unit region, and the area covered with forest, obtained in the manner described above, is multiplied by the average stand of timber or other useful wood. The results thus obtained are necessarily greatly generalized to conform to the scale of the maps used.

The following statement represents the value of the forest crop of the United States for the census year, so far as it has been possible to obtain it:

Saw logs	$139,836,869
Wood used for domestic purposes as fuel (estimated)	306,950,040
Wood used by railroads as fuel	5,126,714
Wood used by steamboats as fuel	1,812,083
Wood used as fuel—	
In the manufacture of brick and tile	3,978,331
In the manufacture of wool	425,239
In the manufacture of salt	121,681
In the production of precious metals	2,874,593
In other mining operations	073,692
Charcoal used as fuel—	
In manufacture of iron	$4,726,114
In manufacture of precious metals	29,306
In the twenty largest cities	521,316
Naval stores	5,000,000
Southern moss	500,000
Railroad ties (29,554,694)	9,806,247
Fence posts (for fencing railroads)	180,000
Uncultivated vegetable substances used in the manufacture of medicines	587,000
Uncultivated nuts	78,540
Hoop-poles	1,947,316
Wood used in the manufacture of—	
Handles	$897,170
Wheel stock	1,360,892
Wood pulp	1,974,074
Baskets	314,125
Excelsior	150,800
Oars	81,000
Shoe pegs	72,000
Hand-made shingles	47,952
Total	490,073,094

These returns are incomplete and often unsatisfactory. Many important items are omitted entirely. It was found impossible to obtain statistics of the amount and value of the wood (posts, split rails, etc.) used in fencing, with the exception of posts used by railroads. The amount of material thus consumed annually must be very large, probably exceeding $100,000,000 in value. No returns of the amount and value of the bark of different trees used in tanning leather have been received, and there are no statistics of the amount and value of the unsawed timber produced—spars, piles, telegraph and other poles, hewed timber, hard wood exported in the log, ships' knees, etc.—that is, all timber not manufactured in saw-mills into lumber. The value of the timber of this sort cut in the United States every year must be very large. The returns include the railway ties laid down by completed roads, and do not embrace those used in the construction of some 10,000 miles of new road built during the census year. It was found impossible to obtain even an estimate of the amount and value of the cooperage stock produced outside of regular saw-mills, and the returns of hand-made shingles only include those made from cypress at a few points in the south Atlantic region. Maple sugar to the amount of 36,576,061 pounds and 1,796,048 gallons of molasses were produced in the forests of the United States during the year 1879. No statistics of the value of these products have, however, been received. Statistics of the value of material consumed in the manufacture of excelsior, wood pulp, wheel stock, handles, shoe pegs, baskets, oars, and hoop-poles are incomplete, and do not fully represent the value of the wood used. The statistics of the value of wild nuts and wild vegetable substances collected are very incomplete, and it has been found impossible to separate the value of the imported from that of the native wood used in the manufacture of veneers, an industry consuming a large amount of high-priced hard wood. Could complete returns of the forest crop of the census year have been obtained it is not improbable that it would be found to exceed $700,000,000 in value.

THE LUMBER INDUSTRY.

The following table represents the volume, by states and territories, of the lumber industry of the United States for the census year, as derived from the returns of the enumerators on the schedule of manufactures, and from the reports of special agents for manufactures in cities having at the time of the Ninth Census 8,000 or more inhabitants. No distinction between the different kinds of wood sawed was attempted in the enumeration:

STATISTICS OF THE LUMBERING INDUSTRY OF THE

	States and Territories.	Number of establishments.	Capital.	AVERAGE NUMBER OF HANDS EMPLOYED.				LABOR.	MATERIALS.	
				Maximum at any one time in the year.	Males above 16 years.	Females above 15 years.	Children and youth.	Wages paid during the year.	Value of logs.	Value of mill supplies.
			Dollars.					*Dollars.*	*Dollars.*	*Dollars.*
	The United States	25,708	181,186,122	......	141,564	425	5,967	31,845,974	139,836,869	6,818,516
1	Alabama	354	1,545,655	2,708	1,611	......	38	424,156	1,517,988	90,649
2	Alaska	......	......	......	......	......	......	......	......	......
3	Arizona	13	102,450	126	77	......	2	33,375	128,486	5,300
4	Arkansas	319	1,067,840	2,985	1,690	......	54	237,394	1,009,954	60,441
5	California	251	6,454,718	4,945	3,423	......	11	1,095,738	2,055,635	186,868
6	Colorado	96	481,200	1,605	870	......	7	112,931	854,500	45,794
7	Connecticut	300	657,300	1,262	699	......	8	178,338	809,024	32,545
8	Dakota	39	113,750	451	288	......	4	54,974	269,235	12,640
9	Delaware	88	259,250	646	378	......	13	40,694	229,763	13,812
10	District of Columbia	1	25,000	35	25	......	......	6,000	32,000	2,000
11	Florida	135	2,219,550	3,240	1,945	......	85	562,249	1,763,817	103,596
12	Georgia	655	3,101,452	4,071	3,298	......	94	554,085	3,049,435	147,720
13	Idaho	48	192,460	311	169	......	4	33,367	213,891	16,875
14	Illinois	040	3,295,483	5,799	3,652	......	199	787,867	2,959,537	185,368
15	Indiana	2,022	7,048,088	18,252	9,926	......	413	1,571,740	9,290,428	336,669
16	Indian territory	......	......	......	......	......	......	......	......	......
17	Iowa	328	4,946,390	4,155	2,526	......	463	825.244	4,023,661	118,224
18	Kansas	146	282,975	831	507	......	9	68,757	421,738	25,711
19	Kentucky	670	2,290,558	5,140	2,506	1	94	871,939	2,238,888	171,855
20	Louisiana	175	903,950	1,514	943	......	33	200,063	1,106,280	80,779
21	Maine	848	6,339,396	9,836	6,480	......	183	1,161,142	4,754,813	197,344
22	Maryland	369	1,237,694	1,769	1,216	......	23	223,786	1,041,836	64,959
23	Massachusetts	608	2,480,340	3,130	1,940	......	30	431,612	1,827,497	76,608
24	Michigan	1,649	39,260,428	30,886	22,732	143	1,380	6,967,905	30,819,008	1,432,369
25	Minnesota	234	6,771,145	3,772	2,732	22	100	924,473	4,408,468	120,587
26	Mississippi	295	922,595	2,113	1,123	......	47	197,867	1,100,902	28,214
27	Missouri	881	2,867,970	6,678	3,408	......	95	669,644	3,113,049	102,243
28	Montana	36	208,200	374	142	......	......	47,945	257,320	20,778
29	Nebraska	38	93,375	295	136	......	4	29,313	153,823	11,055
30	Nevada	9	132,000	66	35	......	......	9,892	151,790	11,020
31	New Hampshire	680	3,745,790	4,765	3,050	......	48	548,556	2,159,461	113,530
32	New Jersey	284	1,657,395	1,066	760	......	8	179,693	942,752	47,227
33	New Mexico	28	74,675	282	172	......	......	24,240	100,145	16,910
34	New York	2,822	13,230,934	17,509	11,056	......	389	2,162,972	8,628,874	490,389
35	North Carolina	778	1,743,217	5,334	2,938	......	91	447,431	1,490,618	86,523
36	Ohio	2,352	7,944,412	15,277	8,769	......	548	1,708,300	8,603,127	292,970
37	Oregon	228	1,577,875	1,185	566	......	13	242,154	1,294,703	36,639
38	Pennsylvania	2,827	21,418,588	21,160	14,443	8	463	2,918,459	13,378,589	576,841
39	Rhode Island	49	144,250	260	139	......	13	33,143	116,085	4,803
40	South Carolina	420	1,056,265	2,338	1,431	......	37	221,963	1,170,088	67,273
41	Tennessee	755	2,004,503	5,587	3,577	......	141	540,222	2,006,124	136,761
42	Texas	324	1,660,952	4,579	3,136	1	40	732,914	1,909,794	186,981
43	Utah	107	272,750	845	375	......	10	65,175	216,819	21,655
44	Vermont	888	3,274,250	4,501	2,411	......	100	426,953	1,030,775	82,093
45	Virginia	907	2,122,925	5,812	3,922	......	89	540,231	1,864,288	119,489
46	Washington	37	2,456,450	891	495	......	4	200,539	1,174,005	14,070
47	West Virginia	472	1,668,020	3,765	2,057	......	126	459,945	1,307,843	67,529
48	Wisconsin	704	19,824,059	14,079	7,748	250	467	2,257,218	12,219,097	252,376
49	Wyoming	7	26,700	68	38	......	......	6,380	24,725	2,625

UNITED STATES FOR THE YEAR ENDING MAY 31, 1880.

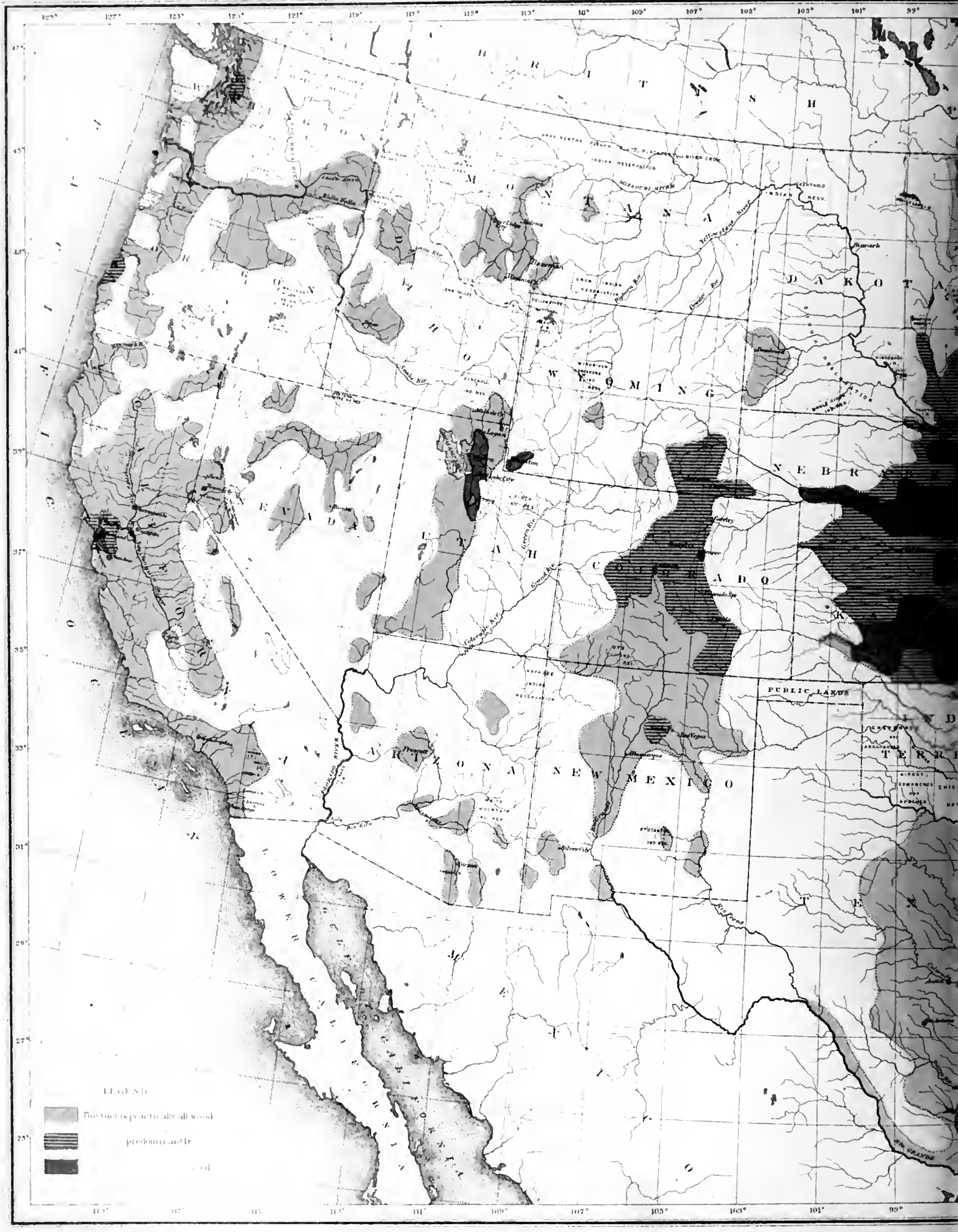
PRODUCTS.									
Lumber (board measure).	Laths.	Shingles.	Staves.	Sets of headings.	Spool and bobbin stock (board measure).	Value of all other products.	Total value of all products.	Rank according to value of products.	
1,500,000	25,000,000	75,000,000	&-400,000 000 bf.		3,000,000				
Feet.	*Number.*	*Number.*	*Number.*	*Number.*	*Feet.*	*Dollars.*	*Dollars.*		
18, 091, 356, 000	1, 761, 788, 000	5, 555, 046, 000	1, 248, 226, 000	140, 523, 000	34, 076, 000	2, 682, 668	233, 268, 729		
251, 851, 000	14, 147, 000	5, 427, 000	2, 357, 000	437, 000			2, 649, 634	23	1
									2
10, 715, 000	150, 000	1, 760, 000	300, 000			1, 010	215, 918	44	3
172, 503, 000	6, 527, 000	61, 758, 000	1, 640, 000	350, 000			1, 793, 848	29	4
304, 795, 000	2, 420, 000	138, 718, 000	2, 063, 000	1, 203, 000		3, 000	4, 428, 950	13	5
63, 792, 000	4, 925, 000	27, 214, 000				700	1, 051, 295	34	6
64, 427, 000	1, 719, 000	7, 192, 000	270, 000	12, 000	33, 000	12, 930	1, 076, 455	33	7
29, 286, 000	564, 000	4, 823, 000				500	435, 792	37	8
31, 572, 000	317, 000	506, 000	4, 510, 000	550, 000			411, 060	38	9
4, 000, 000	1, 000, 000					2, 000	50, 000	46	10
a 247, 627, 000	20, 101, 000	3, 061, 000	791, 000	110, 000		13, 999	3, 060, 291	21	11
451, 788, 000	17, 438, 000	25, 332, 000	2, 014, 000	964, 000	4, 000	3, 975	4, 875, 310	12	12
18, 204, 000	750, 000	4, 235, 000				60, 200	349, 635	40	13
b 334, 244, 000	b 25, 977, 000	b 15, 306, 000	24, 443, 000	1, 385, 000	30, 000	16, 807	5, 063, 037	11	14
915, 943, 000	28, 031, 000	26, 634, 000	283, 071, 000	26, 389, 000	1, 957, 000	145, 750	14, 260, 830	5	15
									16
c 412, 578, 000	c 79, 924, 000	c 128, 100, 000	5, 335, 000	650, 000		38, 343	6, 185, 628	9	17
45, 281, 000	25, 000	835, 000			150, 000	3, 400	682, 697	35	18
305, 684, 000	26, 856, 000	25, 253, 000	23, 148, 000	8, 174, 000	383, 000	75, 655	4, 064, 361	14	19
133, 472, 000	7, 745, 000	30, 195, 000	220, 000	33, 000		15, 470	1, 764, 640	30	20
566, 656, 000	184, 820, 000	426, 530, 000	62, 376, 000	3, 312, 000	13, 426, 000	182, 618	7, 933, 868	7	21
123, 336, 000	7, 955, 000	4, 429, 000	16, 227, 000			149, 894	1, 813, 332	28	22
d 205, 244, 000	d 16, 947, 000	d 19, 667, 000	21, 062, 000	1, 860, 000	572, 000	44, 395	3, 120, 184	20	23
4, 172, 572, 000	461, 805, 000	2, 584, 717, 000	199, 821, 000	21, 897, 000	6, 038, 000	531, 406	52, 449, 928	1	24
563, 974, 000	88, 088, 000	194, 566, 000	7, 825, 000	547, 000		21, 100	7, 366, 038	8	25
168, 747, 000	7, 908, 000	5, 355, 000	60, 000			5, 349	1, 920, 335	27	26
e 399, 744, 000	e 20, 839, 000	e 8, 832, 000	21, 426, 000	3, 363, 000		7, 097	5, 265, 617	10	27
21, 420, 000	2, 620, 000	9, 627, 000				1, 900	527, 695	36	28
13, 585, 000						1, 100	265, 062	41	29
21, 545, 000		485, 000					243, 200	42	30
292, 267, 000	49, 454, 000	67, 086, 000	31, 354, 000	3, 491, 000	3, 072, 000	58, 612	3, 842, 012	15	31
109, 679, 000	8, 948, 000	10, 717, 000	40, 000	155, 000	883, 000	40, 385	1, 627, 640	32	32
11, 195, 000	107, 000	722, 000	20, 000				173, 930	45	33
1, 184, 220, 000	79, 399, 000	305, 711, 000	62, 654, 000	22, 136, 000	1, 003, 000	285, 263	14, 356, 910	4	34
241, 822, 000	13, 340, 000	8, 707, 000	45, 000	571, 000	1, 253, 000	7, 195	2, 672, 796	22	35
910, 832, 000	50, 625, 000	24, 876, 000	214, 245, 000	25, 779, 000	25, 000	196, 788	13, 864, 460	6	36
177, 171, 000	18, 245, 000	5, 040, 000				10, 500	2, 030, 463	26	37
1, 733, 844, 000	183, 740, 000	288, 561, 000	80, 062, 000	10, 401, 000	326, 000	393, 044	22, 457, 359	2	38
8, 469, 000	10, 000	1, 986, 000	365, 000		3, 700, 000	174	240, 579	43	39
185, 772, 000	23, 133, 000	10, 036, 000	385, 000	93, 000		41, 700	2, 001, 507	25	40
302, 673, 000	21, 275, 000	14, 205, 000	4, 342, 000	570, 000	6, 000	72, 998	3, 744, 905	16	41
328, 968, 000	14, 131, 000	112, 523, 000		140, 000		10, 350	3, 673, 449	17	42
25, 709, 000	1, 583, 000	9, 293, 000				1, 765	375, 164	39	43
322, 942, 000	19, 745, 000	55, 711, 000	13, 219, 000	1, 572, 000	415, 000	2, 575	3, 258, 816	19	44
315, 939, 000	14, 402, 000	8, 223, 000	14, 333, 000	929, 000	800, 000	30, 355	3, 434, 168	18	45
160, 176, 000	6, 550, 000	3, 610, 000	23, 606, 000				1, 734, 742	31	46
180, 112, 000	12, 071, 000	3, 695, 000	41, 992, 000	1, 952, 000		40, 105	2, 431, 857	24	47
1, 542, 021, 000	215, 132, 000	862, 922, 000	82, 545, 000	7, 498, 000		152, 171	17, 952, 347	3	48
2, 960, 000	390, 000	805, 000					40, 990	47	49

a Including 77,500,000 feet manufactured from logs cut in Alabama.
b Including 73,700,000 feet lumber, 15,041,000 laths, and 11,226,000 shingles, manufactured from logs cut in Wisconsin.
c Including 334,199,000 feet lumber, 78,728,000 laths, and 127,591,000 shingles, manufactured from logs cut in Wisconsin.
d Including 20,000,000 feet lumber, 11,082,000 laths, and 860,000 shingles, manufactured from logs cut in New Hampshire and Vermont.
e Including 27,000,000 feet lumber, 12,400,000 laths, and 5,300,000 shingles, manufactured from logs cut in Wisconsin.

In the following table the average importance of the saw-mills located in the different states and territories is shown:

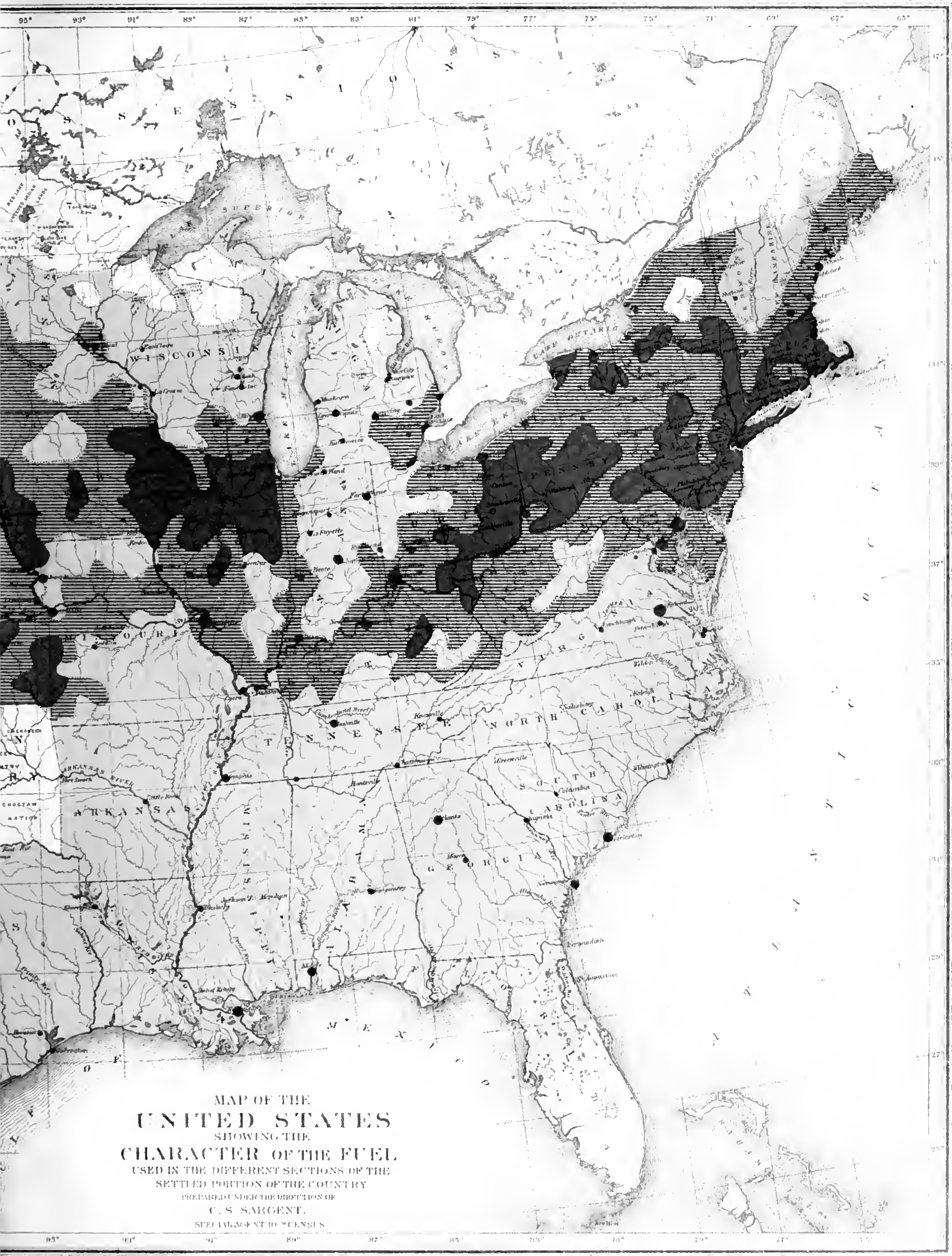
AVERAGE SIZE AND PRODUCT OF SAW-MILLS IN EACH STATE AND TERRITORY OF THE UNITED STATES.

States and Territories.	Total number of establishments.	Capital.	NUMBER OF HANDS EMPLOYED. Maximum at any one time in the year.	Average.	MATERIALS AND LABOR. Value of logs.	Value of mill supplies.	Wages paid during the year.	PRODUCTS. Lumber (board measure).	Laths.	Shingles.	Staves.	Sets of headings.	Spool and bobbin stock.	Value of other products.	Total value of all products.
		Dolls.			Dolls.	Dolls.	Dolls.	Feet.	No.	No.	No.	No.	Feet.	Dolls.	Dolls.
The United States	25,708	7,048	8.8	5.8	5,436	246	1,235	703,000	68,000	216,000	48,000	5,700	1,800	104	9,078
Alabama	354	4,366	7.9	4.0	4,288	256	1,198	712,000	40,000	15,000	6,000	1,000	...	...	7,485
Alaska	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Arizona	13	7,880	9.7	6.0	9,720	408	2,507	824,000	11,000	136,000	23,000	...	...	77	16,600
Arkansas	319	3,347	9.0	5.5	3,166	190	744	541,000	20,000	194,000	5,000	1,000	...	...	5,623
California	251	25,716	19.7	13.7	8,100	744	4,365	1,214,000	10,000	553,000	8,000	5,000	...	12	17,645
Colorado	96	5,013	16.6	9.0	6,808	476	1,176	664,000	51,000	283,000	...	...	...	7	10,951
Connecticut	300	2,119	4.0	2.0	2,030	108	594	215,000	6,000	24,000	1,000	...	...	43	850
Dakota	39	2,917	11.6	7.5	6,003	324	1,410	751,000	15,000	124,000	...	...	...	13	11,174
Delaware	86	3,015	7.5	4.5	2,672	158	473	367,000	4,000	6,000	52,000	6,000	...	...	4,780
District of Columbia	1	25,000	35.0	25.0	32,000	2,000	6,000	4,000,000	1,000,000	...	...	...	...	2,000	50,000
Florida	135	16,441	24.0	15.0	13,064	768	4,165	1,834,000	150,000	23,000	6,000	1,000	...	104	22,668
Georgia	655	4,735	7.5	5.0	4,655	225	845	690,000	27,000	39,000	3,000	1,000	...	6	7,443
Idaho	48	4,000	6.5	3.6	4,452	352	700	380,000	16,000	88,000	...	...	...	1,254	9,340
Illinois	640	5,149	9.0	6.0	4,624	290	1,230	522,000	40,000	24,000	38,000	2,000	...	26	7,911
Indiana	2,022	3,485	8.0	5.0	4,600	166	777	453,000	14,000	13,000	140,000	13,000	...	72	7,052
Indian territory	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Iowa	328	15,080	12.6	9.0	12,267	360	2,513	1,258,000	244,000	390,000	16,000	2,000	...	117	19,000
Kansas	146	1,801	5.7	3.5	2,888	176	457	310,000	40,000	6,000	...	...	...	28	4,700
Kentucky	670	3,418	7.7	3.8	3,341	256	1,003	456,000	40,000	37,000	34,000	12,000	...	113	6,066
Louisiana	175	5,165	8.6	5.6	6,321	462	1,143	762,000	44,000	170,000	1,000	...	...	88	10,083
Maine	848	7,475	11.6	7.8	5,607	232	1,369	668,000	218,000	503,000	73,000	4,000	...	215	9,356
Maryland	369	3,354	4.8	3.0	2,823	176	606	334,000	21,000	12,000	44,000	...	...	406	4,914
Massachusetts	606	4,093	5.0	3.0	3,015	126	712	338,000	28,000	32,000	35,000	3,000	...	73	5,149
Michigan	1,640	23,808	18.7	14.7	18,700	868	4,225	2,530,000	280,000	1,568,000	121,000	13,000	...	322	31,867
Minnesota	234	28,936	16.0	12.0	18,839	515	3,950	2,410,000	376,000	831,000	33,000	2,000	...	90	31,478
Mississippi	295	3,127	7.0	4.0	4,037	95	671	572,000	27,000	18,000	...	...	...	18	6,569
Missouri	881	3,255	7.6	4.0	3,534	116	760	453,000	23,000	10,600	24,000	4,000	...	8	6,000
Montana	36	5,783	11.0	4.0	7,148	577	1,332	595,000	73,000	267,000	...	...	...	53	14,658
Nebraska	38	2,457	8.0	3.7	4,048	290	771	357,000	...	...	...	...	...	20	6,975
Nevada	9	14,666	7.0	4.0	16,865	1,224	1,099	2,394,000	...	54,000	...	...	...	...	27,022
New Hampshire	680	5,508	7.0	4.5	3,175	167	806	429,000	73,000	98,000	46,000	5,000	...	86	5,650
New Jersey	284	5,836	3.7	2.7	3,319	160	633	386,000	31,000	38,000	...	...	...	142	5,731
New Mexico	26	2,870	10.8	6.7	3,851	650	932	430,000	4,000	27,000	...	...	...	...	6,690
New York	2,822	4,688	6.0	4.0	3,057	173	766	419,000	28,000	108,000	22,000	8,000	...	101	5,087
North Carolina	776	2,246	7.0	4.0	1,921	111	570	311,000	17,000	11,000	...	...	...	9	3,445
Ohio	2,352	3,378	6.5	4.0	3,658	124	726	387,000	21,000	10,000	91,000	11,000	...	83	5,895
Oregon	228	6,920	5.0	2.5	5,678	160	1,062	777,000	80,000	2,000	...	...	...	46	8,905
Pennsylvania	2,827	7,576	7.5	5.0	4,732	204	1,032	613,000	65,000	102,000	28,000	3,000	...	139	7,944
Rhode Island	49	2,944	5.0	3.0	2,369	08	676	172,000	...	40,000	7,000	...	...	3	4,909
South Carolina	420	2,515	5.5	3.5	2,785	160	528	442,000	55,000	24,000	...	...	...	99	4,837
Tennessee	755	2,655	7.0	5.0	2,657	181	727	400,000	28,000	18,000	5,000	...	...	96	4,960
Texas	324	5,126	14.0	9.8	5,894	577	2,262	1,015,000	43,000	347,000	...	...	...	32	11,338
Utah	107	2,549	7.9	3.5	2,024	202	609	240,000	14,000	87,000	...	...	...	16	3,506
Vermont	688	4,759	6.5	3.6	2,819	119	620	469,000	28,000	80,000	10,000	2,000	...	3	4,736
Virginia	907	2,340	6.0	4.0	2,055	131	505	348,000	16,000	9,000	15,000	1,000	...	33	3,786
Washington	37	66,390	24.0	13.5	31,730	380	5,420	4,320,000	177,000	97,000	630,000	...	...	...	46,885
West Virginia	472	3,535	8.0	4.0	2,770	143	974	381,000	25,000	8,000	89,000	4,000	...	85	5,[illegible]52
Wisconsin	704	28,150	20.0	12.0	17,356	358	3,200	2,100,000	305,000	1,226,000	117,000	10,000	...	216	25,500
Wyoming	7	3,811	9.7	5.5	3,532	375	911	423,000	43,000	123,000	...	...	...	...	5,855



MONTANA
DAKOTA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
PUBLIC LANDS
Missouri River
Yellowstone River
Colorado River
LEGEND
The fuel is practically all wood
predominantly

4882


MAP OF THE
UNITED STATES
SHOWING THE
CHARACTER OF THE FUEL
USED IN THE DIFFERENT SECTIONS OF THE
SETTLED PORTION OF THE COUNTRY
PREPARED UNDER THE DIRECTION OF
C. S. SARGENT,
SPECIAL AGENT 10TH CENSUS
LAKE ONTARIO
WISCONSIN
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ARKANSAS
Julius Bien & Co. lith

Michigan is the greatest lumber-producing state in the Union. The value of its lumber product, with that of Wisconsin and Minnesota, exceeds one-third of the total value of all the lumber manufactured in the United States. This enormous development of the lumber business in the lake region is due to the excellence of its forests, the natural advantages of the country for manufacturing lumber, and the easy communication between these forests and the treeless agricultural region west of the Mississippi river.

The extinction of the forests of the lake region may be expected to seriously affect the growth of population in the central portion of the continent. The country between the Mississippi river and the Rocky mountains, now largely supplied with lumber from Michigan, Wisconsin, and Minnesota, must for building material soon depend upon the more remote pine forests of the Gulf region or those of the Pacific coast. A great development in the now comparatively unimportant lumber-manufacturing interests in these regions may therefore be expected. New centers of distribution must soon supplant Chicago as a lumber market, and new transportation routes take the place of those built to move the pine grown upon the shores of the great lakes. It is not probable, however, that any one point will ever attain the importance now possessed by Chicago as a center for lumber distribution. With the growth of the railroad system and the absence of good water communication from the great forests remaining in the country toward the center of the continent, lumber will be more generally shipped direct by rail from the mills to the consumer than in the past. In this way the pine of Mississippi, Louisiana, and Arkansas will reach Kansas, Nebraska, and the whole country now tributary to Chicago. Western Texas and northern Mexico will be supplied by rail with the pine of eastern Texas, and the prairies of Minnesota and Dakota must draw their lumber by rail, not as at present from the pine forests covering the shores of lake Superior, but from the fir and redwood forests of the Pacific coast.

FUEL.

The following table represents the consumption of forest products as fuel during the census year. The estimates of the amount and value of the wood used for domestic fuel are based upon answers to letters of inquiry addressed to persons living in every town in the United States. The average amount and value of the wood used by a family of five persons, taken as a unit, is multiplied by the number of families in each state using wood for fuel, and the result thus obtained is taken as the total state consumption:

WOOD USED AS FUEL FOR VARIOUS PURPOSES.

Use.	Cords.	Value.	Use.	Cords.	Value.
For domestic purposes as below	140, 537, 439	$306, 950, 040	In the manufacture of brick and tile	1, 157, 522	$3, 978, 331
By railroads	1, 971, 813	5, 126, 714	In the manufacture of salt	540, 448	121, 681
By steamboats	787, 862	1, 812, 083	In the manufacture of wool	158, 208	425, 239
In mining and amalgamating the precious metals	358, 074	2, 874, 503	Total	145, 778, 137	321, 962, 373
In other mining operations	266, 771	673, 692			

ESTIMATED CONSUMPTION OF WOOD FOR DOMESTIC PURPOSES.

Number of persons using wood for domestic fuel, 32,375,074.

States and Territories.	Cords.	Value.	States and Territories.	Cords.	Value.	States and Territories.	Cords.	Value.
Alabama	6, 076, 754	$8, 727, 377	Kansas	2, 095, 439	$7, 328, 723	North Carolina	7, 434, 690	$9, 019, 569
Alaska			Kentucky	7, 094, 813	13, 313, 220	Ohio	8, 191, 543	16, 492, 574
Arizona	170, 017	724, 572	Louisiana	1, 944, 858	4, 607, 415	Oregon	482, 254	1, 254, 511
Arkansas	3, 922, 400	5, 095, 821	Maine (a)	1, 215, 881	4, 078, 137	Pennsylvania	7, 361, 992	15, 067, 651
California	1, 748, 062	7, 693, 731	Maryland	1, 152, 910	3, 170, 941	Rhode Island	154, 053	706, 011
Colorado	426, 719	1, 638, 783	Massachusetts (a)	890, 041	4, 613, 263	South Carolina	3, 670, 959	11, 505, 997
Connecticut	525, 639	2, 371, 532	Michigan	7, 838, 904	13, 197, 240	Tennessee	8, 084, 611	10, 674, 722
Dakota	422, 918	3, 028, 300	Minnesota	1, 669, 568	5, 873, 421	Texas	4, 883, 852	10, 177, 311
Delaware	177, 306	751, 311	Mississippi	5, 090, 758	7, 145, 110	Utah	171, 923	418, 289
District of Columbia	26, 902	80, 706	Missouri	4, 016, 373	8, 633, 465	Vermont	782, 338	2, 509, 189
Florida	669, 046	1, 230, 412	Montana	119, 947	460, 638	Virginia	5, 410, 112	10, 404, 134
Georgia	5, 910, 045	8, 279, 245	Nebraska	908, 188	3, 859, 843	Washington	184, 226	499, 904
Idaho	99, 910	383, 686	Nevada	155, 276	972, 712	West Virginia	2, 241, 069	3, 374, 701
Illinois	5, 200, 104	14, 136, 662	New Hampshire	567, 719	1, 964, 669	Wisconsin	7, 206, 126	11, 863, 739
Indiana	7, 059, 874	13, 334, 729	New Jersey	642, 598	2, 787, 216	Wyoming	40, 213	224, 848
Indian territory			New Mexico	169, 946	1, 063, 360	Total	140, 537, 439	306, 950, 040
Iowa	4, 090, 649	14, 611, 280	New York	11, 290, 975	37, 599, 364			

a Including a small amount imported from Canada.

CONSUMPTION OF CHARCOAL.

Domestic and manufacturing purposes.	Bushels.	Value.
In the twenty largest cities	4, 319, 194	$521, 316
In the manufacture of iron	69, 592, 091	4, 726, 114
In the production of precious metals	97, 687	29, 306
Total	74, 008, 972	5, 270, 736

The forests of the United States, in spite of the great and increasing drains made upon them, are capable of yielding annually for many years longer a larger amount of material than has yet been drawn from them, even with our present reckless methods of forest management. The great pine forest of the north has already, it is true, suffered fatal inroads. The pine which once covered New England and New York has already disappeared. Pennsylvania is nearly stripped of her pine, which once appeared inexhaustible. The great northwestern pineries are not yet exhausted, and with newly-introduced methods, by which logs once supposed inaccessible are now profitably brought to the mills, they may be expected to increase the volume of their annual product for a few years longer in response to the growing demands of the great agricultural population fast covering the treeless midcontinental plateau. The area of pine forest, however, remaining in the great pine-producing states of Michigan, Wisconsin, and Minnesota is dangerously small in proportion to the country's consumption of white pine lumber, and the entire exhaustion of these forests in a comparatively short time is certain. The wide areas now covered in New England by a vigorous second growth of white pine, although insignificant in extent and productiveness in comparison with the forests it replaces, must not be overlooked in considering the pine supply of the country. These new forests, yielding already between two and three hundred million feet of lumber annually, are capable of great future development.

The pine belt of the south Atlantic region still contains immense quantities of timber unequaled for all purposes of construction, although unsuited to take the place of the white pine of the north. The southern pine forests, although stripped from the banks of streams flowing into the Atlantic, are practically untouched in the Gulf states, especially in those bordering the Mississippi river. These forests contain sufficient material to long supply all possible demands which can be made upon them.

The hard-wood forests of the Mississippi basin are still, in certain regions at least, important, although the best walnut, ash, cherry, and yellow poplar have been largely culled. Two great bodies of hard-wood timber, however, remain, upon which comparatively slight inroads have yet been made. The most important of these forests covers the region occupied by the southern Alleghany Mountain system, embracing southwestern Virginia, West Virginia, western North and South Carolina, and eastern Kentucky and Tennessee. Here oak unequaled in quality abounds. Walnut is still not rare, although not found in any very large continuous bodies, and cherry, yellow poplar, and other woods of commercial importance are common. The second great body of hard wood, largely oak, is found west of the Mississippi river, extending from central Missouri to western Louisiana. The forests of Michigan, especially those of the northern peninsula, still abound in considerable bodies of hard wood, principally maple. Throughout the remainder of the Atlantic region the hard-wood forests, although often covering considerable areas, have everywhere lost their best timber, and are either entirely insufficient to supply the local demand of the present population, or must soon become so.

In the Pacific region the great forests of fir which extend along the coast region of Washington territory and Oregon are still practically intact. Fire and the ax have scarcely made a perceptible impression upon this magnificent accumulation of timber. Great forests of pine still cover the California sierras through nearly their entire extent; the redwood forest of the coast, however, once, all things considered, the most important and valuable body of timber in the United States, has already suffered seriously, and many of its best and most accessible trees have been removed. This forest still contains a large amount of timber, although its extent and productive capacity has been generally exaggerated. The demand for redwood, the only real substitute for white pine produced in the forests of the United States, is rapidly increasing, and even at the present rate of consumption the commercial importance of this forest must soon disappear.

The pine forests which cover the western slopes of the northern Rocky mountains and those occupying the high plateau and inaccessible mountain ranges of central Arizona and southwestern New Mexico have not yet suffered serious damage at the hands of man. The remaining forests of the Pacific region, of little beyond local importance, are fast disappearing. The area of these interior forests is diminished every year by fire and by the demands of a careless and indifferent population; and their complete extermination is probably inevitable.

The forest wealth of the country is still undoubtedly enormous. Great as it is, however, it is not inexhaustible, and the forests of the United States, in spite of their extent, variety, and richness, in spite of the fact that the climatic conditions of a large portion of the country are peculiarly favorable to the development of forest growth, cannot always continue productive if the simplest laws of nature governing their growth are totally disregarded.

The judicious cutting of a forest in a climate like that of the Atlantic or Pacific Coast regions entails no serious or permanent loss. A crop ready for the harvest is gathered for the benefit of the community; trees which have reached their prime are cut instead of being allowed to perish naturally, and others take their place. The permanence of the forest in regions better suited for the growth of trees than for general agriculture may thus be insured. Two causes, however, are constantly at work destroying the permanence of the forests of the country and threatening their total extermination as sources of national prosperity—fire and browsing animals inflict greater permanent injury upon the forests of the country than the ax, recklessly and wastefully as it is generally used against them.

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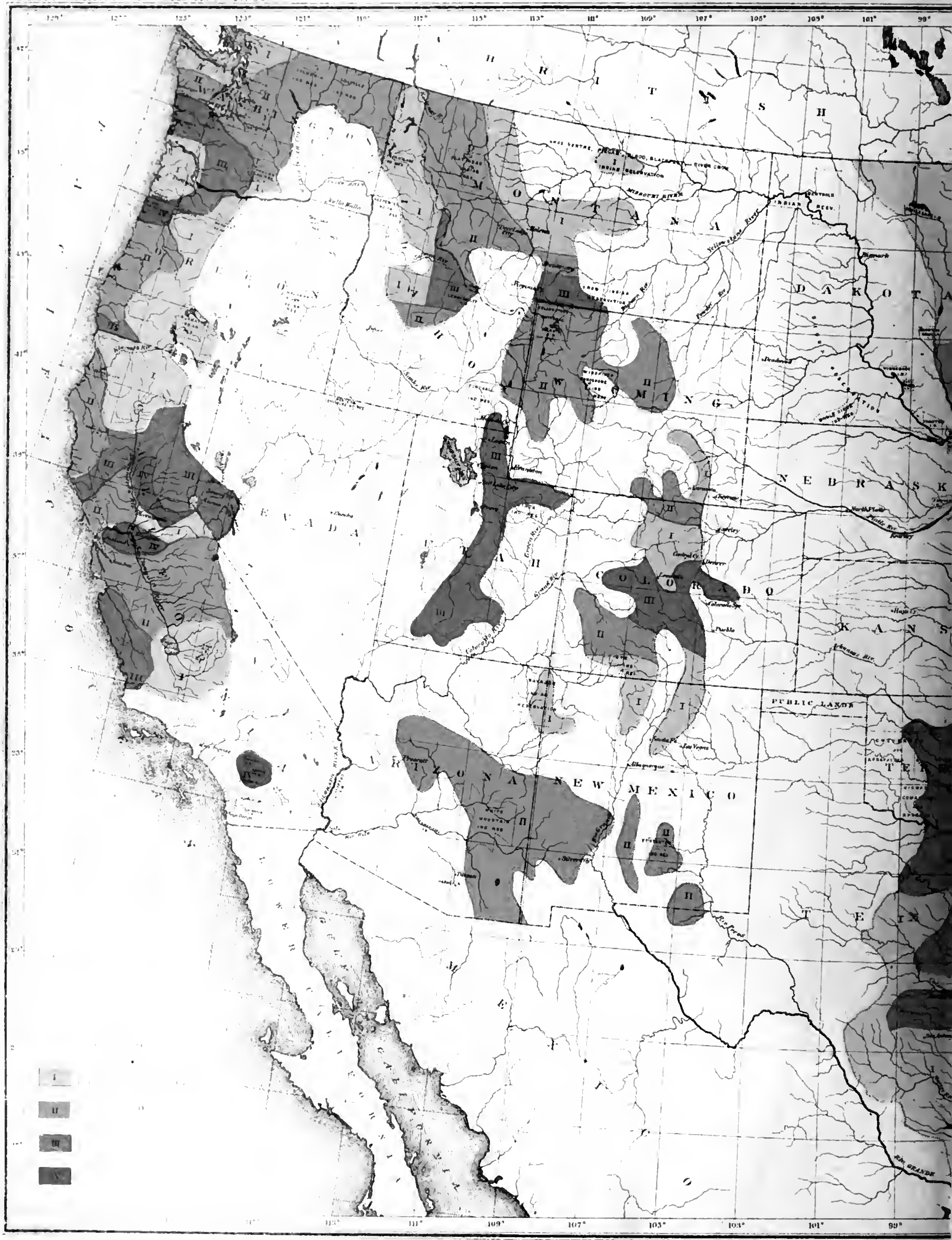
DEPARTMENT OF THE INTERIOR



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MAP OF THE
UNITED STATES
SHOWING THE PROPORTION OF WOODLAND WITHIN THE SETTLED AREA, BURNED OVER DURING THE CENSUS YEAR
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT

Julius Bien & Co. lith

600 Miles.

FOREST FIRES.

The extent of the loss which the country sustains every year from injury to woodlands by fire is enormous. An attempt was made to obtain, by means of circulars of inquiry addressed to enumerators of the census and other persons living in every town of the United States, some estimate of the actual destruction of forest material in this way. More than 30,000 of these circulars were sent out. The information obtained, often vague and unsatisfactory, after a most critical examination, in which all doubtful or contradictory returns were entirely thrown out, is presented in the following table and accompanying map. It must be borne in mind that estimates based upon information obtained in this manner are liable to very considerable error, and due allowance must therefore be made for inaccurate or incomplete returns. Many towns, and even counties, in which forest fires are known to have occurred during the year 1880, made no returns whatever, and the returns of other counties were excluded. It is therefore fair, perhaps, to assume that the following table, inaccurate and unsatisfactory as it no doubt is in many respects, at least does not exaggerate the annual loss inflicted upon the country by forest fires:

TABLE OF FOREST FIRES OCCURRING DURING THE CENSUS YEAR.

States and Territories.	Areas burned, in acres.	Value of property destroyed.	CAUSES OF FIRE.															
			Improving pasturage.	Clearing land.	Locomotives.	Hunters.	Camp fires.	Smokers.	Malice.	Prairie fires.	Coal pits.	Lightning.	Indians.	Prospectors.	Travelers.	Spontaneous combustion.	Wood cutters.	Carelessness.
The United States	10,274,089	$25,462,250	197	1,152	508	628	72	35	262	12	0	32	56	10	2	2	3	3
Alabama	569,160	121,225	34	16	4	20	3											
Alaska																		
Arizona	10,240	56,000					3		2				2					
Arkansas	858,115	259,470		27		20						1						
California	356,815	440,750		9		23	28		5				4					
Colorado	113,820	935,500				7	10		1				5	2	2			
Connecticut																		
Dakota			4		2	2			1									
Delaware	3,305	15,675		6	6				2									
District of Columbia																		
Florida	105,320	69,900	11	2		2			3									
Georgia	705,351	167,620	21	15	2	16												
Idaho	21,000	202,000				3						2	10	6				
Illinois	48,691	45,775		20		27	12		3									
Indiana	90,427	130,335		52	20	23			4									
Indian territory	1,000																	
Iowa	11,017	45,470		26	5	8				7								
Kansas	7,080	14,700			1		3		1	5								
Kentucky	556,647	237,635		51	12	33			10									
Louisiana	64,410	6,800	2	2		2												
Maine	35,230	123,315		39	14	20			3									
Maryland	41,076	37,425		31	16	14			5									
Massachusetts	13,899	102,262		40	52	37		19	8		3							
Michigan	238,271	985,985		161	43	59		3					1					
Minnesota	250,805	1,395,110		40	13	14			9				8					
Mississippi	222,800	78,505	12	8	1	17			1									
Missouri	783,646	294,865	27	14	10	29		1	10									
Montana	88,020	1,128,000			1	1		1					1	1				
Nebraska																		
Nevada	8,710	19,000				3							3					
New Hampshire	5,954	63,610		7	12	6		1	1									
New Jersey	71,074	252,240		7	28	6			7		6							
New Mexico	64,034	142,075		37	1	2			2				3			2		
New York	140,491	1,210,785		37	43	22												
North Carolina	546,102	357,980		115	11	34	10	4	25			22						
Ohio	74,114	797,170		94	27	57		3	11									
Oregon	132,320	503,850		7		12			4				4					
Pennsylvania	685,738	3,043,723		129	133	17			102									
Rhode Island																		
South Carolina	431,750	291,225	22	17	1	25						2						

TABLE OF FOREST FIRES OCCURRING DURING THE CENSUS YEAR—Continued.

States and Territories.	Areas burned, in acres.	Value of property destroyed.	CAUSES OF FIRE.															
			Improving pasturage.	Clearing land.	Locomotives.	Hunters.	Camp fires.	Smokers.	Malice.	Prairie fires.	Coal pits.	Lightning.	Indians.	Prospectors.	Travelers.	Spontaneous combustion.	Wood cutters.	Carelessness.
Tennessee	985,430	$5,254,980	19	19	6	14	......	1	14	......	......	......	......	......	......	......	......	......
Texas	599,359	273,990	19	3	......	7	......	2	16	......	......	4	......	......	......	......	......	......
Utah	42,865	1,042,800	......	......	......	......	3	......	......	......	......	......	4	......	......	......	3	3
Vermont	3,941	48,466	......	10	5	2	......	......	1	......	......	......	......	......	......	......	......	......
Virginia	272,319	320,944	......	26	13	12	......	......	......	......	......	......	......	......	......	......	......	......
Washington	37,910	713,200	......	5	......	3	......	......	2	......	......	1	8	......	......	......	......	......
West Virginia	476,775	155,280	6	22	7	13	......	......	6	......	......	......	......	......	......	......	......	......
Wisconsin	406,208	725,610	20	58	12	15	......	......	3	......	......	......	......	......	......	......	......	......
Wyoming	83,780	3,255,000	......	......	......	1	......	......	......	......	......	......	3	1	......	......	......	......

The largest number of these fires of any one class was traced to farmers clearing land and allowing their brush fires to escape into the forest. The carelessness of hunters in leaving fires to burn in abandoned camps, next to farmers, was the cause of the greatest injury. The railroads were responsible, too, for serious damage to the forest from fires set by sparks from locomotives, while the intentional burning of herbage in the forest to improve pasturage often caused serious destruction of timber.

Only the value of the material actually destroyed by fire is included in these estimates. The loss of timber by fire, great as it is, is insignificant in comparison with the damage inflicted upon the soil itself, or with the influence of fire upon subsequent forest growth. If a forest is destroyed by fire all trees, old and young, giants ready for the ax, and germinating seedlings—the embryo forests of succeeding centuries—are swept away. Undergrowth essential to protect the early growth of trees, the roots of perennial herbage, and the seeds of all plants are consumed. The fertility, or rather the ability of the burned soil to produce again spontaneously a similar crop of trees to the one destroyed, is lost, and the subsequent recovering of burned land with the species of the original forest is only accomplished, if accomplished at all, through the restoration of fertility following the slow growth and decay of many generations of less valuable plants. A northern pine and spruce forest when destroyed by fire is succeeded by a growth of brambles, in time replaced by dwarf birch, poplar, and bird cherries, of no economic value; scrub oaks and various hard woods follow these, and pine rarely reappears except upon land long mellowed in the various operations of agriculture.

In the south Atlantic region a gradual change in the composition of the pine forests is steadily going on under the influence of fire. Less valuable species now occupy the ground once covered with forests of the long-leaved pine, through which annual fires have been allowed to run to improve the scanty pasturage they afford. Stockmen have been benefited at the expense of the permanency of the forest. Fire, too, changes the composition of the broad-leaved forests of the Atlantic region, although its influence is here less marked than upon forests of conifers, which, unlike deciduous trees, rarely grow from stump shoots, and must depend entirely upon the germination of seeds for their reproduction. Still, in regions continually burned over during a long period of time and then covered again with forests, as is the case in some portions of Kentucky and Tennessee, valuable species, like the white oak and the yellow poplar, are rare or entirely wanting in the new forest growth.

The forests of the north Pacific coast offer an exception to the law, otherwise general, for this continent at least, that a change of forest crop follows a forest fire. The fir forests of western Washington territory and Oregon when destroyed by fire are quickly replaced by a vigorous growth of the same species, and the fires which have consumed great bodies of the California redwood have not prevented the reproduction of this species by seeds and shoots. In the interior Pacific region forests destroyed by fire either do not reproduce themselves, or when, under exceptionally favorable climatic conditions, a growth of trees recovers the burned surface, poplars and scrub pines replace the more valuable species of the original forest.

The damage inflicted upon the permanency of the forests of the country by browsing animals is only surpassed by the injury which they receive from fire.

The custom of turning domestic animals into the forest to pick up a scanty and precarious living, common in all parts of the country, is universal in the southern and central portions of the Atlantic region and in California. Sheep, cattle, and horses devour immense quantities of seedling trees, the future forests of the country. They bark the trunks and destroy the vigor and often the life of larger trees. Hogs root up young pines and other plants to feed upon their succulent roots, and devour the edible fruit of many trees. In this way not only is the permanence of the forest endangered, but in the case of deciduous forests their composition is often seriously affected. Species with thin-shelled edible seeds, pines, white oaks, chestnuts, and beeches, are unable to hold their own against species with bitter or unpalatable fruit, on account of the excessive destruction of their seeds by hogs and other animals.

In the central portions of the Atlantic region the general replacement of the sweet-fruited valuable white oaks in the young forest growth by the less valuable bitter-fruited black oaks is noticeable, and seriously endangers the future value of the forests of this whole region. The damage inflicted upon the California mountain forests by sheep is immense; they threaten the complete extermination of these noble forests, and with them the entire agricultural resources of the state.

The pasturage of the forest is not only enormously expensive in the destruction of young plants and seeds, but this habit induces the burning over every year of great tracts of woodland, which would otherwise be permitted to grow up naturally, in order to hasten the early growth of spring herbage. Such fires, especially in the open pine forests of the south, do not necessarily consume the old trees. All undergrowth and seedlings are swept away, however, and not infrequently fires thus started destroy valuable bodies of timber. This is especially true, also, in the coniferous forests of the Pacific region.

The railroads of the country, using in the construction and maintenance of their permanent ways vast quantities of timber, inflict far greater injury upon the forests than is represented by the consumption of material. Railway ties, except in California, are almost invariably cut from vigorous young trees from 10 to 12 inches in diameter; that is, from trees which twenty or thirty years ago escaped destruction by fire or browsing animals, and which, if allowed to grow, would at the end of fifty or one hundred years longer afford immense quantities of valuable timber. The railroads of the United States, old and new, consume every year not far from 60,000,000 ties; the quantity of lumber in 60,000,000 ties is comparatively not very great, and would hardly be missed from our forests; but the destruction of 30,000,000 vigorous, healthy young trees, supposing that an average of two ties is cut from each tree, is a serious drain upon the forest wealth of the country and should cause grave apprehensions for the future, especially in view of the fact that in every part of the country there are now growing fewer seedling trees of species valuable for railway ties than when the trees now cut for this purpose first started.

The condition of the forests of Maine is interesting. They show that forest preservation is perfectly practicable, in the Atlantic region at least, when the importance of the forest to the community is paramount. The prosperity of this state, born of the broad forests of pine and spruce which once covered it almost uninterruptedly, was threatened by the prospective exhaustion of these forests, in danger of extermination by fire and the ill-regulated operations of the lumbermen. The very existence of the state depended upon the maintenance of the forest. The great forests of pine could not be restored, but the preservation of the few remnants of these forests was not impossible. Fires do not consume forests upon which a whole community is dependent for support, and methods for securing the continuance of such forests are soon found and readily put into execution. The forests of Maine, once considered practically exhausted, still yield largely and continuously, and the public sentiment which has made possible their protection is the one hopeful symptom in the whole country that a change of feeling in regard to forest property is gradually taking place. The experience of Maine shows that where climatic conditions are favorable to forest growth the remnants of the original forest can be preserved and new forests created as soon as the entire community finds forest preservation really essential to its material prosperity.

The production of lumber is not, however, the only function of forests; and the future extent and condition of those of the United States cannot, in every case, be safely regulated by the general law which governs the volume of other crops by the demand for them. Forests perform other and more important duties in protecting the surface of the ground and in regulating and maintaining the flow of rivers. In mountainous regions they are essential to prevent destructive torrents, and mountains cannot be stripped of their forest covering without entailing serious dangers upon the whole community. Such mountain forests exist in the United States. In northern Vermont and New Hampshire they guard the upper waters of the Connecticut and the Merrimac; in New York they insure the constant flow of the Hudson. Such forests still cover the upper slopes of the Alleghany mountains and diminish the danger of destructive floods in the valleys of the Susquehanna and the Ohio. Forests still cover the upper water-sheds of the Missouri and the Columbia, the Platte and the Rio Grande, and preserve the California valleys from burial under the *débris* of the sierras. The great mountain forests of the country still exist, often almost in their original condition. Their inaccessibility has preserved them; it cannot preserve them, however, much longer. Inroads have already been made into these forests; the ax, fire, and the destructive agency of browsing animals are now everywhere invading them. Their destruction does not mean a loss of material alone, which sooner or later can be replaced from other parts of the country; it means the ruin of great rivers for navigation and irrigation, the destruction of cities located along their banks, and the spoliation of broad areas of the richest agricultural land. These mountain forests once destroyed can only be renewed slowly and at enormous cost, and the dangers, actual and prospective, which threaten them now offer the only real cause for general alarm to be found in the present condition of the forests of the United States. Other forests may be swept away and the country will experience nothing more serious than a loss of material, which can be produced again if the price of lumber warrants the cultivation of trees as a commercial enterprise; but if the forests which control the flow of the great rivers of the country perish, the whole community will suffer widespread calamity which no precautions taken after the mischief has been done can avert or future expenditure prevent.

NORTH ATLANTIC DIVISION.

MAINE.

The forests of the Northern Pine Belt once extended over the state of Maine. Pine and spruce, with which were mingled maple, birch, and other deciduous trees, covered the entire state, with the exception of the immediate coast region between the Kennebec and the Penobscot rivers, a region of hard-wood forest; hemlock was common.

The original pine and spruce forests of the state have been practically destroyed. Pine has been cut in every township, and the largest spruce everywhere culled, except from the inaccessible region about the headwaters of the Allaguash river. Scattered bodies of the original pine, often of considerable extent and generally connected with farms, exist in the southern, and especially in the southeastern, counties, and fine hemlock of large size is still an important element of the forest in the central and southern portions of the region west of the Penobscot river. Birch, maple, and oak, too heavy for transport by raft, are still common, except in the neighborhood of manufacturing centers and the lines of railroad. Hard-wood timber is particularly fine and abundant through the central portion of the state; farther north the forest is more generally composed of coniferous trees.

The lumber business of southern and central Maine attained its greatest importance as early as 1850. In that year spruce was for the first time driven down the Kennebec with pine, and the proportion of spruce to pine has since steadily increased, until, in the season of 1879-'80, only 20 per cent. of the lumber cut on that river was pine. The lowest point of productive capacity of the forests of Maine has probably been passed. The reckless disregard of forest property which characterized the early lumbering operations of the state has been replaced by sensible methods for preserving and perpetuating the forest. This change in public sentiment in regard to the forests has followed naturally the exhaustion of the forest wealth of the state. As this disappeared the importance of preserving some part, at least, of the tree covering, the source of the state's greatest prosperity, forced itself upon public attention; for unless the forests could be perpetuated, the state must lose forever all commercial and industrial importance. It has followed that the forests of Maine, as compared with those in other parts of the country, are now managed sensibly and economically. They are protected from fire principally through the force of public sentiment, and only trees above a certain size are allowed to be cut by loggers buying stumpage from the owners of land. In the southern counties the young pine now springing up freely on abandoned farming lands is carefully protected, and large areas are planted with pine in regions where the natural growth has not covered the soil. The coniferous forests, under the present management, may be cut over once in every fifteen or twenty years, producing at each cutting a crop of logs equivalent to 1,000 feet of lumber to the acre, of which from 5 to 7 per cent. is pine, the rest spruce.

Forest fires, which formerly inflicted every year serious damage upon the forests of the state, are now of comparatively rare occurrence. During the census year only 35,230 acres of woodland were reported destroyed by fire, with an estimated loss of $123,315. These fires were set by farmers in clearing land, by careless hunters, and by sparks from locomotives.

The following estimates of the amount of pine and spruce standing in the state May 31, 1880, were prepared by Mr. Cyrus A. Packard, of Augusta, land agent of the state. They were made up from the results of actual surveys, and have been reviewed by a large number of experts most familiar with the condition of the forests in different parts of the state:

Basin of—	Pine (*Pinus Strobus*).	Spruce (*Picea nigra*).
	Feet, board measure.	*Feet, board measure.*
Saint John river and tributaries	75, 000, 000	1, 400, 000, 000
Penobscot river and tributaries	100, 000, 000	1, 600, 000, 000
Kennebec river and tributaries	50, 000, 000	1, 000, 000, 000
Androscoggin river and tributaries	50, 000, 000	500, 000, 000
Saint Croix, Machias, Narraguagus, and Union rivers and other small streams	200, 000, 000	500, 000, 000
Total	475, 000, 000	5, 000, 000, 000
Cut for the census year ending May 31, 1880	138, 825, 000	301, 020, 000

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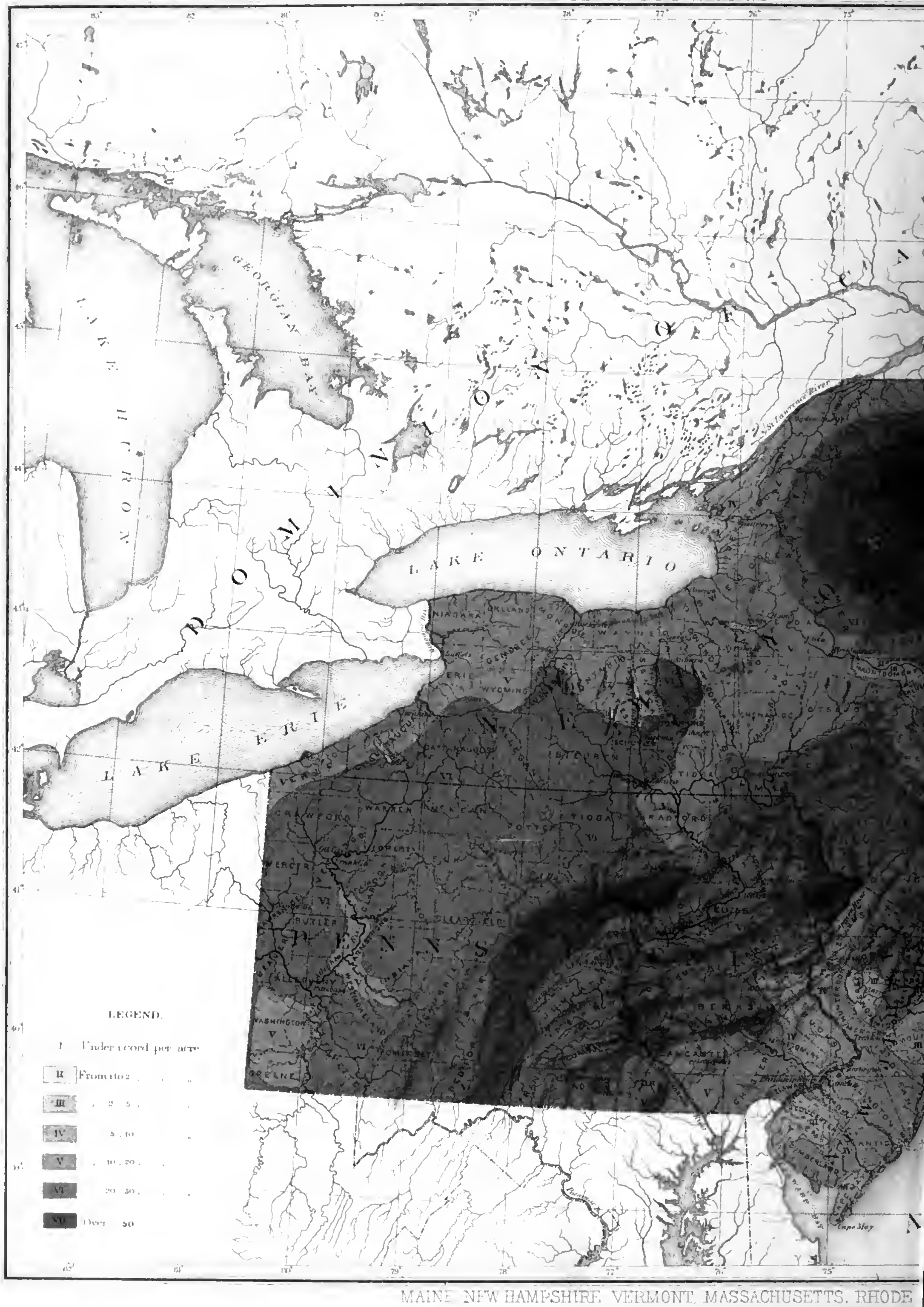
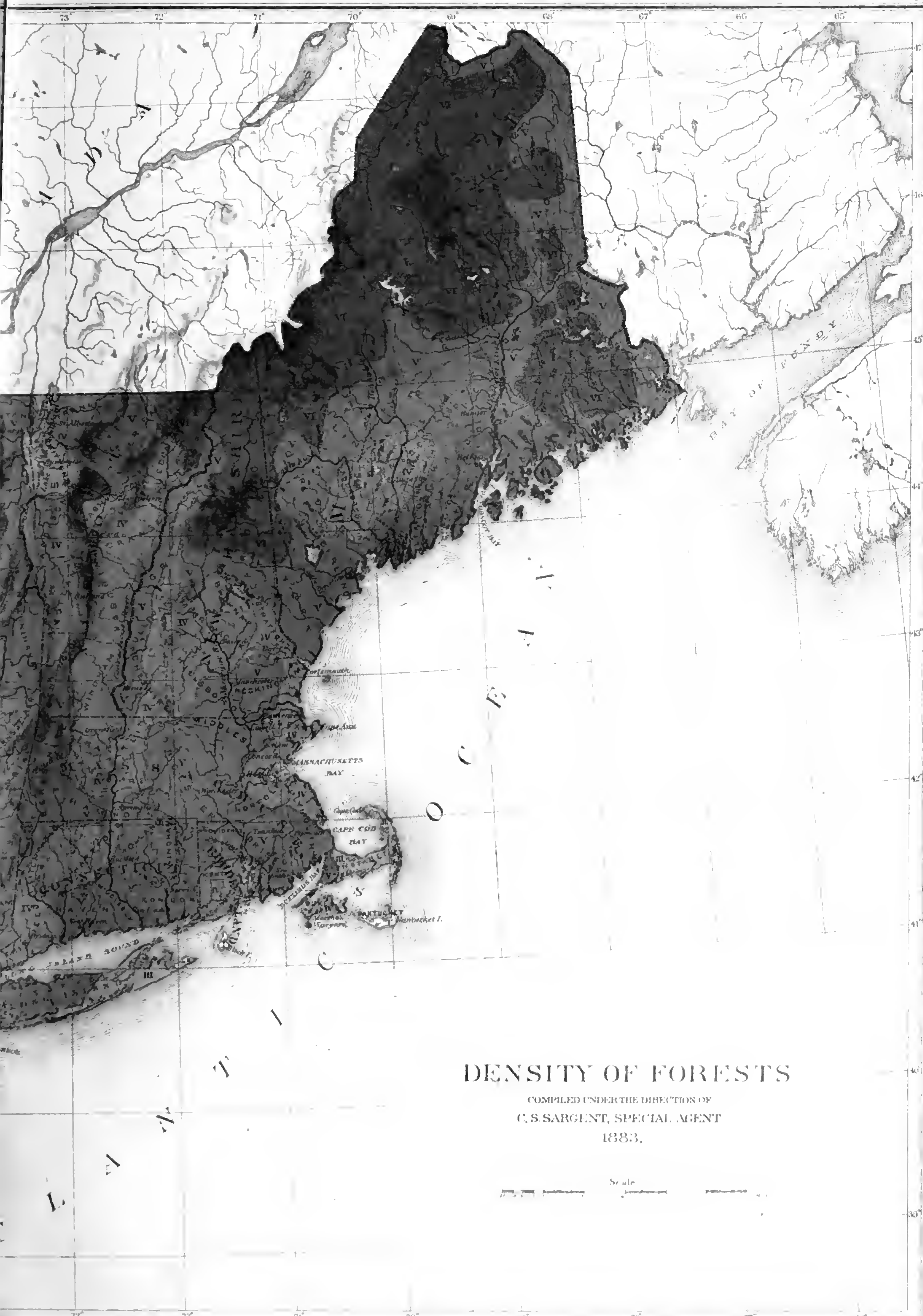


MAINE, NEW HAMPSHIRE, VERMONT, MASSACHUSETTS, RHODE



D., CONNECTICUT NEW YORK NEW JERSEY PENNSYLVANIA

Julius Bien & Co. lith

Quantities of logs cut in Aroostook county are driven down the Saint John river and manufactured in New Brunswick. During the season of 1879–'80 there were handled in this way 70,000,000 feet of spruce, 4,500,000 feet of pine, 2,800,000 feet of cedar, 1,500,000 feet of squared pine timber, 1,000,000 feet of squared birch timber, 110,000 feet of squared larch timber. Of this 70 per cent. of the spruce and 80 per cent. of the pine were returned to the United States manufactured into lumber, and the whole of the cedar in the form of shingles.

Important industries dependent for material upon a supply of hard wood have long flourished in the state. Large quantities of cooperage stock, woodenware, handles, spools, bobbins, etc., are manufactured, and more recently the production of wood pulp and excelsior, principally from poplar and other soft woods, has assumed important proportions. Manufacturers from nearly every part of the state report a deterioration and scarcity of the best timber, especially oak, which is now largely imported from Canada or replaced by southern hard pine. Birch, however, is still abundant, and is largely exported in the form of spool and bobbin stock. The manufacture of potash, once an important industry of the state, has been abandoned as unprofitable. Several establishments engaged in the manufacture of tanning extracts from hemlock bark are located in the state, and the numerous tanneries upon the Penobscot river consume large quantities of the same material. The demand for hemlock lumber is now good, and the logs, after being stripped of their bark, are manufactured into lumber and not allowed, as in other parts of the country, to rot upon the ground. A recently-established industry is the manufacture of kegs, barrels, and woodenware from pulp made from chips, brush, and other waste material of the forest. Partial estimates of the hoop-pole industry give a product of 5,449,200, valued at $75,612. During the year 1879 153,334 pounds of maple sugar were produced in the state.

ANDROSCOGGIN COUNTY.—One-half of this county is reported covered with woods, largely second growth; it contains, however, considerable bodies of fine first-growth white pine. Manufacturers of cooperage stock report oak exhausted, other hard woods scarce and of inferior quality, and that no second-growth timber is of sufficient size for use. A large amount of excelsior is manufactured, principally from poplar.

AROOSTOOK COUNTY.—Nine-tenths of this county is reported covered with forests, the clearings being confined to the neighborhoods of the rare settlements along the river bottoms. Logs cut in this county are largely rafted down the Saint John river, and little lumber in proportion to the cut is manufactured within its limits. The production of cooperage stock and other articles requiring hard wood in their manufacture is rapidly increasing, and with abundant material such industries seem destined to great development.

CUMBERLAND COUNTY.—One-half of this county is reported covered with woods, principally of second growth. Manufacturers of cooperage stock report a general deterioration and scarcity of material, especially hard woods, now nearly exhausted. Spruce and poplar in large quantities are manufactured into wood pulp.

FRANKLIN COUNTY.—Three-fourths of this county is reported covered with woods, principally confined to the northern portion. Staves, hoop-poles, handles, and excelsior are manufactured in large quantities.

HANCOCK COUNTY.—Seven-eighths of this county is reported covered with woods, largely composed, toward the coast, of second-growth white pine. The northern portions contain fine bodies of large hemlock. Manufacturers of cooperage stock report deterioration of material; ash especially has become scarce.

KENNEBEC COUNTY.—Four-tenths of this county is reported covered with woods, largely second growth. Merchantable spruce and pine have been everywhere removed. Considerable areas are again covered with pine, and the wooded area is increasing. Next to Penobscot this is the most important lumber manufacturing county in the state. Numerous mills located on the Kennebec river saw logs driven from its upper waters and from beyond the limits of the county. Large quantities of poplar and spruce are consumed annually in the manufacture of wood pulp, excelsior, handles, etc. The supply of hard wood is small and of inferior quality. The poplar now used is nearly all second growth.

KNOX COUNTY.—One-half of this county is reported covered with woods, generally of second growth. Heavy timber, however, still exists in the towns of Washington, Appleton, and Union. White pine is scarce, and great deterioration in timber of all kinds is reported. Scarcity in the near future is apprehended by manufacturers. A large amount of cord-wood is consumed annually in burning lime.

LINCOLN COUNTY.—About one-half of this county is reported covered with woods, nearly all second growth.

OXFORD COUNTY.—From one-half to two-thirds of this county is reported covered with woods. The northern portion still contains large areas of original forest, although pine and spruce have been culled everywhere. In the southern part of the county there are considerable bodies of second-growth white pine, and the wooded area is increasing. Cooperage stock, handles, and wood pulp are largely manufactured. Manufacturers report that timber of all kinds has deteriorated in quality and become scarce, with the exception of oak, which is still abundant and of good quality.

PENOBSCOT COUNTY.—Nine-tenths of this county is reported covered with woods. The merchantable pine and spruce have been removed from the southern portion and everywhere culled. In the northern townships hemlock is still abundant and of fine quality. Penobscot is the great lumber manufacturing county of the state, Bangor, once the principal market in the United States for pine lumber, being still the most important saw-mill center. Spruce and not pine, however, except in insignificant quantities, is now manufactured upon the Penobscot. Manufacturers using hard woods report an abundant supply of excellent material.

PISCATAQUIS COUNTY.—From eight- to nine-tenths of this county is reported covered with forests, the southern portion only being cleared of the original tree growth.

SAGADAHOC COUNTY.—One-half of this county is reported covered with woods, principally second growth. Considerable second-growth white pine is now growing up upon abandoned farm lands, and the wooded area of the county is increasing. Manufacturers report all timber of sufficient size for use scarce and of inferior quality, and apprehend early exhaustion of hard woods suitable for mechanical purposes.

SOMERSET COUNTY.—Five-sixths of this county is reported covered with woods, the southern portion only being cleared of its forests of spruce and pine. Excelsior, handles, woodenware, etc., are largely manufactured. Hard-wood timber of all sorts is abundant and of excellent quality, with the exception of black ash, now scarce and in great demand.

WALDO COUNTY.—From one-quarter to one-half of this county is reported covered with woods, generally of second growth. The wooded area is now gradually increasing by the growth of white pine on abandoned farming lands. Manufacturers report a scarcity and deterioration of timber of all kinds of sufficient size for use.

WASHINGTON COUNTY.—From eight- to nine-tenths of this county is reported covered with woods. In the southern portion considerable areas contain scattered bodies of large pine, and through the center of the county are large tracts of first-growth hemlock forests. No future scarcity of lumber is apprehended.

YORK COUNTY.—From one-third to one-half of this county is reported covered with woods; it contains large quantities of scattered pine. Second-growth pine is spreading on abandoned agricultural land, and the forest area is increasing. Wood pulp, cooperage stock, and handles are largely manufactured. Timber of all sorts is reported as depreciating in both quality and quantity. No immediate scarcity, however, is apprehended.

NEW HAMPSHIRE.

The forests of New Hampshire were originally composed of a belt of spruce, mixed with maple, birch, and other hard-wood trees, occupying all the northern part of the state and extending southward through the central portion; the southeastern part of the state and the region bordering the Connecticut river were covered with forests of white pine, through which considerable bodies of hard wood were scattered. The original white-pine forests of New Hampshire are practically exhausted, although in the northern counties of the state there still remain a few scattered bodies remote from streams and of small size; once of great extent and importance, these forests have disappeared before the ax of the settler and lumberman, or have been wasted by forest fires. Large areas, however, once covered with forests of pine, have grown up again, especially in the southern part of the state, with this tree. No estimate of the amount of this second-growth pine standing in the state has been possible; it furnished during the census year a cut of 99,400,000 feet of lumber, board measure. The remaining forests of the state, considered as a source of lumber supply, are composed of spruce, more or less mixed with hard woods, of which the sugar maple and the birch are the most valuable. In the northern part of the state large areas of the original spruce forest remain, although these bodies of timber are now only found at a considerable distance from streams.

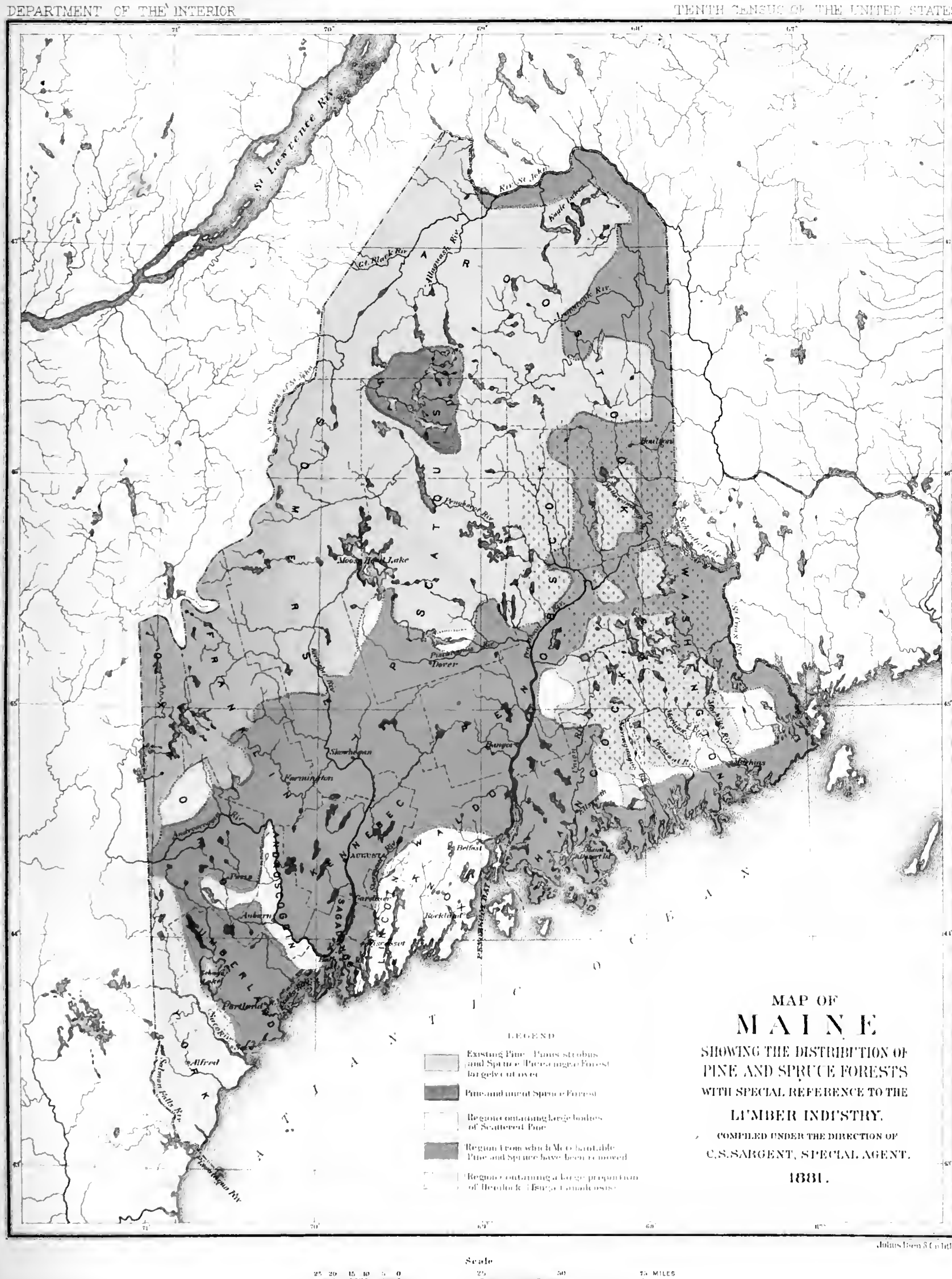
Fires, which at different times have destroyed vast areas of forest, especially in the northern part of the state, are now less frequent and destructive. During the year 1880 but 5,954 acres were reported stripped of their tree covering by fires. Of such fires twelve were set by sparks from locomotives, seven by the escape into the forest of fires originally set in clearing land for agricultural purposes, six by sportsmen, one through malice, and one by the careless use of tobacco.

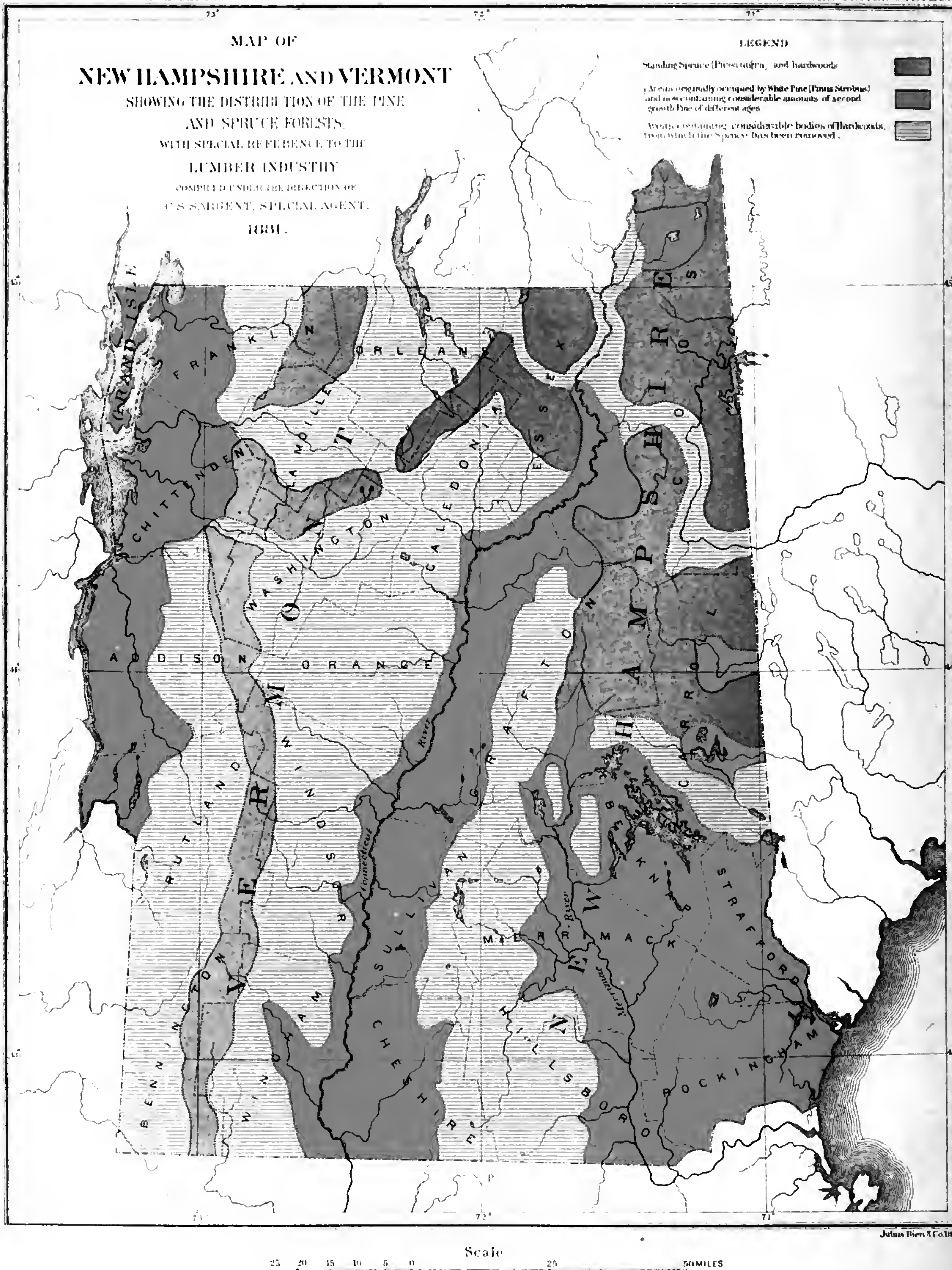
The basis of the following estimate of the amount of merchantable black spruce (*Picea nigra*) lumber standing May 31, 1880, in Carroll, Coos, and Grafton counties, where alone the spruce forests of the state are now of commercial importance, was furnished by Mr. G. T. Crawford, of Boston, and verified by the testimony of other experts:

BLACK SPRUCE (*Picea nigra*).

Counties.	Feet, board measure.
Carroll	60,000,000
Coos	1,000,000,000
Grafton	450,000,000
Total	1,510,000,000
Cut for the census year ending May 31, 1880 (including 26,000,000 feet sawed on the Connecticut river, in Massachusetts).	153,175,000

It is roughly estimated that the spruce forests of the state contain over 33,750,000 cords of hard wood and 165,000,000 feet of hemlock.


MAP OF
MAINE
SHOWING THE DISTRIBUTION OF
PINE AND SPRUCE FORESTS
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C.S.SARGENT, SPECIAL AGENT.
1881.
LEGEND
Existing Pine (Pinus strobus) and Spruce (Picea nigra) Forest largely cut over
Pine and mixed Spruce Forest
Region containing large bodies of Scattered Pine
Region from which Merchantable Pine and Spruce have been removed
Region containing a large proportion of Hemlock (Tsuga canadensis)
St Lawrence Riv.
Moose Head Lake
Skowhegan
Farmington
Augusta
Bangor
Belfast
Rockland
Auburn
Portland
Alfred
Houlton
Machias
Dover
Gardiner
Wiscasset
A T L A N T I C   O C E A N
Scale
25 MILES


MAP OF
NEW HAMPSHIRE AND VERMONT
SHOWING THE DISTRIBUTION OF THE PINE
AND SPRUCE FORESTS,
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT.
1881.
LEGEND
and hardwoods
Areas originally occupied by White Pine (Pinus Strobus)
and now containing considerable amounts of second
growth Pine of different ages
considerable bodies of Hardwoods,
from which the Spruce has been removed.
VERMONT
NEW HAMPSHIRE
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
RUTLAND
WINDSOR
BENNINGTON
WINDHAM
COOS
GRAFTON
CARROLL
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
CHESHIRE
HILLSBORO
ROCKINGHAM
Connecticut River
Merrimac River
73°
72°
71°
Julius Bien & Co. lith.
Scale
25 20 15 10 5 0 25 50 MILES

Partial returns of the hoop-pole industry give a production during the census year of 4,225,000, valued at $29,280. New Hampshire is fourth among the states in the importance of its maple-sugar product. During the year 1879 it produced 2,731,945 pounds.

BELKNAP COUNTY.—From one-third to three-eighths of this county is reported covered with woods.

CARROLL COUNTY.—Five-eighths of this county is reported covered with woods. In the northern portion there are still large areas covered with an original growth of spruce. Large quantities of charcoal are manufactured in this county, and the usual method of lumbering adopted here and very generally in northern New Hampshire is first to cut the spruce large enough for saw-logs, taking all trees 6 inches in diameter 25 feet from the ground, and then cut for charcoal all the remaining growth, hard wood and soft, even the young spruce. As the land cleared is of little value for agricultural purposes, it is allowed to grow up again with wood. Deciduous trees come up at first, and these are sometimes, but not always, followed by spruce. It is necessary to exercise great care in order to prevent the newly-cleared tracts from suffering from fire, as the material for charcoal, cut into cord-wood, is often left on the ground until the second season. Mr. C. G. Pringle, who studied the forests of this region, furnishes the following notes upon the forests of Carroll county:

"The forests on the mountain sides between Crawford's and Bartlett are composed principally of the yellow and paper birch, the sugar maple, the red maple, poplars, the black spruce, and the balsam fir. About Bartlett scattering specimens of white pine make their appearance. In the more level part of North Conway the red and the pitch pine and the hemlock become common, while on the more sterile, sandy plains farther down the Saco these pines with the white birch constitute the principal arborescent growth.

"The tract known as Hart's location, lying partly in the White Mountain notch, includes 10,000 acres, 2,000 of which bear 15,000 feet per acre of spruce and hemlock—rather more of hemlock than of spruce; 10,000 acres in this tract will cut 25 cords of hard wood per acre. The town of Bartlett, partly cleared, still has 40,000 acres of woodland, which will yield an average of 5,000 feet per acre of spruce and hemlock and 15 cords of hard wood. Sargent's grant covers mount Crawford, Stair mountain, and a part of mount Washington. On this tract are 15,000 acres of timber-land, carrying 20,000 feet per acre, chiefly spruce. The Thompson and Meserve purchase comprises portions of mounts Washington, Jefferson, and Madison, and covers 12,000 acres. Two thousand acres of this will yield 30,000 feet of spruce and hemlock per acre in nearly equal proportions. The remaining 10,000 acres will cut 25 cords of hard wood per acre. The Bean purchase lies north of the town of Jackson, and covers 40,000 acres. It is occupied by a dense forest, amounting to 20,000 feet of spruce and hemlock and 20 cords of hard wood per acre. Originally there was considerable pine on the streams and sides of the mountains in this vicinity, particularly on mount Kearsarge, but now there is little left. Twelve and twenty-five years ago much of the town of Bartlett was burned over, and a different growth has come up—white birch, poplar, bird cherry, etc."

A large amount of cooperage stock, excelsior, and an average of 1,000 cords of shoe pegs (from birch and maple) are annually made in this county. Considerable damage to oak and poplar caused by the ravages of the army-worm [?] are reported. The natural increase of timber is said, however, nearly to equal the present consumption by local industries, and scarcity is not apprehended.

CHESHIRE COUNTY.—About one-half of this county is reported covered with woods.

COOS COUNTY.—Nine-tenths of this county is reported covered with forests. The following is extracted from Mr. Pringle's notes upon the forests of this county:

"Everything east of the Connecticut lakes and about the upper portions of Indian and Perry streams is original forest. Such also is the condition of the Gilmanton, Atkinson, and Dartmouth College grants and the towns of Dixville, Odell, and Kilkenny. All the eastern portions of Clarksville, Stewartstown, Colebrook, Columbia, and Stratford are forest, and nearly all of Wentworth's location, Millsfield, Errol, Dummer, Cambridge, and Success. In these forests the spruce will cut 5,000 feet and the hard wood about 50 cords per acre. There is considerable hemlock, but even less pine than in Essex county, Vermont. Not much of the region has been burned over, and spruce comes into the soil again but slowly after clearings and fires.

"In the township of Kilkenny, in the mountains east of Lancaster, there are 16,000 acres of forest still untouched, though a branch railroad from Lancaster into this forest has been surveyed, and may be constructed in a few years, for the purpose of bringing the lumber down to the mills at Lancaster. Lowe and Burbank's grant is a wilderness, three-fourths well timbered and the remainder a mountain ridge of nearly bare rock. Bean's purchase is nearly inaccessible and but little lumbered. Stark, on the upper Ammonoosuc, is badly cut over, only about one-quarter remaining in virgin forest. About one-half of Berlin is uncut; also the northern half of Randolph, the south half of Gorham, and the south quarter of Shelburne. Considerable land in Success was burned over some years ago, as well as some in Stark and in the eastern part of Berlin, but fires have not lately been very destructive in the New Hampshire forests."

A large amount of cooperage stock, handles, wood pulp, shoe pegs, etc., is manufactured in this county. Abundant material, with the exception of ash, is reported.

GRAFTON COUNTY.—One-half of this county is reported covered with woods, mostly confined to the northern and central portions. Shoe pegs, cooperage stock, wood pulp, and excelsior are largely manufactured. The amount of material is considered abundant for the present consumption.

HILLSBOROUGH COUNTY.—One-half of this county is reported covered with woods, mostly second growth. A large amount of cooperage and wheel stock is manufactured. No deterioration in the quality of material is reported, although at the present rate of consumption it must soon become exhausted.

MERRIMACK COUNTY.—One-half of this county is reported covered with woods. Cooperage stock, handles, and excelsior are largely manufactured. A slight deterioration in the quality of material is reported.

ROCKINGHAM COUNTY.—From one-quarter to five-eighths of this county is reported covered with woods, mostly second growth.

STRAFFORD COUNTY.—Four-tenths of this county is reported covered with woods, mostly second growth. Hoop-poles, cooperage stock, etc., are largely manufactured. Wood of all sorts is reported scarce and rapidly increasing in value.

VERMONT.

The forests of Vermont, as compared with those of New Hampshire and Maine, are varied in composition. About the shores of lake Champlain several western trees first appear, and throughout the state the forest is more generally composed of deciduous than coniferous species. Forests of spruce, however, spread over the high ridges of the Green mountains, their foot-hills being covered with hard-wood trees and little pine or hemlock occurring in the valleys. A forest of white pine once stretched along the banks of the Connecticut, and great bodies of this tree occurred in the northwestern part of the state, adjacent to lake Champlain. The original white-pine forests of the state are now practically exhausted. They are represented by a small amount of second-growth pine only, which furnished during the census year a cut of 6,505,000 feet of lumber, board measure.

The forests of Vermont now suffer comparatively little from fire, although at different periods during the last fifty years very serious fires have laid waste great areas of forest in the Green Mountain region. During the year 1880 3,941 acres of woodland were reported destroyed by fire, with an estimated loss of $48,466. Of such fires ten escaped from farms into the forest, five were set by locomotives, two were traced to the carelessness of hunters, and one to malice.

Large amounts of cooperage stock, woodenware, furniture, paper-pulp, excelsior, veneers, etc., are manufactured throughout the state. Material for these industries is fast disappearing, and a great deterioration in quality, especially of oak, ash, and chestnut, is reported by manufacturers.

Vermont surpasses all other states in the manufacture of maple sugar. During the year 1879 11,261,077 pounds were produced in the state.

The following estimate of the spruce standing in the state May 31, 1880, has been prepared from Mr. Pringle's report, and is based upon the statements of numerous timber-land owners and experts in different parts of the state:

BLACK SPRUCE (*Picea nigra*).

Regions.	Feet, board measure.
Green Mountain range	380,000,000
Valley of the Connecticut river	375,000,000
Total	755,000,000
Cut for the census year ending May 31, 1880 (excluding 16,191,000 feet imported from Canada).	109,080,000

Partial returns of the hoop-pole industry give a production during the census year of only 43,900, valued at $470.

ADDISON COUNTY.—About one-third of this county is reported covered with woods. Spruce and ash are scarce and rapidly disappearing. Oak of sufficient size for the manufacture of cooperage stock is exhausted.

BENNINGTON COUNTY.—Two-thirds of this county is reported covered with woods. Manufacturers of woodenware and cooperage stock consider the prospects for future local supply favorable.

CALEDONIA COUNTY.—From one-third to three-eighths of this county is reported covered with woods, mostly confined to the northern and western portions.

CHITTENDEN COUNTY.—About one-fifth of this county is reported as woodland. The following extracts are made from Mr. Pringle's note upon the forests of Vermont:

"Except on the summits of a few of the higher peaks of the Green mountains, where black spruce and balsam fir grow to the exclusion of other trees, the arboreal growth is composed of a large number of species. In the valleys and on the foot-hills, and even on the slopes of the higher mountains in their lower portions, hemlocks mingle with spruce, beech, maple, and birch (yellow birch chiefly, for there is little white birch seen in northern Vermont); basswood, butternut, the ashes, red oaks, etc., are confined to the lower elevations and are less abundant than the trees first mentioned. Between the isolated patches of spruce and fir about the summits of the mountains and the region where hemlock is found, rock maple, yellow birch, and black spruce are the predominating species.

"To estimate the area of valuable original forest still standing in the Green mountains is not an easy task. The belt extends from the Canada line to Massachusetts, and even into that state. The outlines of this belt are made very irregular by the cleared and settled valleys which run up among the mountains, and by reason of forest clearings, so that its width is constantly varying as we proceed from one end to the other.

"The woodlands of the plateau, some 10 miles broad and elevated from 200 to 300 feet above lake Champlain, lying between the foot-hills of the Green mountains and the lower plain beside the lake, occupy, for the most part, rocky hills, and are composed principally of sugar maple, beech, basswood, white ash, black birch, and red oak. Certain limestone hills offer a favorable situation for the butternut, the ironwood, the slippery elm, and the bitter hickory. The swamps and other lowlands yield the red maple, the black ash, the white elm, and the black willow. The latter, especially along streams, is associated with alders and the sheepberry. The colder, sphagnous swamps are covered with a growth, more or less dense, of yellow cedar, black spruce, balsam, and larch; sometimes in the higher portions the white pine mingles with these, scattered or in groves. When grown in such soil this wood is liable to be extremely hard and brittle. The poplars occupy hillsides and ridges where the soil is a light, cold, sandy loam; with them the bird cherry is perpetually associated. The black cherry is scattered in a diversity of soils. White oak and hickory attain their best development on clayey soil or glades of slight elevation; on the red sand-rock hills they are smaller. Certain slopes of cold clay are still here heavily wooded with hemlock, while warm clay lands are the favored site of the burr oak. In the vicinity of the lake and its tributaries low, wet shores are scattered over with the swamp white oak and the burr oak. The chestnut oak is common on the thin, poor soil of the red sand-rock hills, ranging through the valley from the lake as far back in some places as the foot-hills of the Green mountains. The red pine appears on the sandy shores of lake Champlain, and extends far up the Winooski river. The moister and more fertile portions of the sandy plain are still occupied to some extent by white pine, the poorer portions by pitch pine. The white birch occurs on cold, wet, sandy soil near the lake; and in the mountains the black spruce becomes the most common tree; with it in stronger soil are associated the yellow birch and the sugar maple.

"*Burlington.*—This place is believed to rank as third, or next to Albany, among the lumber markets of the United States. More lumber may enter some ports, as Oswego and Tonawanda, for transshipment, but all lumber brought to this market is stored and sold here. The kind is chiefly white pine brought up the lake from Canada, a little of it being cut in Michigan (perhaps one-tenth); all the rest is of Canadian growth. A few of the lumber companies here own lands of limited extent among the Green mountains, from which they obtain spruce for clapboards, etc. The general direction which the lumber sent from here takes is to the older portions of New England, Massachusetts, Rhode Island, and Connecticut, considerable pine being sent even to Maine, which once supplied to commerce so much of this material. Much lumber is dressed here and sent to Boston for shipment to foreign countries. The business still enjoys the highest prosperity, and during the census year, under the stimulus of general commercial prosperity, it was especially active. As yet no lack in the supply is felt, the loggers only having to go farther back in the Canadian forests than formerly to obtain timber enough to meet the demand. The proportion of lumber worked up here is small, there being merely a few factories producing doors, sash, blinds, packing boxes, etc."

ESSEX COUNTY.—Five-sixths of this county is reported covered with forest. The following is extracted from Mr. Pringle's report:

"Four-fifths of that part of the county of Essex lying north of Guildhall and Victory is still in virgin forest, which will yield 5,000 feet of spruce per acre. The towns of Lewis and Averill are entirely unlumbered, and so is Avery's Gore. Colton is mostly covered with forest, and so is Ferdinand. Timber-lands compose about two-thirds of Granby and East Haven, and cover the back parts of the river towns and those crossed by the Grand Trunk railroad. South of Guildhall and Victory the towns of Concord and Lunenburg are mostly cleared and settled. The proportion of hemlock in these forests is not large; there is considerable yellow cedar and a large amount of maple, birch, and beech—probably 50 cords per acre. There is but little pine in all this region, principally confined to the township of Lewis; elsewhere only occasional pine trees occur."

FRANKLIN COUNTY.—From one-fourth to three-tenths of this county is reported covered with forest, mostly confined to the hills in the northeastern and northern portions. In the village of Montgomery a large establishment for the manufacture of butter tubs is located, and at East Richford birch is largely manufactured into turned ware.

GRAND ISLE COUNTY.—About a quarter of this county is reported covered with woods.

LAMOILLE COUNTY.—About one-third to one-half of this county is reported covered with woods, very generally distributed over its entire surface.

ORANGE COUNTY.—One-quarter of this county is reported covered with forest.

ORLEANS COUNTY.—One-half of this county is reported covered with woods. The following is extracted from Mr. Pringle's notes:

"At Newport, situated at the southern extremity of lake Memphremagog, are several mills for cutting veneering from birch. The product of these mills is closely packed in boxes, so that it cannot warp, and sent to the manufactories near the large cities, to be used for chair bottoms and other purposes. Southward from Newport, in the valleys of the Barton and Black rivers, which flow northward into lake Memphremagog, and of the Passumpsic river, which runs southward and joins the Connecticut, are almost continuous swamps of yellow cedar, black spruce, and larch, from which the cedar timber is now being largely drawn to be sawed into shingles. At Barton the hard woods are largely cut into material for furniture, which is shipped toward the sea-board before being put together.

"The valley of the Clyde river from Newport to Island Pond is cleared for the most part and improved for farms. The usual species of the northern forest occupy the summits of the low hills on either side of the valley. Eastward from Island Pond, down the Neipegan river to the Connecticut by the line of the Grand Trunk railroad, we pass through the wild region from which the lumbermen have only taken some of the spruce and pine. Here, beginning 2 or 3 miles back from the railroad, or in some places much nearer to it, a virgin and unbroken forest stretches over the slopes and summits of the hills for many miles to the northward and southward; black spruce, yellow birch, sugar maple, and beech are its chief component species. In a few places, where the soil is sandy, white pine occurs in straggling groves or isolated specimens, and the swamps, as well as those of all of northern Vermont, are occupied by the black spruce, yellow cedar, and by a few scattering pines. The pine being the kind of lumber first secured, is seldom found now in these Vermont swamps. The cedars are now cut and manufactured into shingles, fence posts, railway ties, etc., for which purposes the lasting quality of the wood makes it eminently suited. There is little hemlock in northeastern Vermont, and it is believed to indicate poor soil wherever it occurs. The soil of this entire region presents a marked contrast to that of northern New York, being fertile and in other respects well adapted to agriculture. On this account land once lumbered over is generally occupied by the farmer and not allowed to come up again to forest, except in the more hilly portions."

Staves, tubs, pails, buckets, and hoops are largely manufactured from spruce, cedar, and ash. The quality of the material used is said to have deteriorated, and manufacturers report that at the present rate of consumption it will soon be consumed.

RUTLAND COUNTY.—Four-tenths of this county is reported covered with woods, principally in the eastern portion. Elm, formerly largely used in manufacture of tubs, etc., is reported exhausted, and basswood has become scarce.

WASHINGTON COUNTY.—One-third of this county is reported covered with woods, principally situated in belts along its eastern and western borders. The following is extracted from Mr. Pringle's report:

"Reaching Montpelier from the west we have left behind the Green Mountain gneiss and entered a granitic formation. Here is an extensive burned region; the fire, in consuming the forest and vegetable mold upon the surface of the land, has exposed granite bowlders thickly embedded in the soil. To replace the forest growth thus removed there is only an occasional little spruce or balsam to be found among the thickets of bird cherry. The hilltop and hillside forests east of Montpelier show hemlocks everywhere mingled with sugar maples, yellow birches, and spruce; farther east the spruce and birch predominate. Approaching the Connecticut river, hemlocks and maples again appear and second-growth white pine and paper birches take the place of the other species."

WINDHAM COUNTY.—Three-eighths of this county is reported covered with woods, mostly confined to ridges of the Green mountains. Ash and white pine are reported very scarce.

WINDSOR COUNTY.—From one-fourth to one-third of this county is reported covered with woods, quite generally distributed over the hills. Tubs, barrels, kegs, and buckets of white and red oak, white pine, spruce, and ash are manufactured. Oak is reported by manufacturers to be already practically exhausted, spruce to be fast disappearing, and ash very scarce and in danger of speedy extermination.

MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

The original forest which once covered these states has disappeared and been replaced by a second, and sometimes by a third and fourth growth of the trees of the Northern Pine Belt. The area covered by tree growth in these states is slowly increasing, although, with the exception of the young forests of white pine, the productive capacity of their woodlands is, in view of the heavy demands continually made upon them, especially by the railroads, rapidly diminishing. Abandoned farming land, if protected from fire and browsing animals, is now very generally, except in the immediate vicinity of the coast, soon covered with a vigorous growth of white pine. The fact is important, for this new growth of pine promises to give in the future more than local importance to the forests of this region.

These states sustain a considerable annual loss from forest fires. In Massachusetts during the year 1880 13,899 acres of woodland were reported destroyed by fire, with a loss of $102,262. Of these fires fifty-two were set by locomotives, forty by fires started on farms and escaping to the forest, thirty-seven by hunters, nineteen by the careless use of tobacco, eight through malice, and three by carelessness in the manufacture of charcoal. No returns in regard to forest fires in Rhode Island and Connecticut have been received, but it is believed that in proportion to their forest area such fires are not less destructive in these states than in Massachusetts. Numerous important industries using hard wood have been driven from these states or forced to obtain their material from beyond their limits. On the other hand, industries like the manufacture of certain sorts of woodenware, using second-growth pine, are rapidly increasing in volume. The principal forests now found in these states are situated in Berkshire, Hampden, and Worcester counties, Massachusetts.

BERKSHIRE COUNTY, MASSACHUSETTS.—From one-third to one-half of this county is reported covered with woods, largely second growth. The high ridges of the hills are still covered with forests of black spruce, their slopes and intervening valleys with hard woods or hemlock, now often replaced by a growth of young white pine. Cooperage stock, baskets, and wood pulp are largely manufactured. Spruce is reported to have deteriorated in quality; manufacturers consider the supply of material, however, abundant for all present local demands.

FRANKLIN COUNTY, MASSACHUSETTS.—One-half of this county is reported covered with woods, largely second-growth white pine.

WORCESTER COUNTY, MASSACHUSETTS.—One-half of this county is reported covered with woods, largely second-growth white pine. Winchendon, the most important point in the United States for the manufacture of woodenware, small cooperage, etc., is supplied with material from the young pine forests of this and the neighboring counties. Timber is reported to have deteriorated. The supply of pine is not equal to the demand, and is rapidly increasing in value.

In Barnstable county, Massachusetts, numerous experiments in forest planting have been made. In South Orleans and neighboring towns fully 10,000 acres of sandy, barren soil have been successfully and profitably planted with pitch pine. Similar plantations have been made upon the island of Nantucket; and many large groves of white pine planted many years ago in Bristol and Plymouth counties demonstrate the entire practicability of forest culture in this whole region.

The only important lumber manufacturing establishments found in these states are situated upon the Connecticut river, in Massachusetts and Connecticut. They are entirely supplied with material from the forests of northern New Hampshire and Vermont. Partial returns of the hoop-pole industry give a production during the census year in Massachusetts of 11,507,600, valued at $95,009; in Connecticut, of 191,000, valued at $9,660.

NEW YORK.

That portion of the state north of the forty-third degree of latitude, including within its limits the elevated Adirondack region, was once covered with a dense forest of maple, birch, basswood, and other northern deciduous trees, through which were scattered spruce and pine. The low hills bordering the Hudson and extending along the southern boundary of the state west of that river were covered with the coniferous species of the Northern Pine Belt. Over the remainder of the state the broad-leaved forests of the Mississippi basin spread almost uninterruptedly, except where an occasional sandy plain or high elevation favored the growth of pines. The original forest still covers large areas in the northern counties, and protects the hills through which the Delaware river forces its way in crossing the southern part of the state. With these exceptions, however, the forests of New York are now almost exclusively of second growth.

The forests of the state, especially in the north, have at different times suffered great damage from fire. During the census year 149,491 acres of woodland were reported destroyed by fire, with a loss of $1,210,785. Of these fires thirty-seven were set by farmers clearing land for agricultural purposes and allowing them to escape to the forest, forty-three were set by locomotives, and twenty-two by the carelessness of sportsmen.

With the exception of the spruce of the Adirondack region, the forests of the state are no longer important as a source of general lumber supply; and many industries depending upon hard woods have in late years decreased in importance, owing to the want of sufficient material, or have been forced to obtain their supply of timber from the west. White oak, largely consumed by the railroads, has become scarce, and has advanced at least 50 per cent. in value during the last twelve years. Elm, ash, hickory, and other woods are reported scarce in all parts of the state. Partial returns of the hoop-pole industry give a production during the census year of 10,948,258, valued at $155,764.

New York is only surpassed by Vermont in the amount of maple sugar produced by its forests. During the year 1879 10,693,619 pounds were manufactured in the state.

The following extracts are taken from Mr. Pringle's report upon the forests of northern New York:

"One who enters northeastern New York at Port Kent, and takes stage by way of Keeseville to the Saranac lakes, finds himself, as long as his route runs up the Au Sable river, which is as far as the Au Sable forks, passing through a region which gives evidence of having been formerly covered with pine. The white, the red, and the pitch pine are all represented here. The pitch pine is confined chiefly to the sterile sandy plains between the Au Sable and the Saranac rivers. The red pine mingles with this species, and grows on the rocky hills of the region and on the river cliffs, while the abundance of white pine in nearly all situations must have made this quarter of the state, like the region of Vermont lying opposite, a valuable pinery in former times. But fifty or seventy-five years have passed since the pine of the Champlain valley was harvested and shipped to England by way of the Saint Lawrence.

"In the valleys of the Au Sable and the Saranac rivers white pines spring up numerously whenever permitted to do so, and I am told that farmers, realizing that much of their soil is not suitable for profitable agriculture, are seriously considering whether it be not to their highest advantage to surrender much of their land to timber growing, and encourage the growth of the more valuable species, such as white pine, white oak, etc. Of non-coniferous trees the white, red, and black oaks are conspicuous among the pines, and in the colder and wetter sands the white birch is common. But through all this region the trees are all of second growth, and lumber for building purposes is largely imported.

"The forest on the upper waters of the Au Sable and of the divide between this river and the Saranac is principally devoted to supplying fuel to numerous iron furnaces. The best butt logs only of spruce are sorted out and sent to the saw-mills as the forests are mowed down; the hemlock bark is removed for the tanneries, but everything else, young pine, spruce, and poplar, fall clean with maple and birch. Here and there, even far up on the hillsides, are seen the charcoal kilns, and around and about them, quite to the crest of the foot-hills of the Adirondacks, the woods are cut down in great swaths to feed them. Lands once cut over are left to grow up to timber again, though fires originating in the dead brushwood and consuming the sun-dried vegetable mold on the surface of the soil generally interfere with any new growth of trees.

"Little Tupper lake is situated in the heart of the Adirondack wilderness, and is surrounded by some of the most valuable timber lands to be found in all this region. The woods about the lake have never heard the lumberman's ax. The stream which connects it with Tupper lake, by way of Round pond, is not adapted to driving, and before lumber could be brought down it would be necessary to clear out the stream by blasting away much rock and building a dam with flood-gates at the foot of Round pond. The shores of this beautiful lake present a marked contrast to those of any I have as yet visited. On other shores and river banks I had seen scattering pines, but on all the points and bluffs of this lake throughout its entire circuit, and even following the ravines far back in the hills, are great groves and belts of white pine with straight and clean shafts towering high above all other trees, unless is excepted the red pine, of which a few specimens are mingled with them on the gravelly banks of the lake, vying with the white pines in height and beauty of trunk. At certain places on the shores of this lake, and particularly along the sluggish streams connecting it with Round pond below, are considerable swamps occupied chiefly by larch. It is pleasing to observe and to learn from guides that this lake region of the Adirondack woods has suffered but little from forest fires. It is only limited areas here and there on the shores of the lakes and ponds or along the rivers that have been devastated by fires originally started in hunters' camps. Seldom do these fires spread far back from the water, a fact which is to be attributed, it is believed, to the wet and mossy condition of these woods; yet, when they have been lumbered, as is the case lower down the Racket river, and a considerable proportion of the trees have been removed so as to expose the brushwood, etc., to the drying influences of the sun, much the usual liability to fire exists here.

"It is safe to assume that 2,500 square miles fairly represent the area of the virgin forests of the Adirondack wilderness. This area will average 3,000 feet of spruce (board measure) per acre, or about five billion feet in the aggregate. The amount of hemlock, variously estimated from 300 to 10,000 feet per acre, will cut at least 2,000 feet per acre, or 3,000,000,000 feet in the aggregate, or its equivalent; when the bark alone is considered, 3,000,000 cords of bark. The pine hardly, if at all, exceeds 200 feet per acre, or 320,000,000 feet in all. The hard wood growing over this entire region will fairly average 40 cords per acre, or 64,000,000 cords.

"Glens Falls is the great sawing center for the lumber cut upon the upper Hudson. This business here has passed the point of maximum prosperity and begun to decline; not that there was any necessity for a diminution of the yearly crop of logs from this field, if the forest could be protected from devastating fires. The lumberman leaves standing, as far as possible, the spruce trees too small for the ax, and these, the overshadowing growth being removed, grow with increased vigor, so that good crops of timber could be harvested from the soil every thirty or forty years, were it not that over at least one-half of the area lumbered fire follows the ax, burning deep into the woody soil and inducing an entire change of tree covering. Poplars, birches, and bird cherries, if anything, succeed the spruces and firs. From this cause alone the lumbering industry of the region must dwindle. A large area utterly unadapted to agriculture is being made desolate and nearly valueless, and its streams, the feeders of the water privileges and canals below, become every year more and more slender and fitful. These fires are largely set by reckless sportsmen and hunters, with whom this region peculiarly abounds in summer. They are careless in their smoking; they neglect to watch and properly extinguish the fires lighted for camp and cooking purposes, and sometimes they even delight to set fire to the dry brushwood of lumbered land in lawless sport. Again, to some extent, a class of petty pioneers follow the lumberman, obtaining for a trifling sum a title to a little land, or, squatting without rights, set fire to the dry brushwood left by the lumberers, and allow the fire to spread at will, devastating thousands of dollars' worth of property for the mere convenience of saving themselves the trouble of burning boundary strips around their fields, which might not cost them labor to the amount of $10. The laws of New York in respect to the setting of forest fires are totally inadequate to protect the forests. The opinion prevails in the forest region of northern New York that a growth of trees removed is followed by a similar growth, the result of young seedling trees left in the soil, except in the case of pine. 'Pine once cleared off is never renewed,' was the invariable remark. This of course presumes that fire is kept out of the clearing, for after a fire has consumed the brushwood and much of the 'duff' or vegetable mold, and with this all the young seedling trees, and even the seeds of trees that may be in the soil, an entirely different growth from the hemlock and spruce springs up. Raspberry bushes are the first to appear, the seeds of which are dropped by birds flying over the clearing. Bird cherries generally appear among the first trees, the seeds being dropped everywhere in a new country by birds;

poplars and small willows also appear early in a burned district, their downy seeds being widely distributed by the wind. It is only through the agency of the wind that the seeds of birches and conifers can be disseminated, and spruces and hemlocks must needs appear, if they return at all, as tardy stragglers.

"Not many miles above Glens Falls the Hudson flows out from among the lowest outposts of the Adirondacks and winds through a plain which reaches from near Troy to the vicinity of the southern ends of lakes George and Champlain. The soil of this plain is sand deposited by the waters of former periods. The hills which bound this plain on the northwest are piles of sand, gravel, and bowlders, evidently the moraines of a glacier which once flowed through the course of the Hudson. All this region, from Troy to Luzerne, among the foot-hills of the Adirondacks, must formerly have been covered with pine; among the hills and near the streams white pine, and in the more sterile central portions of the plain, red and pitch pine. To-day there exists of these species scarcely more than a scanty and scattered second growth.

"Thirty or forty years ago it was thought that all the accessible spruce in the valley of the upper Hudson had been harvested, but there is to-day nearly as much sawed at Glens Falls as there was at that time. At that time nearly all the timber standing near this river and its larger tributaries had been cut. Such as stood 5 or 10 miles back from these streams and all that was growing in the valleys of the smaller streams, or higher up the mountain slopes, would not pay the cost of hauling to the larger streams; but it is this timber which now furnishes the present supply. Logs are now driven out of streams which were then thought incapable of being driven. By damming streams so small that they may almost dry up in midsummer, throwing the logs into their courses during the winter, either above or below the dams, and in spring-time, when the dams are pouring with the floods resulting from the melting of deep mountain snows, tipping the planks of the dams and letting loose the torrents, the logs from remote places are got out to the large rivers where they can be driven. All the rivers of this region, however, are steep and rocky. The logs come down with their ends badly battered, and often with gravel and fragments of rock driven into the ends in a manner to injure the saws. They must, therefore, be 'butted' before being sawed; that is, a thin section is cut from each end, and on this account the logs are cut in the woods 4 inches or, for the worst streams, 6 or more inches longer than the standard length. The standard length for all logs brought down the Hudson is 13 feet. The character of these streams is such that long logs, for spars or other purposes, cannot safely be driven through them. Such sticks are certain to get fastened among rocks and cause bad jams. As already stated, the lumber business upon the upper Hudson is well advanced in its decline, and a score of years hence it must become insignificant under the practices now pursued, and the future of this valley gives little promise of prosperity; the soil is inferior in quality and not adapted to agriculture, while the timber, once the chief source of its prosperity, is nearly exhausted.

"As a lumber market Albany ranks second in the United States, or next to Chicago. White pine is the variety of lumber most largely handled here, and two-thirds of it comes from Michigan by way of the Erie canal, the remaining one-third coming from Canada through lake Champlain, the white pine contributed by New York being an inappreciable quantity. Most of the lumber firms here are merely commission dealers, although in two large mills considerable lumber is dressed before being shipped. The region supplied by this market includes the banks of the Hudson, New York city, New Jersey, and the shores of Long Island sound. A little reaches Philadelphia, and much is shipped to foreign ports from the city of New York. A great deal of the lumber handled by Albany dealers, however, does not go to Albany at all, but, sold by runners, is sent direct by railroad from the Michigan mills to points south of New York. The lumber trade here is still in full prosperity.

"Leaving the beautiful Mohawk valley at Rome, the traveler by the Rome and Watertown railroad soon notes a less improved region, and one, indeed, less capable of improvement. For a long time the road stretches over a sandy plain; in the higher portions of this plain, not far from Rome, the red and pitch pines are seen, and in the wetter places hemlocks and black spruces appear, with white birch, black ash, etc. On the higher, undulating lands, 20 or 30 miles north of Rome, white pine and hemlock seem once to have been the most abundant species of the forest; they now exist only in broken and scattered ranks, although numerous stumps give evidence of a former heavy growth of these two species. Northward from Albion the country gradually rises, hard wood becoming more and more common until on the limestone banks of the Black river at Watertown the patches of woodland are mainly composed of birch and maple. Yet the soil continues sandy, and at a little distance from the river is favorable to the growth of pine, and I can readily believe that all this sandy tract east of lake Ontario was originally covered with a heavy growth, principally of pine and hemlock. The pine was long since harvested, and now the mills and tanneries are consuming the hemlock. On each of the small streams that flow into lake Ontario are established saw-mills which cut quantities of hemlock yearly. Little, however, is sawed at Watertown, although a limited amount of logs is driven down to Dexter at the mouth of the Black river, and there sawed; yet once the neighborhood of Watertown and Dexter was a great center for the production of pine lumber. This region (chiefly its swamps) still yields a little black spruce. The lumber sawed along the Rome and Watertown railroad at Williamstown, Richmond, etc., is mostly sent southward to Syracuse and other places to meet the demand there for coarse lumber. The lumber yards at Watertown are mostly filled with Canadian pine.

"Carthage, in Jefferson county, was once an important lumber center. The 'Long falls' of the Black river furnished unlimited water-power. Immense quantities of pine and hemlock lined the banks of the river and covered the plains of the vicinity; northward lay a heavy pinery. Canal-boats laden with lumber were towed through the river to Lyon's falls and thence by canal to Utica. Now the pine is nearly all gone from this region, the saw-mills are rotting down and only a little hemlock is sawed here.

"That portion of the state which lies along the Saint Lawrence river as far east as the vicinity of Malone, and extending some 25 miles back from the river, seldom exceeds 250 feet above the sea-level and is, for the most part, clayey loam, flat and well adapted to agriculture. This tract is now pretty well settled. Proceeding to the southeastward and rising to an altitude of 250 feet a wide region of sandy soil is entered, cold, damp, and unfit for agricultural purposes. This is the region of forest lying northwestward of the mountains in the southern portions of Saint Lawrence and Franklin counties, and has not yet been badly encroached upon by the ax and fire. The destruction of this forest would be a public calamity, so useless is the soil for any other purpose than the production of timber, and so harmful to the settled country below would be the consequences resulting from clearing it. This forest is, no doubt, capable of yielding, perpetually, an annual crop double that now drawn from it. This estimate, of course, is based upon the supposition that fires are prevented. But this side of the forest is less invaded by fires than the valley of the Hudson river, and fires do not burn so deeply into the soil nor consume so much of the vegetable matter; they are, consequently, less fatal to the continuance of timber growth.

"At Canton, in Saint Lawrence county, and in its vicinity as far down as Buck's bridge, below Morley, is sawed all the lumber cut on the Grass river. From this point the lumber is shipped principally to Massachusetts and Connecticut by rail, both via Rome and via Plattsburgh and Rouse's Point.

"Colonel Colton, of Norwood upon the Racket river, explained to me at length the methods employed by him in the lumber business, and, as nearly the same methods are pursued throughout this region, I give his account. Several weeks of the summer he devotes to exploring the lands of his company, to decide from what tract the stock of logs for the following year shall be drawn. In the settlements near the margin of the forest are men whose business it is to cut and haul onto the ice of the river during winter the timber desired by the lumber companies. Contracts are made with these men to harvest the timber above a certain diameter on certain specified tracts belonging to the company. The contractors go to their respective fields of labor as soon as the snow is of sufficient depth, taking into the woods a force of men, horses, and supplies, and building camps in the vicinity of their work. When a full stock of logs is placed on the river, and the spring floods break up the ice and set the logs going, other contracts are made with the same or other men to drive the logs into the booms of the different mills at a stipulated price per log. If, as is usually the case, logs of several different companies are on the same river, all are driven down in common, and the drive is called a 'union drive'. Arrived at the uppermost boom—formed by chaining together logs floating on the surface of the water and held in place by occasional piers, strong but rude structures of logs filled in with rocks, located above the first sawing station—the logs belonging to these mills are sorted out and turned into the different booms, while those belonging below are sent on their way down the channel. Once within the boom of the mills to which they belong, they are again assorted; the pine, hemlock, and the spruce are separated, and the different grades are floated into separate booms or pockets which lead down to the different mills or saws which are to cut up each separate class. At the mills inclined planes lead down to the water from each gang of saws, up which, chains being attached to the logs, they are drawn by the machinery into the mill. After sawing, the sorting of the lumber into different grades is completed with care. The boards are run through planing-mills which smooth both sides, then through other machines which tongue and groove their edges, and finally fine saws neatly trim their ends. This dressing of the lumber at the mills makes a saving in freight when it is shipped, besides greatly facilitating sales. Colonel Colton invited me to accompany him 20 or 30 miles up the river to see the 'drive' which was just coming out of the woods. The highway by which we drove led near the river, and we could see the logs everywhere coming down, advancing endwise with the current. In many places of still water the entire breadth of the river for some distance was closely covered with them. These were not so small as those usually seen in the Maine rivers, but were from full-grown trees of the original forest—spruce from 1 foot to 2 feet in diameter. With the spruce logs were a few hemlocks, usually of larger size; a few pine logs, sometimes 2 or 3 feet in diameter, floated with the others. As the water was lowering, stranded logs were seen everywhere along the shore. They covered gravel banks and bars in the middle of the river, and were piled in disorder on the rocks of the rapids, or, pushing over the waterfalls, stood on end in the midst of the white, pouring torrent.

"A few miles above Potsdam we entered upon a sandy soil; the farms appeared less productive and the farm buildings and fences gave evidence of less thrift. As we advanced toward Colton, a region near the borders of the forest some twenty years settled, less and less prosperity among the settlers was manifest. The tilled fields appeared incapable of yielding even passably good crops; some of them could do no more than give a small crop of rye once in three years. The grass lands were red with sorrel, which comes up everywhere over this region as soon as the forest is cleared and the ground burned over. The sandy soil is cold and sour, in some places so light as to be blown about by the wind. Above South Colton we drove over sandy plains utterly incapable of sustaining the meager population, which ekes out a wretched existence by means of fishing and lumbering. My companion affirmed that settlements had been pushed farther into the forest than they can be maintained, and that they must in most places be abandoned and the land given up to forest again. All along our way the woodlands were straggling and sadly ravaged by the ax, fire, and wind. The spruce and pine had been culled out and most of the hemlock had been cut down and barked. Half-burned stumps and logs and gaunt and blackened trunks still standing disfigured the landscape on every side.

"The species of trees observed embraced all those common in northern woodlands. In one locality black cherry was remarkably abundant. Formerly the saw-mills of Colton cut pine, as there was a larger proportion of this lumber upon the Racket than is usually found in northern New York; now they do little busness in any lumber.

"As we passed up along the river I saw small squads of 'drivers' stationed in a few places where the character of the river was such that it was liable to become obstructed with logs. By assisting the logs to pass such places great jams are prevented. The main body of the men, however, worked at the rear of the drive, scrambling over the disordered piles of logs which accumulate upon the shore or lodge against the rocks in the midst of the current. With their cant-hooks the men pry and roll the logs into the current, springing about on the pile as the logs roll from under their feet. Not unfrequently logs are left by the subsiding waters among the rocks at some distance from the main channel of the river. Files of men on each side then seize them with their cant-hooks and, splashing through the shallow water, bring them by main force into the channel. Sometimes logs become fastened among the rocks where the current is so swift that they cannot be reached by a boat or in any other way. Then hooks attached to ropes are thrown out from the shore; the logs are grappled and thus hauled off into the current. The drivers work Sundays and week days, fair weather or foul; their occupation is full of peril, and men are lost every year. Such are usually, as a driver assured me, 'men who do not know where it is safe to go.' But sometimes the most careful men become mixed with the rolling logs or seized by the current of the waterfalls and are swept away.

"Franklin county contains 995,279 acres, and 347,500 acres are still believed to be timbered. The timbered portion lies in the south end of the county, and because it is not watered through much of its area by streams of sufficient size for driving out the logs, much of the timber is inaccessible, or rather, the prices of lumber do not yet warrant hauling the logs long distances. The country across the line of the Ogdensburg and Lake Champlain railroad appears exhausted of its spruce and hemlock. Some tracts of hard wood are still standing, but the poplars, whose young growth often conceals the stumps and prostrate trunks of dead hemlocks, really seem in many places the most common species. But little timber land remains in Clinton county and, until the present season, lumbering on the Saranac had been for several years nearly suspended. This year, however, a company was cutting a few million feet of lumber drawn from the woods of Essex and Franklin counties. The lumber of the eastern side of the Adirondack wilderness mostly comes out by the way of the Saranac and the Hudson rivers. The mountain sides about lake George are being denuded of their spruce, which is sawed in the vicinity of Ticonderoga, and here, as elsewhere, fires follow the ax in their usual fashion."

The forests of the Adirondack region have suffered severe loss at different times, particularly in 1878, by the sudden death of great blocks of black spruce. Mr. Pringle carefully studied the extent of this destruction and the causes which produced it. In regard to these, great diversity of opinion exists among woodsmen and others familiar with the Adirondack forests. It has been generally supposed that the trees were killed by an unusually severe summer drought, or by the attacks of a boring insect working under the bark; but the testimony gathered by Mr. Pringle points to other causes of destruction. The spruce occupies dry mountain slopes and ridges and deep wet swamps never greatly affected by drought. It is noticed that as many trees have died in the swamps as upon the dry slopes. It is evidently not drought, then, which has caused them to perish. The opinion, too, is firmly held by the most intelligent observers that insects do not attack the trees until they are dead or nearly dead, and are never found in vigorous living specimens.

The black spruce is not a long-lived tree, and this dying out may indicate that the old trees of this forest, probably all of nearly the same age, had so nearly reached the limits of their natural existence as to be unable to withstand some unusual or severe climatic state, such as a period of intense winter cold or late spring frost. The following extracts from Mr. Pringle's report will indicate the opinions of those best able perhaps to form an opinion upon this subject:

"Mr. Mark Moody, residing at the foot of Tupper lake, a hunter and woodsman who has passed his life in the forest, testifies as follows: 'The spruce died fearfully in his vicinity about two years ago; he tried to learn the cause. Sixteen years ago the spruce had died out much in the same way as it has been doing lately. It is the older trees which die. They seem to die by crops, successively. Under the large trees were always springing up small trees to take the places of those that perish. There seems to be a narrower limit to the life of the spruce than to that of any other species. Other trees do not die in the same manner, by crops. The spruce does not seem to enjoy the same green old age, long drawn out, as other trees do, but when it has reached its full growth seems to relinquish its vitality without any apparent or sufficient cause, and before giving evidence of decay or any diminution of vigor.'

"Mr. Wardner, of Bloomingdale, Essex county, an old hunter, woodsman, and guide, testified as follows: 'The spruce timber on this side of the forest has failed clear through to its northern borders, in the same manner and during the same seasons as in other portions of the region.' Mr. Wardner first noticed the leaves falling and covering the ground in 1878; the destruction was continued through 1879, but during the past season he had met with very few trees that were dying. Spruce timber had perished in this manner before, and he pointed out a broad valley in which most of the trees were dead and falling when he came into this region, twenty-five years before. He had carefully endeavored to ascertain the cause; was positive that insects either under the bark or upon the leaves had nothing to do with the death of the spruce trees, and he is sure that it is not due to drought, as he has seen the greatest destruction on the northern slopes. No active destructive agent being apparent, he inclines to the opinion that the spruce trees die because they have reached the limit of their life, and that it is some peculiarity of the winter rather than the summer that turns the scale against them; for this reason they perish in quantities, sometimes in sections. He has counted the rings of many trees, and considers 100 to 150 years the average lifetime of the spruce."

Whatever has caused the destruction of these forests, the damage thus occasioned, both in the loss of valuable timber and in the increased danger of forest fires from the presence of such a body of dead wood is enormous. It is believed by Mr. Pringle that from one-third to one-half of the fully-grown spruce timber left in the Adirondack region is dead.

NEW JERSEY.

The original forests of New Jersey have disappeared, except from some of the highest and most inaccessible ridges situated in the northwestern part of the state, and these, with the increased demands of the railroads for ties and other material, are now fast losing their forest covering. The forests of New Jersey are insufficient to supply the wants of the population of the state, and nearly all the lumber it consumes is brought from beyond its limits. The forests of pitch pine, which once covered large areas in the southern counties, have now generally been replaced by a stunted growth of oaks and other broad-leaved trees.

The forests of New Jersey, especially those on the dry sandy soil of the southern part of the state, have long suffered from destructive fires. During the census year 71,074 acres of forest were reported destroyed by fire, causing a loss of $252,240. Of these fires twenty-eight were set by locomotives, seven through malice, seven by fires set on farms escaping to the forest, and six each by the carelessness of hunters and charcoal-burners.

The manufacture of cooperage stock and other industries using hard woods have been largely abandoned, owing to the decrease of the local supply of timber.

PENNSYLVANIA.

Pennsylvania once possessed vast forests of white pine and hemlock stretching over both flanks of the Alleghany mountains and extending from the northern boundaries of the state to its southern limits. East and west of the Alleghany region the whole country was covered with a heavy growth of broad-leaved trees mixed with hemlocks and occasional groves of pines. Merchantable pine has now almost disappeared from the state, and the forests of hard wood have been either replaced by a second growth or have been so generally culled of their best trees that comparatively little valuable hard-wood timber now remains. Large and valuable growths of hemlock, however, are still standing in northwestern Pennsylvania. From all parts of the state manufacturers using hard wood report great deterioration and scarcity of material, and Pennsylvania, which during the census year was only surpassed by Michigan in the value of its forest crop, must soon lose, with its rapidly disappearing forests, its position as one of the great lumber-producing states.

The following estimates of merchantable pine and hemlock standing in Pennsylvania May 31, 1880, have been prepared by Mr. H. C. Putnam. They are based upon the reports of a large number of timber-land owners and experts familiar with the forests of the state:

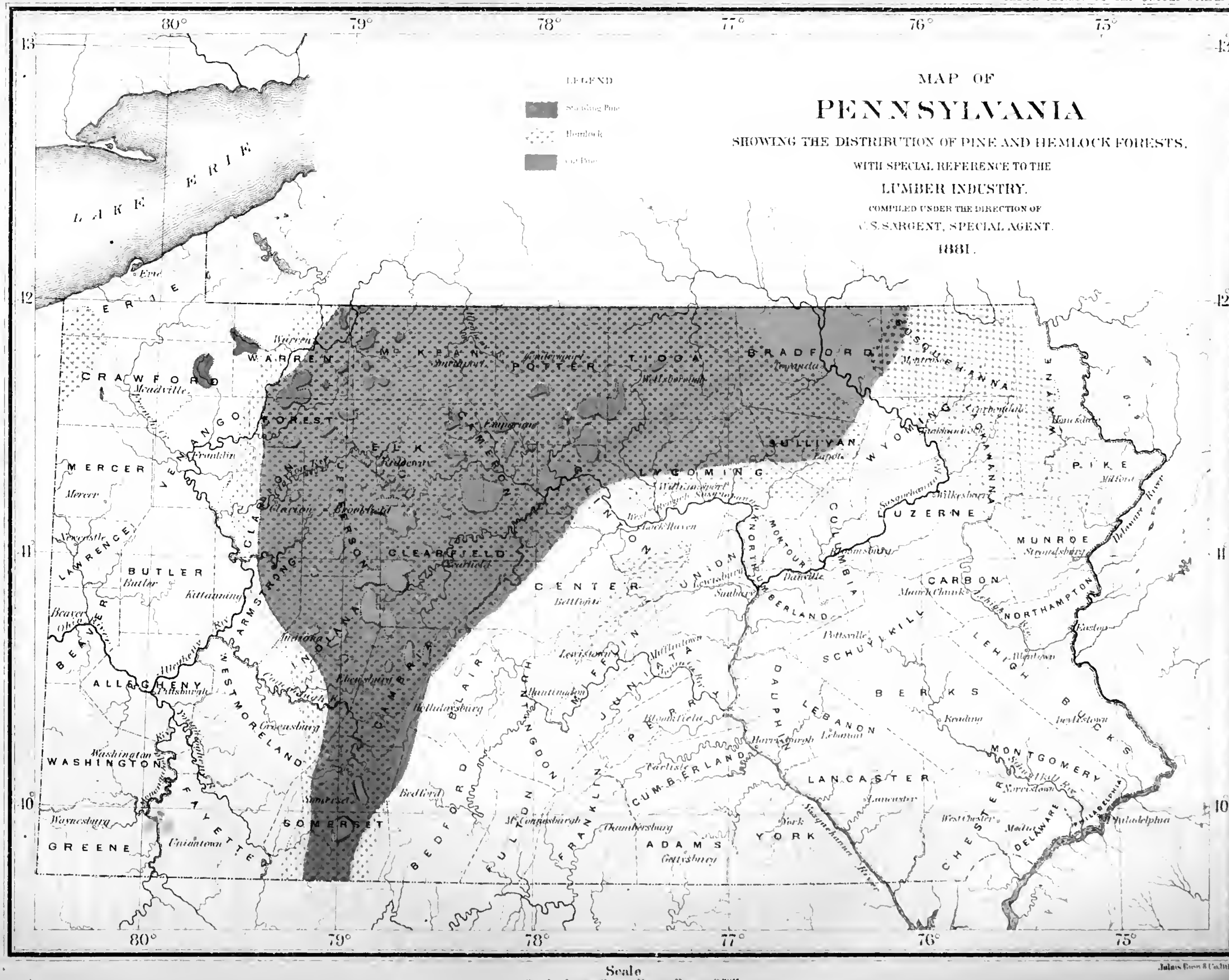
WHITE PINE (*Pinus Strobus*).

Regions.	Feet, board measure.
Alleghany river and tributaries	500,000,000
West Branch of the Susquehanna river and tributaries	1,300,000,000
Total	1,800,000,000
Estimated amount cut for the census year ending May 31, 1880	380,000,000

HEMLOCK (*Tsuga Canadensis*).

Estimated amount of hemlock standing May 31, 1880	4,500,000,000
Estimated amount cut for the census year, exclusive of trees cut for their bark alone.	300,000,000

Of lumber of all kinds 1,848,304,000 feet, including 288,561,000 shingles and 183,740,000 laths, were manufactured in the state during the census year; the nature of the returns, however, prevents anything beyond an estimate, based upon extended correspondence, of the amount of pine and hemlock sawed.


MAP OF
PENNSYLVANIA
SHOWING THE DISTRIBUTION OF PINE AND HEMLOCK FORESTS,
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT.
1881.
LEGEND
Hemlock
LAKE ERIE
ERIE
CRAWFORD
WARREN
McKEAN
POTTER
TIOGA
BRADFORD
SUSQUEHANNA
WAYNE
MERCER
VENANGO
FOREST
ELK
CAMERON
SULLIVAN
WYOMING
PIKE
LAWRENCE
BUTLER
CLARION
JEFFERSON
CLEARFIELD
LYCOMING
LUZERNE
MUNROE
BEAVER
ARMSTRONG
CENTER
UNION
MONTOUR
COLUMBIA
CARBON
NORTHAMPTON
ALLEGHENY
WESTMORELAND
INDIANA
CAMBRIA
BLAIR
HUNTINGDON
MIFFLIN
JUNIATA
NORTHUMBERLAND
SCHUYLKILL
LEHIGH
BERKS
BUCKS
WASHINGTON
FAYETTE
GREENE
SOMERSET
BEDFORD
FULTON
FRANKLIN
CUMBERLAND
PERRY
DAUPHIN
LEBANON
LANCASTER
ADAMS
YORK
CHESTER
DELAWARE
MONTGOMERY
PHILADELPHIA
Scale

Numerous bodies of pine too small to be indicated on the map, of no great commercial importance and not included in these estimates, still remain scattered over the region originally occupied by pine forest.

The forests of Pennsylvania, especially through the mountain regions, have long suffered from destructive fires. During the census year 685,738 acres of forest were reported destroyed by fire, with a loss of $3,043,723. Of these fires a large proportion were traced to locomotives and the escape of fires from farms to the forest.

The forests of Pennsylvania produced during the year 1879 2,866,010 pounds of maple sugar.

The following extracts are made from Mr. Pringle's report upon the principal lumber-producing regions of the state:

"Originally the broad pine belt of northern Pennsylvania, occupying the region drained by the numerous streams constituting the headwaters of the Susquehanna, extended from Susquehanna county, in the northeastern corner of the state, westward through Bradford and Tioga counties to Potter county, although this county never had as much pine as the others, and thence southwestward over Cameron, Elk, and Clearfield counties. The heaviest growth of pine in all this region was on Pine creek, in the southwest part of Tioga county. Now there is but little pine left in Susquehanna and Bradford counties, these counties being thickly settled; and in Tioga county, from which one firm alone has cut four billion feet, there now remain standing but little over one billion feet. The greatest part of the pine now standing in the Pennsylvania forests is on the upper waters of the West Branch of the Susquehanna, in Cameron, Elk, and Clearfield counties. In some of the counties adjoining these, as McKean, there was once, and still may be, a little pine timber.

"Active lumbering operations on the West Branch of the Susquehanna were begun in 1850, when the boom of the Susquehanna Boom Company was constructed at Williamsport. At this place the greatest part of the lumber on the West Branch is sawed. At Lock Haven, 25 miles above, on the same river, advantage was taken of the feeder-dam of a canal to construct another boom, and a few companies operating in lumber are now located there, about one-tenth as much lumber being sawed as is handled at Williamsport. Some of the companies, however, are removing from Lock Haven to the larger center of Williamsport. Below Williamsport no logs are driven, but a little timber squared by the ax in the woods and left at full length is made into rafts and taken down the main Susquehanna. Some of this is sawed in the towns on the river, and the remainder is taken to the large markets to supply the demand for squared timber for ship-building, etc.

"Williamsport is situated on the north or left bank of the West Branch of the Susquehanna, and for 2 or 3 miles along the river side are ranged the mills and lumber-yards of the thirty-four lumber companies operating here. We visited a large number of mills and found much the same methods employed in all. The logs are first slit up by gang-saws; then each board or plank is put through an edger, where two circular saws cut a strip from each side to give the board a square and straight edge; the boards are then assorted into two or more grades, loaded on trucks, and moved over tramways which ramify through the lumber-yards adjacent to each mill. The fragments of boards and better portions of the edgings are made into fence pickets and other portions into laths, and the fragments and strips which will not even make laths are carried to one side and added to a burning pile. The fragments thus burned (rather than thrown into the river) constitute the only waste, for the sawdust supplies the engines with fuel. This being cut chiefly from heart-wood makes better and more easily handled fuel than the sap-wood strips. Even these are, however, often cut and put up into bundles of kindling-wood for city use.

"In the woods the trees are sawed into logs 12, 16, or 18 feet in length, as can be done to the best advantage and the least waste of timber.

"The West Branch of the Susquehanna must be an exceptionally fine river to drive, judging from the comparatively unbattered condition of the logs seen about the mills. The smaller streams in the woods are furnished with flood-dams, and from these extend throughout the timber belt numerous narrow-gauge railroads, tramways, and slides for bringing down the logs. Little hauling is done upon wagons or sleds, the ground in the woods being too rough, it is said, for hauling logs with teams. It is probable that snow does not fill up the depressions and smooth the surfaces to the same extent as in the northern woods.

"The lumbermen of this place at first were content to send their lumber to market in the simplest shape, but of late, as the supply diminishes more and more, mills and shops are being built for the manufacture of doors, sashes, blinds, packing-boxes, furniture, etc. Some companies have so exhausted their pine lands that they can in future only carry on business in this way, buying the rough timber from their neighbors. As the pine lands of one firm after another are exhausted the pine remaining comes to be held by a very few parties, who know its value. Not all of these are operators, but, living at a distance, sell stumpage to manufacturers.

"The following table, giving the amounts of lumber rafted out of the Susquehanna boom at Williamsport since the record has been kept, may be of interest as showing something of the rise and decline of the lumber business at this important center. The greatest prosperity or fullest development of the business was attained, as will be seen, in 1873. After that year, with the steady decrease of the supply of pine and the consequent increase of expense in securing logs, the annual stock steadily diminished until 1877. During the past three years the increasing demand for lumber has stimulated the operators to greater activity, but more than to this cause the recent gain in the yearly stocks is due to the substitution of hemlock for pine, the ratio of hemlock to pine being at present as 1 to 4, although the average for the last seven years is but as 1 to 10. As the supply of pine timber is exhausted, hemlock will be more and more handled until it will become the most important timber of this region. The summary is made for the last eight years only:

Years.	Number logs.	Feet, board measure.	Years.	Number logs.	Feet, board measure.
1862	196, 953	37, 853, 621	1875	1, 096, 897	210, 740, 956
1863	405, 175	76, 475, 826	1876	715, 087	134, 396, 293
1864	511, 549	96, 505, 681	1877	589, 827	106, 944, 257
1865	379, 302	72, 421, 468	1878	617, 552	112, 069, 602
1866	615, 373	118, 831, 494	1879	1, 040, 278	190, 549, 111
1867	833, 388	163, 196, 511	1880 (to November 21)	763, 768	128, 558, 959
1868	853, 663	165, 338, 389	1873 to 1880 (eight years)	7,395,455	1, 382, 342, 272
1869	1, 080, 511	223, 060, 305	Logs remaining in river November 21, 1880		25, 000, 000
1870	1, 099, 777	225, 180, 973			
1871	842, 129	116, 661, 181			1, 407, 342, 272
1872	1, 484, 103	297, 185, 652	Deduct hemlock		140, 734, 227
1873	1, 582, 400	318, 342, 712			
1874	989, 586	180, 734, 382	Williamsport pine, 1873-1880		1, 266, 608, 045

"It is proper to add that the variations in the yearly stock of logs shown above are in some measure due to a greater or less proportion of each annual cut being left behind in the woods or in the streams, from varying supplies of water or from other peculiarities of the season.

"The lumber manufactured at Lock Haven and Williamsport is shipped by railroad and canal to Baltimore and Philadelphia and to intermediate cities and stations.

"I found it more difficult to obtain information of the extent and limits of the hemlock woods of Pennsylvania, and of the amount of the standing timber and the annual crop of hemlock, than I did to get the same facts respecting the pine. Lumbermen agree that there was originally far more hemlock in this state than pine, and they speak of it now as inexhaustible, which is not strictly true, for it is doubtful if it holds out to supply the increasing drain made upon it by tanneries and saw-mills for more than twenty-five years to come. Large quantities of hemlock have been wasted. Much that grew intermingled with the pine has died after the pine has been removed, partly from exposure to fuller sunlight and summer drought, and partly to forest fires induced by and following lumber operations. In the early days of the tanning industry of this region, when hemlock lumber was esteemed of little value, and whenever of late years the lumber trade has been so dull as to offer no inducement to send to market the trunks of the trees felled for their bark, large quantities of these have been left in the woods to decay. Now, however, with a good market for hemlock lumber, tanning companies owning hemlock lands, or the contractors who furnish the tanneries with bark, buying for this purpose stumpage from the proprietors of the timber-lands, often own saw-mills in the timber region, and cut and ship this lumber to market by railroad.

"Inasmuch as hemlock, besides mingling more or less with pine throughout the pine belt, seems to have formed a border entirely around the pine, the extent of the hemlock woods, as well as the quantity of hemlock timber, has always been much greater than of pine. Beginning in Wayne county, in the extreme northeastern corner of the state, the original hemlock forest extended westward through the northern tier of counties as far as Warren county, in the vicinity of lake Erie. Thence its bounds may be traced southward through Forest, Clarion, and Jefferson, and thence eastward through Clearfield, Center, Clinton, Lycoming, and Sullivan counties. Now the northeastern counties are for the most part cleared, and not only have the outskirts of these woods been cut off on all sides, but their continuity has been completely broken up throughout its whole extent by countless clearings and settlements. Yet, however much the hemlock forest has suffered, it possesses to-day greater value than did all the pine standing in 1850. Quite neglected a few years ago, hemlock is appreciating rapidly in value and importance, and ere many years shall have passed it will be almost the only kind of lumber known in the Williamsport market. The best grades of hemlock bring as high a price as scrub pine, the product of the shorter and more knotty trees grown on high land. Although as a rule Pennsylvania hemlock is of superior quality, much of it being nearly as good as spruce, yet here, as well as elsewhere, considerable variation in quality is noticed. Lumbermen classify hemlock into two kinds, red and white, according to the character of the wood, but the more intelligent among them attribute the difference to soil and situation. White hemlock, being sounder, firmer, and straighter grained, constitutes the highest grade. Red hemlock is more brittle, more inclined to splinter, and liable to be found more or less decayed when the trees have gained full size. In this condition trees are said to be 'shaky'. Such timber is generally found on bottom lands, while the hemlock of high hillsides is apt to be short and scrubby. The quality of the hemlock seems to deteriorate west from the center of the state. The Pine Creek hemlock is considered better than that of the Sinnamahoning, and this better than that on the Alleghany. Seldom more than two good logs can be obtained from a trunk, the third and fourth logs being generally inferior and knotty; 8,000 feet per acre is here considered a good yield of hemlock, and 10,000 feet a large yield.

"From Williamsport to Lock Haven the valley of the West Branch of the Susquehanna is usually less than a mile in width, being bounded by abrupt and rocky ridges a few hundred feet in height. At Lock Haven we ascended the ridge on the south side of the river, some 800 feet in altitude, in order to examine the moderate forest growth with which it was covered. In favorable places scattering specimens of white pine indicated the crop these hills have yielded the lumberman in former years. Hemlock, also, was scattered over the hillsides, but even as late as the present year most of the trees in this immediate neighborhood had been felled for their bark; their peeled trunks lay strewn over the hillsides, being left to decay within a mile or two of the saw-mills of Lock Haven. The summit of the ridge afforded a good view of the surrounding country. Parallel ridges of a similar altitude, and which appeared more heavily timbered, lay back of the one on which we stood; between them were seen narrow valleys occupied by farms. On the north or opposite side of the river successive ridges rose higher and higher as they receded from the river, and in the distance seemed to lose themselves in a plateau whose altitude was equal to that of the ground on which we were standing. The gentle slopes and rounded summits immediately above the river showed smooth, cultivated fields interspersed among woodlands of deciduous trees. The more distant heights displayed a darker forest growth where hemlock and pines predominated.

"From Lock Haven to Warren, the county-seat of Warren county, even on the hillsides overlooking the river, close to the banks of which the railroad crept, but especially where we were able to look into the deep runs coming down to the river by a gradual descent from the table-lands of the divides, seldom more than a few miles back above the river, we saw much original forest still standing and principally composed of hemlock. Some white pine appeared as scattering trees or in groves, and some hard wood. The proportion of hard wood increased as we ascended the divide between the waters of the Susquehanna and those of the Alleghany river.

"On the summit of this divide the forest had a truly northern aspect, except that we missed the spruce, not seen in Pennsylvania. The dark foliage of the hemlock mingled with sugar maples, beeches, and birches. For many miles above Lock Haven it was a second growth which occupied the hillsides, a thin growth of white oak, chestnut, locust, etc., which had followed the lumberman and forest fires. Considerable second-growth white pine was seen in a few places, but on this none of the present generation seem to set much value, and I have yet to meet any one in the state who gives a thought to encouraging and preserving such growth. To consume the forests as speedily as possible, satisfied with what can be realized from them in the operation, appears to be the spirit which rules this region. Alternating here and there with the original forest mentioned above were seen all along the railroad leading through this timber belt, but especially in the vicinity of the settlements and lumbered districts, tracts which have been ranged by fire. Sometimes the fires had spread from the clearings into unculled timber, killing everything, large and small. Sometimes 'hemlock slashes' had burned over after the trees had been cut and 'peeled'. Always the charred stumps thickly dotted the ground, and the blackened, half-consumed trunks strewn over the soil in confusion gave to the landscape an aspect of complete desolation. The bird cherries and poplars, which in the forests farther north soon cover and hide from view such wastes of ruin, are wanting here.

"I learned that the best hemlock grows on the steep sides of the deep runs, and that upon the summits of the divides were considerable barrens, the soil of which was sometimes too poor to support any arboreal growth. Farther to the west the summits of the dividing ridges are occupied by hard wood chiefly, although hemlocks mingle with the beeches and maples.

"Arrived at Warren, we find that we have passed through the woods and are in a long-settled and well-improved country, and, judging from the scattered patches of woodlands occupying the low hills within view, the region of hard-wood forest has been reached. The coniferous forest belt only extends into the southeastern quarter of Warren county; the northern and western portions, lying beyond the Alleghany river, yield oak, chestnut, hickory, etc. Originally there was a little pine scattered over the southeastern portion of Warren county, but this has been mostly cut, and hemlock remains, as it ever has been, the most important timber in this part of the county. In Forest county, next south of Warren, pine is local, being scattered in small quantities throughout the county. On the highlands there is much hard wood, beech, maple, and white wood existing in belts between the streams. This, however, may be called a hemlock county. In McKean county a central table-land is covered principally by a growth of maple, beech, etc. In the remaining portions of the county the timber is chiefly hemlock. The valley of the Alleghany river, in the eastern part of McKean county, is mostly cleared and improved. Elk county is one of the best counties for hemlock. Through Elk, the southwestern corner of McKean, and the southeastern corner of Warren runs the Philadelphia and Erie railroad. Along the line of this road, as it passes through this portion of the timber belt, are located the largest tanneries of the United States. These are consuming the hemlock of this region at an enormous rate, and, in addition to the vast amount of bark which they consume, large quantities are shipped out of the region by railroad. The first important tanneries of Warren county were established 12 or 15 years ago, and at the present rate of consumption the hemlock of this county can hardly hold out 20 years longer. The land, after the forest has been removed, is excellent for agricultural purposes throughout this region, and on all sides pioneers are making themselves farms. These men prefer to begin in the undisturbed forest rather than locate on the slashes, because they can pay for their land with the hemlock bark which it yields; and from a radius of 15 miles bark is drawn and sold at from $4 50 to $5 a cord to the tanneries. On an average, four trees yield a cord or ton of bark, the equivalent of 1,000 feet of lumber, board measure. In Warren county from 5,000 to 6,000 acres of hemlock were cut down in 1880, and there is no possibility of this growth being renewed, for every foot of slashed land is eventually burned over, and sometimes the burnings are repeated until the soil is nearly ruined for agricultural purposes. From the dry slashes the fires extend to a greater or less distance through the living woods, ruining not only heavy bodies of hemlock, but also destroying the belts of hard wood intermixed with the hemlock. Notwithstanding stringent legislation in this state upon the subject of forest fires, they seem inevitable, and especially so in the slashes. They spread from the clearings constantly made throughout this timber belt by the settlers, and, as the forest abounds in deer and its streams are stocked with fish, hunters and fishermen are always in the woods, and from their camp fires spread many conflagrations. Many fires here also are set by a tribe of half-civilized Indians residing in this region, to burn over the huckleberry fields in order that the bushes may renew themselves and yield fuller crops; or, where it is so easy to start a fire and conceal its origin, many doubtless arise from malice.

"In this region the aspen springs up on land upon which the hemlock has been destroyed, but this tree manifestly does not thrive as it does in northern woods. Yellow and black birch, bird cherry, beech, maple, white oak, chestnut, black cherry, etc., are the trees which spring up slowly among the briers, and cover burned land with a rather meager second growth. If a few pines have been left on the hilltops they may scatter a few seeds and give rise to some saplings, but as regards hemlock, fires kill it out clean, seedlings and seed; and if the 'peelers' and the fires happen to leave any scattering trees standing, these, being more sensitive to changed conditions than pines, are seldom able long to survive as seed bearers. The bird cherry only thrives on cold, wet soils here. There is another phase of the slaughter of the hemlock forest: As the pine forest gives out, large numbers of laborers turn to the hemlock woods and find employment as bark peelers. In the pine woods work is mostly suspended when spring arrives; then larger numbers of men come into the hemlock woods than can find work at satisfactory wages, and these sometimes set fires in the slashes, which spread into the living woods and kill large quantities of hemlock. To save the bark it must be peeled at once, or before it adheres to the wood and becomes injured by worms, and thus employment is given to a larger force of men.

"The pine now remaining in Clearfield county is mostly found in the northern and the southwestern portions of the county. The eastern and southeastern portions are now principally cleared and improved, as the entire county is destined to be, the soil being principally a strong, clayey loam, excellent for farming purposes. Already four-fifths of the pine timber originally standing in the county has been removed; most of the hemlock, which orginally about equaled in amount the pine, remains. There are no tanneries in this region, and after the pine is cut the hemlock is next harvested, the bark being saved and shipped to the tanneries below to the amount of from 5,000 to 6,000 cords annually. Fires are here sometimes started by hunters in order to clear away the young second growth, that they may be able better to see the deer. One important reason which lumbermen have for planting their saw-mills near the woods, in preference to driving all their logs to the sawing centers below, is that they can then work into shingles, etc., many trees which, being defective by reason of rotten spots or other blemishes, would not be worth driving down the river. Such trees are seen standing here and there all through the woods, having been left behind by the lumbermen. Sometimes persons buy this culled timber and erect shingle-mills, etc., to work it up.

"With respect to the maximum yield of pine per acre, it would seem that 10,000 feet was a good yield for tracts of 400 or 500 acres in extent, although smaller tracts of 50 acres and upward will often cut 25,000 feet to the acre, and even a yield of 100,000 feet to the acre has been reported. The rough nature of the surface in all this region often necessitates the use of slides to bring the logs from the forest to the streams. They are constructed by pinning to ties of hemlock some 3 feet in length hemlock logs about a foot in diameter placed side by side, their inner sides above the point of contact being hewn with care to form a broad V-shaped trough along which the logs may be slid. Except where there is considerable descent logs cannot be slid unless the weather is frosty, when the slide can be kept icy by means of water sprinkled over it from time to time. Slides sometimes are built for 6 or 8 miles back into the woods, usually following up some run so as to get an even and gentle grade. By this means the greatest part of the logs come down to the streams, for sleds are not used in this country. Most of the hazard of lumbering depends upon the lumberman's ability to slide his logs successfully. They can be cut at any time in the woods, and almost any year can be driven to the mills when once in the water, but mild weather interrupts sliding and deep snows impede the operation; so that in open winters lumbermen are sometimes compelled to do their sliding in the night time, when ice will form on the slide. The logs, stripped of their bark, are drawn singly, by horses with chains, from the places where they have fallen to the upper end of the slide. When a sufficient number—from 6 to 40, according to the grade and the size of the logs—have been placed end to end in the slide, the hook of a chain is driven into the rear log near its forward end, and horses are attached which walk a tow-path formed on one side of the slide, and push ahead of them the 'trail' of logs, thus bringing them down to the stream.

"Only in the late autumn and in the winter is it thought expedient in Pennsylvania to fell pine; if cut in summer, when the bark will part from the wood, the sap-wood soon assumes a blackish appearance and disfigures the lumber. As a rule hemlock is here cut and peeled in summer, at the time when operations in pine are suspended; thus by alternating operations in pine and hemlock the hands are kept employed throughout the whole year. In cutting trees the several parts of the work are allotted to different men; some merely fell the trees, others measure them off into suitable lengths and cut away the limbs as far as the upper end of the last log taken, where they sever the top of the tree from the trunk by means of the ax; others follow in pairs with cross-cut saws and cut the trunk into logs."

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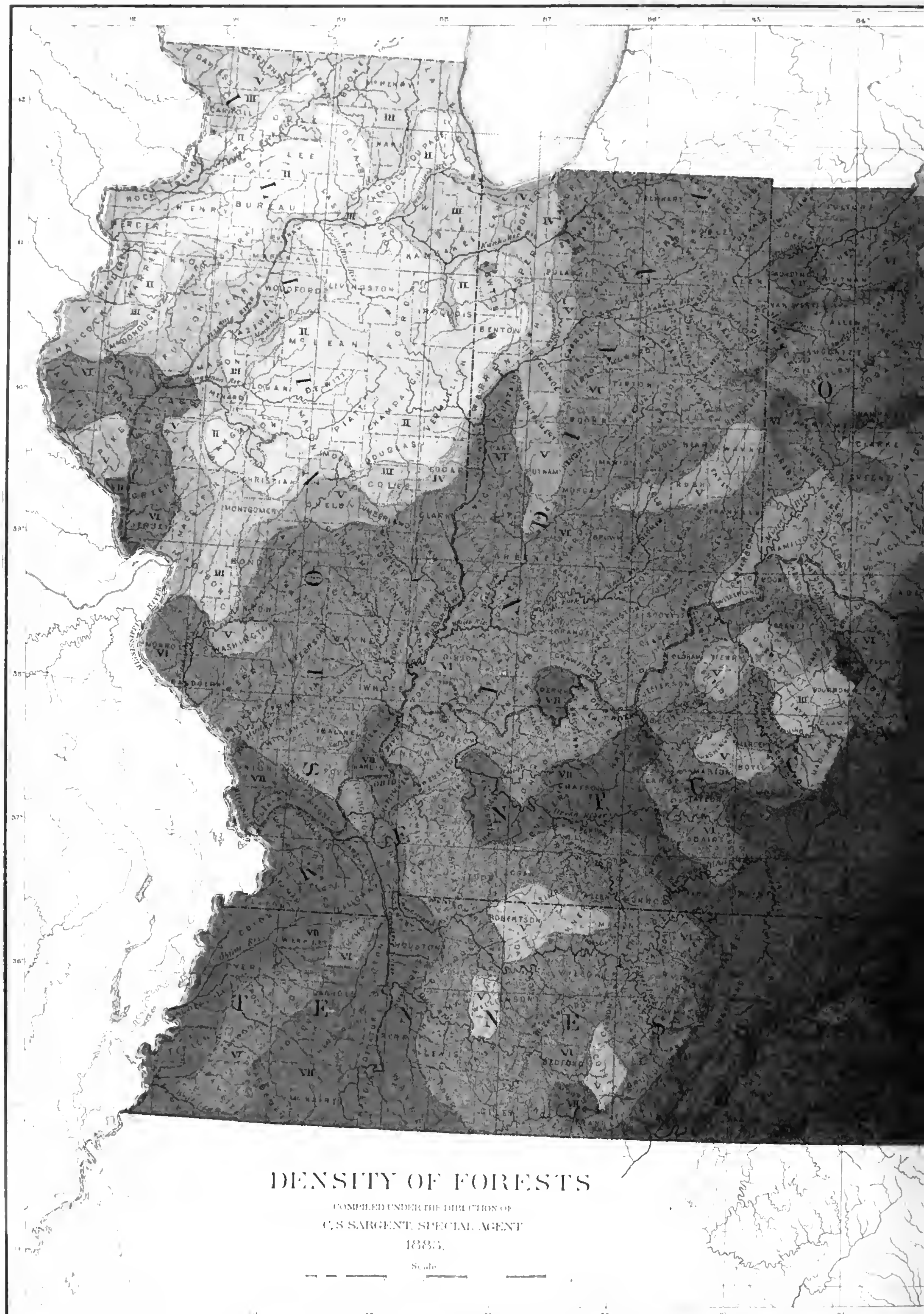
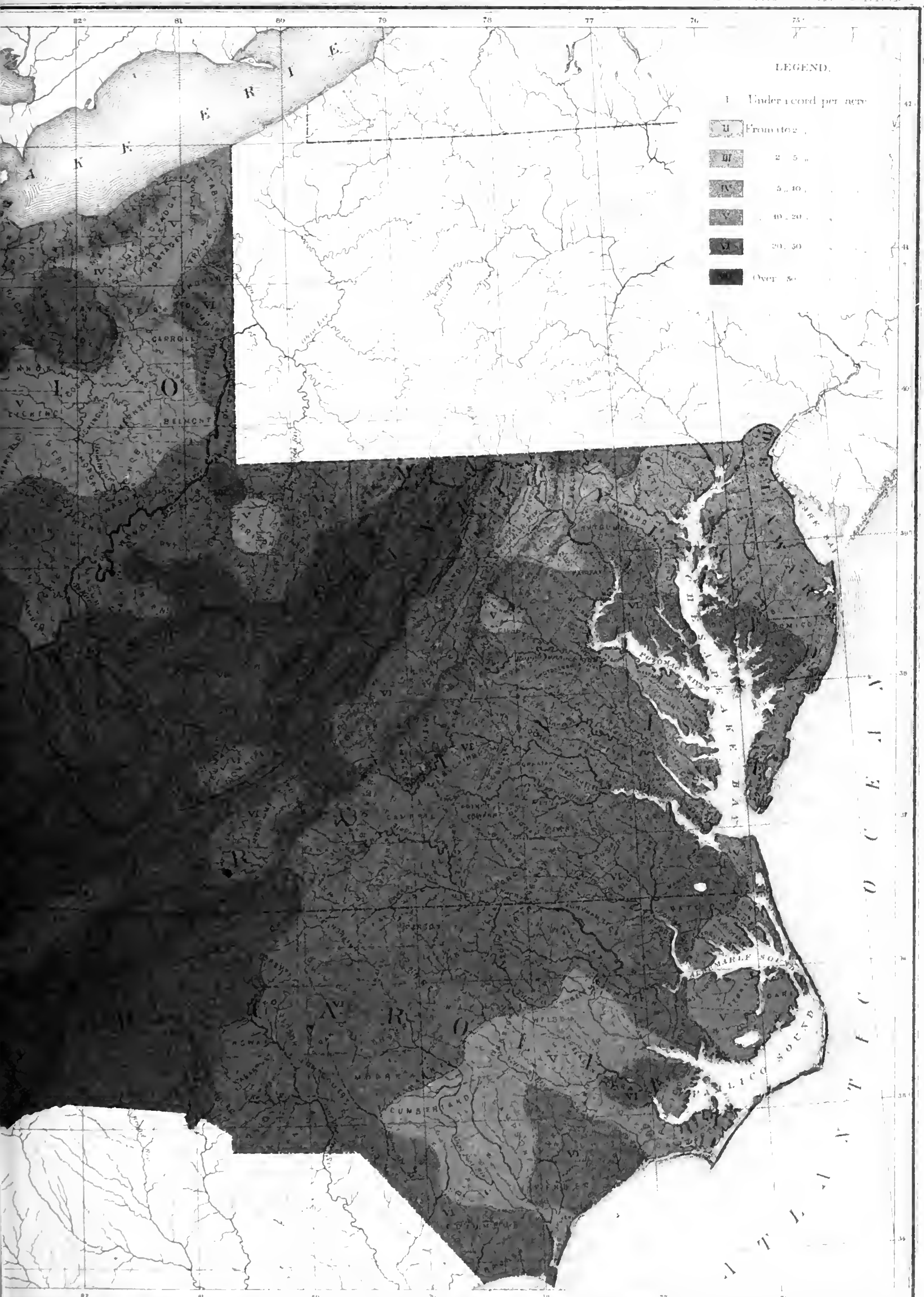


MARYLAN WEST VIRGINIA, VIRGINIA, NORT



Julius Bien & Co. lith.

SOUTH ATLANTIC DIVISION.

DELAWARE.

The northern portion of the state, comprising New Castle and Kent counties, was once covered with the deciduous forests of the Atlantic plain. Conifers, with the exception of the red cedar, were rare. In the sandy soil of the southern part of the state various pitch pines flourished, forming fully one-half of the forest growth. These pine forests were long ago consumed and are now replaced by a second growth, generally composed of the species which originally occupied the ground; and throughout the state the best hard-wood timber has been culled from the forest. Large quantities of wheel and cooperage stock were formerly manufactured in the northern counties; but of late years these and other industries using the products of the forest have, for want of material, generally decreased in importance. The manufacturers report a general scarcity of timber.

During the census year 3,305 acres of woodland were reported destroyed by fire, with a loss of $15,675. Of such fires six were set by locomotives, six by the careless burners of brush upon farms, and two through malice.

KENT COUNTY.—About one-quarter of this county is reported covered with forest. A few small mills saw oak from the immediate neighborhood into shipstuff and car lumber, shipping to Wilmington, Philadelphia, and even to New York.

NEW CASTLE COUNTY.—About one-quarter of this county is reported covered with woodland, mostly of second growth and attached to farms. The large establishments for the manufacture of gunpowder, located in the neighborhood of Wilmington, consume large amounts of willow wood, generally grown for the purpose upon farms in their immediate vicinity.

SUSSEX COUNTY.—One-third to one-half of this county is reported covered with woodland. Numerous small mills, obtaining their supply of logs from the immediate neighborhood, saw oak for shipstuff.

MARYLAND.

The northwestern portion of the state, crossed by the ridges of the Appalachian system, was once covered with the forests of white pine, hemlock, birch, and maple peculiar to this mountain region. The central portion of the state, extending from the mountains to the shores of Chesapeake bay, was covered with oaks, hickories, gums, and other deciduous trees in great variety, the eastern peninsula largely with different species of pitch pine, occupying sandy plains, or mixed with deciduous trees.

In the mountain region considerable bodies of the original forest remain upon the highest and most inaccessible slopes; in the remainder of the state this, where the land has not been permanently cleared for agriculture, is now largely replaced by a second growth, or—the best timber at least—has been everywhere culled.

A large amount of cooperage stock was formerly manufactured in this state. This industry has, however, greatly suffered from the deterioration and exhaustion of the local supply of timber; manufacturers report the best stock nearly exhausted and the substitution for oak, formerly exclusively used, of elm and other inferior woods now brought from beyond the limits of the state.

During the census year 41,076 acres of woodland were reported destroyed by forest fires, with a loss of $37,425. These fires were traced to the carelessness of hunters, to locomotives, and largely to the escape from farms to the forest of fires set in clearing land. The principal lumber manufacturing establishments using Maryland logs are situated in Garrett county; these saw white pine, hemlock, and oak to supply a limited local demand and ship to Baltimore, Philadelphia, Pittsburgh, and Wheeling; considerable oak timber is sent to Europe from this county. During the year 1879 the northern counties produced 176,076 pounds of maple sugar.

DISTRICT OF COLUMBIA.

The original forest has disappeared from the District of Columbia and has been replaced by a second and third growth of oaks, scrub pines, and other trees. The area occupied with woods is probably slowly increasing. A single saw-mill, situated in the city of Washington, saws logs grown beyond the limits of the District.

VIRGINIA.

The forests of Virginia, like those of the Carolinas and Georgia, fall naturally into three divisions, dependent upon the elevation and soil of the different parts of the state. The mountains and ridges of its western border are covered with a heavy growth of pine, hemlock, white oak, cherry, yellow poplar, and other northern trees; over the region extending east of the mountains oaks, principally black oaks, once formed the prevailing forest growth; through these are now mingled long stretches of various pitch pines, occupying exhausted and barren soil once devoted to agriculture. The eastern counties are covered with the forests of the Maritime Pine Belt, generally confined to the Tertiary deposits of the coast and extending inland to the head of tide-water of the principal streams; along the western borders of this pine belt the forest growth is nearly equally divided between the pines and the broad-leaved species.

The inaccessible mountain region in the southwestern part of the state still contains immense quantities of the original oak, hickory, walnut, and cherry, the scanty population of these mountains having made but slight inroads upon the forests. Railroads have hardly penetrated them, while the streams which head here are unsuited to carry to market the hard woods of which this forest is largely composed. The most valuable hard-wood forest remaining on the continent exists in southwestern Virginia and the adjacent counties of West Virginia, Kentucky, Tennessee, and North Carolina. From the central and eastern portions of the state the original forest has almost entirely disappeared, and is now replaced by a second growth, in which the Jersey pine and the old-field pine are characteristic features, generally replacing more valuable species of the original growth.

During the census year 272,319 acres of woodland were reported ravaged by fire, with a loss of $326,944. Of such fires the largest number was traced to the careless burning of brush upon farms and to locomotives.

The manufacture of cooperage stock is increasing rapidly in the western part of the state, and great quantities of staves are exported thence directly to Europe, as well as oak, yellow poplar, and walnut in the log. The manufacture of tobacco cases from sycamore lumber is an important industry in the neighborhood of Lynchburg and other tobacco-distributing centers. Considerable quantities of hand-made shingles are produced in the cypress swamps which occupy a large portion of Norfolk and other eastern counties. A large amount of second-growth pine (*Pinus Tæda*) is shipped from the different Virginia ports by schooner to New York for fuel, and this second-growth pine furnishes the principal building material used throughout the state. The grinding of oak and sumach bark and the manufacture of tanning extracts are important and profitable industries of the state.

WEST VIRGINIA.

The forests of West Virginia, with the exception of the belt of pine and spruce confined to the high ridges of the Alleghany mountains, are principally composed of broad-leaved trees, the most important of which are the white and chestnut oaks, the black walnut, the yellow poplar, and the cherry. The white pine and spruce forests reach within the state their southern limit as important sources of lumber supply.

The forests have been largely removed from the counties bordering the Ohio river, and the most valuable hard-wood timber adjacent to the pricipal streams, especially black walnut, cherry, and yellow poplar, has been culled in nearly every part of the state. But slight inroads, however, have yet been made into the magnificent body of hard-wood timber covering the extreme southern counties, which still contain vast quantities of oak, cherry, and poplar.

The black walnut found scattered everywhere in West Virginia is least plentiful in the northwestern and Ohio River counties, and most abundant along the upper waters of the rivers flowing into the Ohio through the southwestern part of the state. Yellow poplar is found throughout the state, and is still abundant about the headwaters of nearly all the principal streams. Large bodies of cherry are found in Greenbrier, Nicholas, Webster, and other counties immediately west of the mountains, and a large amount of hemlock is scattered through the valleys and ravines of the northeastern part of the state and along the western slopes of the Alleghanies. The area still occupied by white pine is estimated to extend over 310 square miles, and to contain about 990,000,000 feet of merchantable lumber. The principal centers of lumber manufacture are along the Kanawha river at Ronceverte, in Greenbrier county, at Parkersburg, and along the upper Potomac.

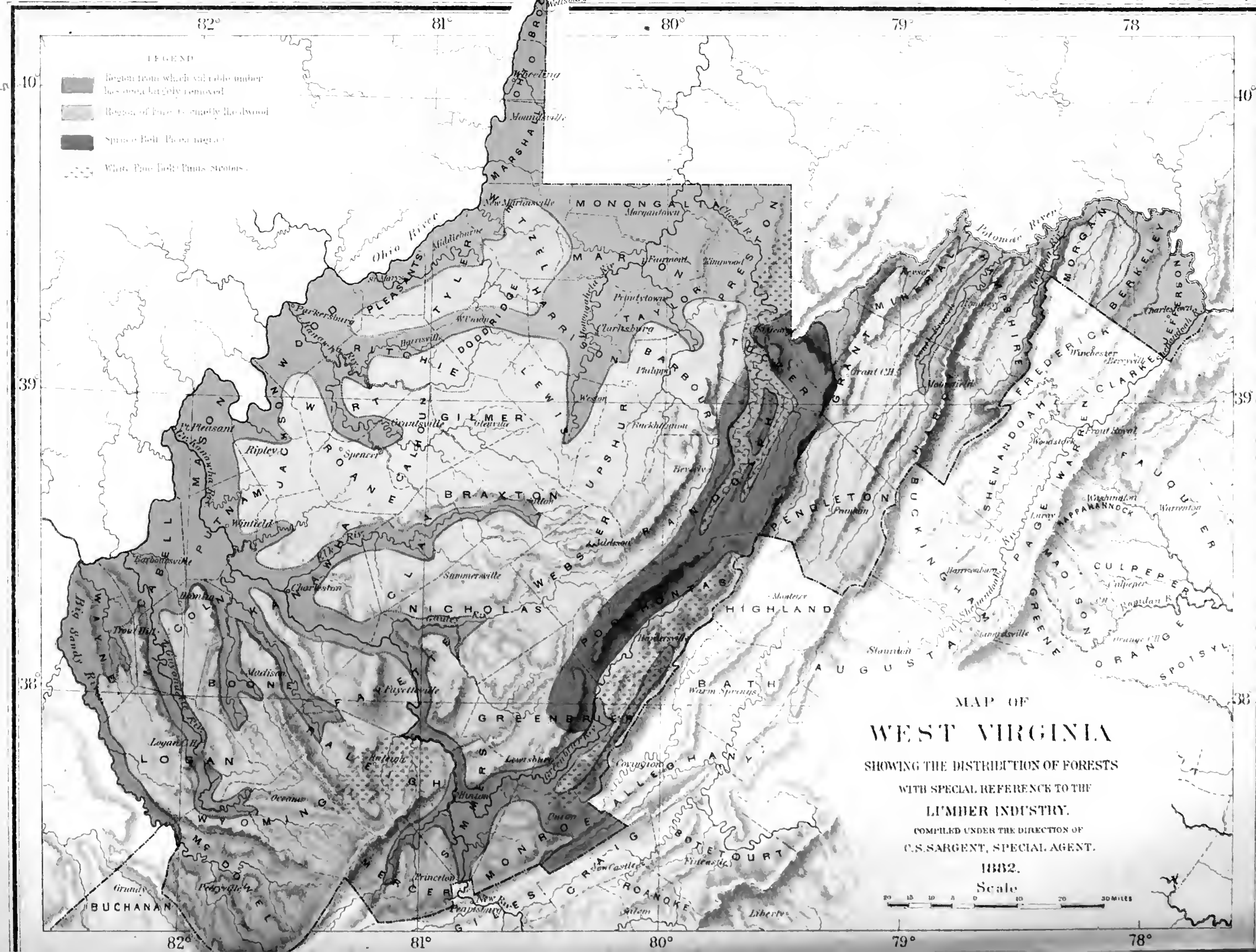
Partial returns of the hoop-pole industry gave a product during the census year of 3,549,000, valued at $146,000.

During the census year 476,775 acres of woods were reported destroyed by fire, with a loss of $155,280. Of these fires the largest number was traced to the careless clearing of land for agricultural purposes, although many had their origin in sparks from locomotives.

The manufacture of cooperage stock is fast increasing in importance, and seems destined, with the exhaustion of the more accessible hard wood forests of the country, to assume a much greater development than at present Large quantities of black walnut, yellow poplar, and oak in the log are shipped to northern markets and to Europe.

The following notes upon the forests of West Virginia are extracted from Mr. Pringle's report:

"Entering West Virginia at Keyser (New Creek) by way of Cumberland, Maryland, we find ourselves in one of the narrow valleys lying among the low abrupt ridges of the northern Alleghanies, among which we have been traveling since we reached the vicinity of Williamsport, Pennsylvania. Coming south from middle Pennsylvania, however, the forest growth covering the long mountain chains within view from the railroad becomes heavier and heavier, the evidences of fire and ax largely disappearing. On the hills above Keyser fewer evergreens appeared than I had previously seen. A few slopes were principally occupied by pine in variety, but the mountains of this


MAP OF
WEST VIRGINIA
SHOWING THE DISTRIBUTION OF FORESTS
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C.S.SARGENT, SPECIAL AGENT.
1882.
Scale
82°
81°
80°
79°
78
40°
39°
38°
BROOKE
OHIO
MARSHALL
WETZEL
MONONGALIA
MARION
PRESTON
TAYLOR
BARBOUR
TUCKER
GRANT
MINERAL
HAMPSHIRE
MORGAN
BERKELEY
JEFFERSON
HARDY
PENDLETON
RANDOLPH
POCAHONTAS
GREENBRIER
MONROE
MERCER
SUMMERS
RALEIGH
FAYETTE
NICHOLAS
WEBSTER
UPSHUR
LEWIS
HARRISON
DODDRIDGE
TYLER
PLEASANTS
RITCHIE
WOOD
WIRT
GILMER
BRAXTON
CLAY
CALHOUN
ROANE
JACKSON
MASON
PUTNAM
KANAWHA
CABELL
WAYNE
LINCOLN
BOONE
LOGAN
WYOMING
McDOWELL
BUCHANAN
GILES
CRAIG
ROANOKE
BOTETOURT
ALLEGHANY
BATH
HIGHLAND
AUGUSTA
ROCKINGHAM
SHENANDOAH
FREDERICK
CLARKE
WARREN
PAGE
GREENE
MADISON
RAPPAHANNOCK
FAUQUIER
CULPEPER
ORANGE
Ohio River
Potomac River
Big Sandy R.
Wheeling
Moundsville
Wellsburg
New Martinsville
Morgantown
Fairmont
Kingwood
Pruntytown
Clarksburg
Philippi
Weston
Buckhannon
Beverly
Parkersburg
Ripley
Spencer
Glenville
Sutton
Charleston
Summersville
Winfield
Pt. Pleasant
Barboursville
Hamlin
Madison
Fayetteville
Lewisburg
Union
Princeton
Beckley
Logan C.H.
Oceana
Grant C.H.
Moorefield
Romney
Winchester
Berryville
Charlestown
Martinsburg
Front Royal
Luray
Warrenton
Culpeper
Harrisonburg
Staunton
Monterey
Franklin
Huntersville
Warm Springs
Covington
New Castle
Fincastle
Salem
Liberty

region were covered with a growth of deciduous trees, white, black, red, Spanish, and chestnut oaks, hickories, butternuts, black walnuts, yellow poplars, locusts, elms, sugar maples, etc. At Piedmont some $200,000 have been expended in the construction of a boom on the North Branch of the Potomac. At this point, as well as at Swanton and Deer Park, on the Maryland side, there are mills sawing chiefly white oak, and also considerable white pine, spruce, hemlock, poplar, white ash, etc. Some spruce which had not been seen or heard of in the timber belt of Pennsylvania is found 20 miles above Piedmont. The market for lumber manufactured here is chiefly eastward. Much of the oak is sent to Europe, partly in the form of squared timber, partly cut 5 by 12 inches and from 15 to 20 feet long. The mills at Swanton and Deer Park are located on the railroad, and cut timber is hauled to them from the vicinity. The mills at Piedmont are fed by logs driven down the river from the western portions of Mineral and Grant counties, West Virginia. This lumber is chiefly oak, spruce, and hemlock. Great difficulty is experienced in driving this part of the Potomac, as it is a swift and rocky stream. Logs, especially oak, constantly lodge on the rocks or banks, and there has been great difficulty in maintaining the boom and dam at this point.

"Rowlesburg, in Preston county, owes its existence as a lumber depot to the fact that the Cheat river, upon which it is situated, as it passes through the Briery mountains, for a distance of 25 miles below this point has so narrow and rocky a channel and so swift a current that it is not possible to get the logs farther down the stream. Above Rowlesburg the Cheat river is a good stream to drive, and any one of its branches can be driven from a point 125 miles above that point. From the mouth of the Black Fork, 30 miles above, the timber is brought down in rafts rather than as separate logs; this is because there is no boom as yet at Rowlesburg to stop the logs. There are small booms on Black and Shaver's Forks, many miles above Rowlesburg. Scattered along the river at some distance above Rowlesburg there are a few small mills, the product of which is floated down the stream on rafts. The timber of Preston county between Rowlesburg and the vicinity of the mouth of the river is oak, poplar, chestnut, ash, beech, yellow beech, hemlock, basswood, and hickory.

"The timber of Canaan valley, in Tucker and Randolph counties, is largely hemlock on the lower lands, on the higher situations and slopes sugar maple and beech; and, as soon as a suitable elevation is reached, spruce is mingled with black cherry. In other portions of Tucker county and on the tributaries of the Cheat river, flowing out of Randolph county, the timber is chiefly oak, poplar, ash, spruce, cherry, black walnut, white pine, etc. This, however, is not a black-walnut region, and there are here nowhere more than scattered trees; a careful search has failed to find any great body of this timber here. It is estimated that 2,500,000,000 feet of yellow poplar are still standing in the valleys of the Cheat and its tributaries.

"Shaver's Fork is heavily timbered with spruce. A boom has been constructed at Grafton, on Tygart's Valley river, a main branch of the Monongahela. It is a rough stream, unfavorable for lumber operations, and for a distance only of 10 miles above Grafton is smooth enough to admit of the passage of rafts. All lumber has, therefore, to come down in separate logs, and only such kinds as are light enough to float well can be got down. For this reason there is very little except poplar sawed at Grafton. Oak is too heavy to be driven successfully, and as it cannot be tied up in rafts with poplar, as is done on the Cheat, the stores of oak timber growing in the valleys drained by this river must wait the building of a railroad to bring them to market. The yellow poplar still standing in this region is estimated at 300,000,000 feet, and on the higher grounds, especially about the headwaters of streams, there are fine bodies of black cherry mixed with other trees.

"At Parkersburg are located the mill and shops of the Parkersburg Mill Company, situated on the banks of the Little Kanawha, a short distance above its confluence with the Ohio. This is the only company operating in lumber within the city of Parkersburg. It manufactures about 6,000,000 feet of lumber annually, mostly poplar, some oak, and about a quarter of a million feet of beech. Little black walnut can now be obtained here, and that of inferior quality. Rough lumber and manufactured articles of wood find a market in nearly every direction, west, north, and east. I was astonished and delighted to see how closely the lumber was worked up and the great variety of articles manufactured from slabs, edgings, culls, etc., which in other mills are so generally thrown into the waste pile. Broom handles, corn-popper handles, brush handles, brush heads, tool handles of many descriptions, and fly-trap bottoms are but a few of the articles which are turned out by millions from odd bits of wood, few of which are too small to make something or other from. The company executes orders for articles used in manufactories widely distributed over the country from Cincinnati and Chicago to Boston and New York. Poplar is used for broom handles, and beech, maple, sycamore, black walnut, cherry, etc., for smaller articles. This company does not own and operate timber lands, but buys its logs from parties who deliver rafts to its mill. Formerly much lumber was wasted in this region in clearing lands for farms, but now proprietors of land find it to their advantage to cut and save their logs, which they bring down in rafts themselves or sell to parties who make a business of rafting. Once out of the small streams, the logs are easily rafted down the Little Kanawha during favorable seasons.

"There are no booms on the Little Kanawha, except temporary constructions for special purposes, which are broken up by every flood. Several years ago it was supposed that the timber on this river was nearly exhausted, but it continues to come down in undiminished quantities to the value of some hundred thousand dollars annually, in addition to railroad ties, staves, etc. It is only about 40 miles up the main river, and to no great distance back from the stream, that the supply of oak is exhausted. The river is a hundred miles long, and about its upper waters and those of its tributaries the oak is comparatively untouched. Much of Wirt county and the greater part of Roane, Calhoun, and Gilmer, in the upper part of the valley of the Little Kanawha, are a vast virgin forest of oak and poplar, containing a good deal of black walnut and sugar maple and some black cherry. Baxter county is magnificently timbered, as is Webster, although the timber here is yet inaccessible.

"The Guyandotte is a good river for lumbering operations. Rafts can come down from a point 100 miles from its mouth. There are yet no booms on this river, except strings of logs occasionally stretched across it for temporary purposes. On its course above Guyandotte are four or five mills, doing for the most part a local business, their product for export being only about 1,000,000 feet of sawed lumber. The rafting of this sawed lumber is attended with some risk of loss, and therefore a much greater amount is brought down in unsawed logs bound together in rafts, which are taken down the Ohio and sold to various mills along its course. These rafts are usually made 11 logs wide, and three or four of these courses are placed end to end. White oak is made up into rafts with a poplar log in the center of each course, and thus the raft is made light enough to float easily. Along the Guyandotte, in the lower part of its course, the oak and poplar have been cut for a distance of from 1 mile to 2 miles from the stream, the black walnut for some 5 miles back; but nine-tenths of the area drained by this river is still in original forest, composed of white, chestnut, and other oaks, poplar, walnut, several hickories, beech, sugar maples, sycamore, ash, etc. In this region there is, in the aggregate, a good deal of black walnut, but it exists as scattered trees rather than in groves or tracts.

"Coal river is 160 miles long, and for 36 miles, or to Peytona, is navigable for barges. The valley of this river is covered with truly magnificent forests, in which the trees of the several species composing them attain remarkable dimensions. Poplar and white oak here exist in nearly equal proportions, and together constitute about a third of the timber. Besides these there is a good deal of black cherry, lin, and locust, as well as hemlock, the latter not being considered valuable in this country. Black walnut appears more abundant in this region than in any other of similar extent of which I have yet heard. But little timber has yet been removed from the valley of this river, and it is chiefly the lower portion and the immediate vicinity of the banks which have been lumbered.

"The Elk river empties into the Kanawha at Charleston. About 2 miles above its mouth are located a boom and several saw-mills, and here are also a dam and lock which secure slack-water for some 20 miles. The river is about 180 miles in length; logs have been driven from a point 150 miles above its mouth, but its valley has only been lumbered to any great extent in the immediate vicinity of the main river, and to a distance of some 110 miles from its mouth. Most of the original growth of the forest of the Elk basin still remains, and is composed largely of white oak, hickory, chestnut, and poplar. Black walnut here, as everywhere else in this state, is scattered, although it is estimated that 10,000,000 feet of this lumber still remain in this region. Above a certain altitude and about the upper waters of this river considerable black cherry, sugar maple, and birch is found. Here also beech and basswood abound, by the streams hemlock occurs, and on the mountains a little black spruce. About the upper settlements on this river miles of fence constructed with boards of black cherry and farms fenced with black-walnut rails may be seen. Formerly large numbers of coal-boats and salt-boats were built upon the Elk river. Once, also, the salt-works of the Kanawha required vast numbers of barrels; these were made of black as well as white oak; now but five of the sixty furnaces once boiling brine in this vicinity are in operation, and there is little demand for black oak for staves. The country along the Kanawha between the Elk and the Gauley rivers has been lumbered for 5 or 6 miles back from the streams, and about one-fourth of the timber has been cut from these valleys. The Gauley river with its several large tributaries drains a valley which covers nearly 5,000 square miles; its length is about 110 miles, much less than that of the Elk, which is a long, slender stream, but it occupies a much broader valley and has twice the volume of water of the Elk. Unlike the rivers just considered, which wear out for themselves smooth channels through the soft sandstone, the Gauley is a rough stream, tumbling rapidly over hard conglomerate rock, its bed being full of bowlders and ledges. For the first 10 miles from its mouth the fall averages 4 feet to the mile; above that 20 feet to the mile, while its upper waters are so swift and rough as to be unnavigable even for small boats. For these reasons the Gauley does not admit of the passing of rafts, and it is a difficult river upon which even to drive single logs. Its valley is but little settled, except on Meadow river and along its right bank below that stream. Above a point 15 miles from its mouth no timber has been touched except by the few settlers. In the lower part of the valley of the Gauley for 15 or more miles the timber is chiefly oak, poplar, walnut, etc. The Gauley and its large affluents, the Cherry, Cranberry, and Williams rivers, all head back in the forests of black spruce, which sometimes take entire possession of the mountain tops; a little lower, yet often mingled with the spruce, hemlocks and black cherry abound. On Cherry river the cherry trees so predominate over all others as to have given their name to the stream. Here are trees often 4 feet in diameter. The region intermediate between the upper and the lower districts of the Gauley thus described contains much beech, sugar maple, and black cherry. The white oak which abounds in the lower basin of this river disappears above an altitude of 2,000 feet. I was informed that, although lumbering operations were but lately begun on the Gauley, nearly 1,000,000 feet of poplar were brought out of the river in 1879, and that it had yielded 50,000 feet of black walnut in 1880, while there were now in the river poplar logs enough to make 3,000,000 feet of lumber. About one-fourth of the cut of late years has been sawed at mills near the falls; the rest is rafted to Charleston.

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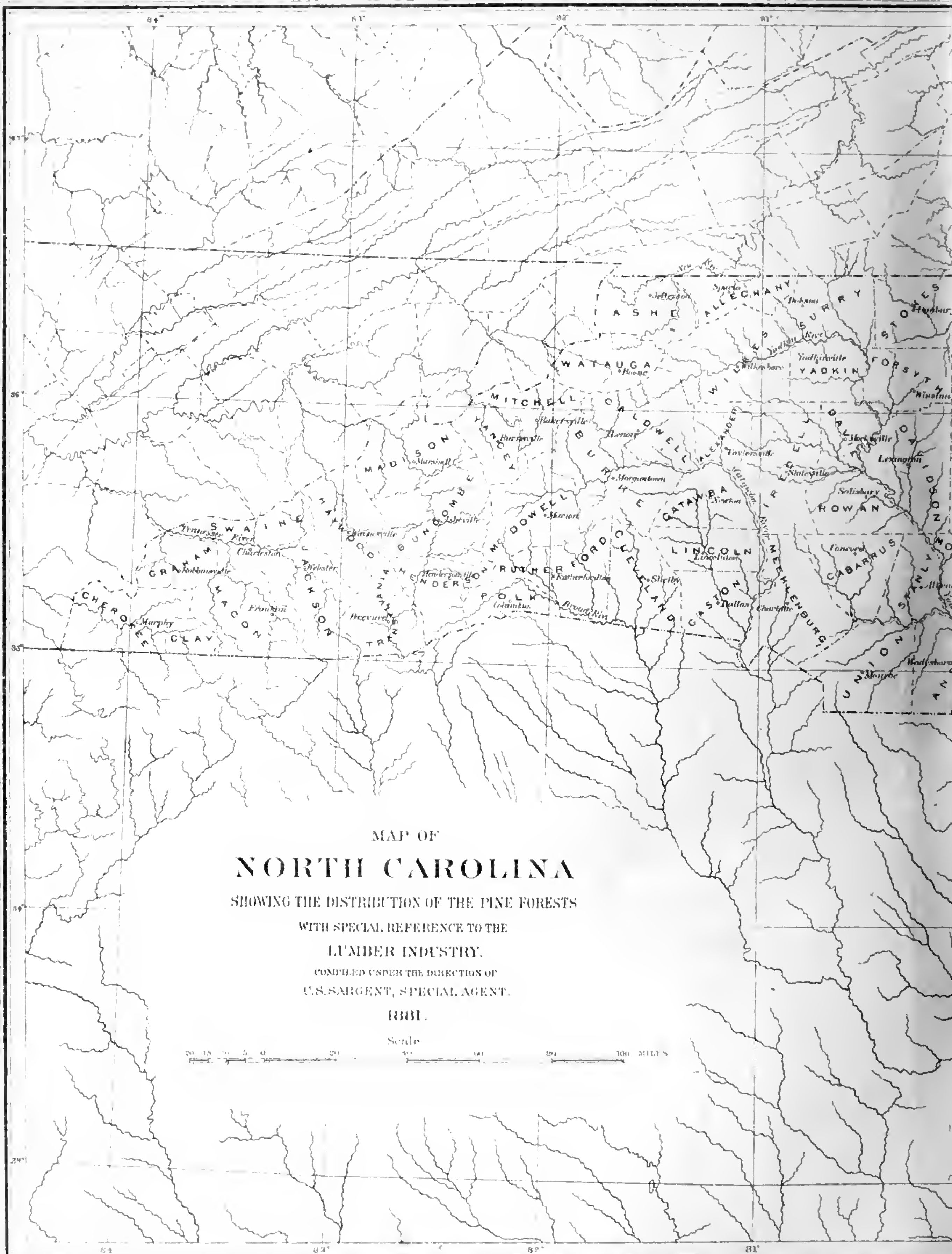
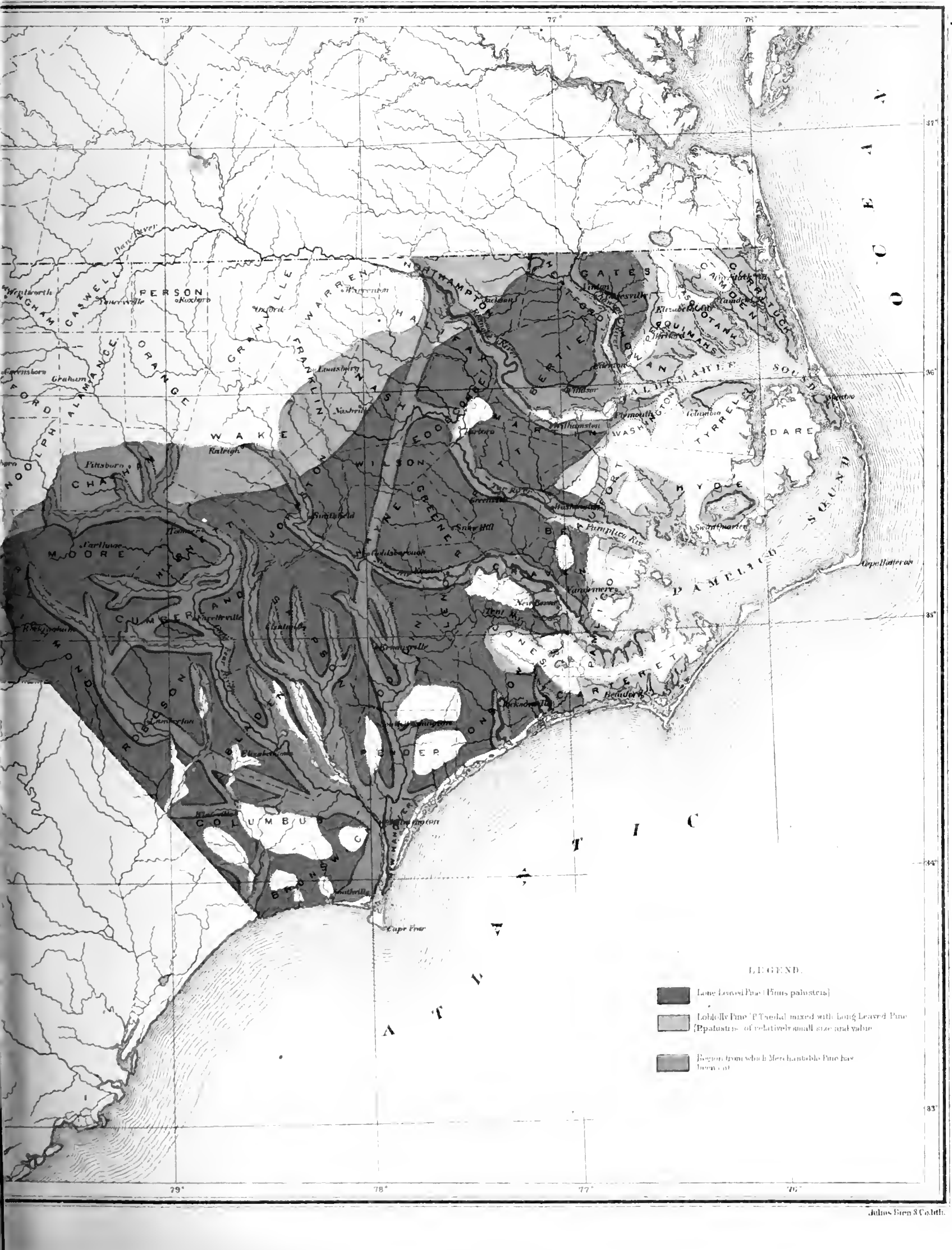

MAP OF
NORTH CAROLINA
SHOWING THE DISTRIBUTION OF THE PINE FORESTS
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C.S.SARGENT, SPECIAL AGENT.
1881.
Scale
MILES
ASHE
ALLEGHANY
SURRY
STOKES
WATAUGA
YADKIN
FORSYTH
WILKES
MITCHELL
CALDWELL
ALEXANDER
IREDELL
DAVIE
YANCEY
MADISON
BURKE
DAVIDSON
ROWAN
CATAWBA
McDOWELL
BUNCOMBE
HAYWOOD
SWAIN
GRAHAM
JACKSON
MACON
CHEROKEE
CLAY
HENDERSON
TRANSYLVANIA
RUTHERFORD
POLK
CLEVELAND
LINCOLN
GASTON
MECKLENBURG
CABARRUS
STANLY
UNION

5142



Julius Bien & Co. lith.

"The valley of the New river is only lumbered for from 3 to 5 miles from the stream, although the walnut has been gathered 10 miles farther back. This is a rough country in which to lumber, since the streams cut deep into the earth, and New river cannot be driven.

"Ronceverte is situated on the Greenbrier river at the point where the Chesapeake and Ohio railroad first meets this stream as it descends from the Alleghany mountains. Here is the boom of the Saint Lawrence Boom Company, and here are located three or four lumber firms operating steam-mills. One of these, the New York Hoop Company, uses two million hoop-poles per annum, chiefly hickory, manufacturing hoops for flour barrels, pork barrels, hogsheads, and tierces, besides strips for boxes, etc. The process of manufacturing hoops was explained to me as follows: The poles, of assorted lengths and sizes, are passed through machines which split each of them into two, three, or four pieces, and these are put through other machines which plane flat the inner side of each strip, leaving the bark intact. The hoops thus made are tied into bundles and shipped to New York.

"The Greenbrier river rises in the limestone sinks in Randolph county, whence it flows southwesterly through the fertile limestone valley between the Alleghany and the Greenbrier mountains for a distance of 120 miles, emptying into the New river at Hinton. Flowing through such a valley it is not a rapid stream, but from a point 12 miles below Travelers' Rest, on its headwaters, it is fine for rafting. Yet the stream needs some improvement, especially by the closing up of back channels into which the logs are borne by high water, to be left in swamps when the flood recedes.

"Only a small proportion of the timber of the Greenbrier river has been removed as yet, and it is estimated that in its valley white oak, white pine, poplar, cherry, hemlock, walnut, and ash enough remain to make 1,000,000,000 feet of boards, and that there are not less than 500,000,000 feet of white pine in this region, occupying a belt through the center of both Greenbrier and Pocahontas counties. The eastern limit of the black-spruce belt on the headwaters of the Elk and Gauley rivers, the most extensive and valuable in West Virginia, coincides with the western limits of the white-pine belt lying in Pocahontas county. Its southern line runs northwesterly from the south end of Pocahontas to near the center of Nicholas county. From this point its western line runs northeasterly through the center of Webster county to the vicinity of Huttonville, in Randolph county, the northern end of the belt covering the upper waters of Shaver's Fork of the Cheat river. Over this belt black spruce is scattered more or less densely, sometimes occupying almost exclusively the high slopes, particularly the northern slopes and the summits of the mountains.

"It is believed that 10,000,000 feet of black walnut, in paying quantities, could still be gathered in this part of the state, and that there would then be left an equal amount so scattered that it could not be profitably collected at present prices."

NORTH CAROLINA.

The forests of North Carolina were once hardly surpassed in variety and importance by those of any other part of the United States. The coast region was occupied by the coniferous forests of the southern Maritime Pine Belt; the middle districts of the state by a forest of oaks and other hard-wood trees, through which the old-field pine is now rapidly spreading over worn-out and abandoned farming lands. The high ridges and deep valleys of the Appalachian system which culminate in the western part of the state are still everywhere covered with dense forests of the most valuable hard-wood trees mingled with northern pines and hemlocks. The inaccessibility of this mountain region has protected these valuable forests up to the present time, and few inroads have yet been made into their stores of oak, cherry, yellow poplar, and walnut. The hard-wood forests of the middle districts, however, have been largely removed or culled of their finest timber, although the area of woodland in this part of the state is now increasing. These new forests, usually composed of inferior pine, are of little economic value, except as a source of abundant fuel and as a means of restoring fertility to the soil, preparing it to produce again more valuable crops. A larger proportion of the pine forest of the coast has been destroyed in North Carolina than in the other southern states. This part of the state has long been the seat of important lumbering operations, while the manufacture of naval stores, once almost exclusively confined to North Carolina, and always an important industry here, has seriously injured these forests. The original forests have been practically removed from the northeastern part of the state, the great region watered by the numerous streams flowing into Albemarle and Pamlico sounds; and although some lumber, largely second-growth pine trees of poor quality, is produced here, the importance of these forests is not great. The merchantable pine, too, has been removed from the banks of the Cape Fear and other rivers flowing through the southern part of the state, and although these streams still yield annually a large number of logs, they are only procured at a constantly increasing distance from their banks and with a consequent increasing cost for transport.

Forest fires inflict serious damage upon the pine forests of the south. During the census year 546,102 acres of woodland were reported destroyed by forest fires, with a loss of $357,980. The largest number of these fires were traced to the carelessness of farmers in clearing land, to locomotives, hunters, and to malice.

Manufacturers of cooperage and wheel stock, industries which once flourished in the eastern and central portions of the state, already suffer from the exhaustion and deterioration of material. Such industries, however, are increasing in the extreme western counties, and promise to attain there an important development.

The following estimate, by counties, of the merchantable pine standing May 31, 1880, south of the Neuse river, the only part of the state where it is of commercial importance, was prepared by Mr. Edward Kidder, of Wilmington. It is based upon actual surveys and the reports of a large number of timber-land experts familiar with the different counties still occupied by the forests of long-leaved pine:

LONG-LEAVED PINE (*Pinus palustris*).

Counties.	Feet, board measure.
Bladen	288,000,000
Brunswick	141,000,000
Chatham	448,000,000
Columbus	288,000,000
Cumberland	806,000,000
Duplin	21,000,000
Harnett	486,000,000
Johnston	563,000,000
Moore	504,000,000
New Hanover	96,000,000
Onslow	34,000,000
Robeson	864,000,000
Sampson	602,000,000
Wake	48,000,000
Wayne	40,000,000
Total	5,229,000,000
Cut for the census year ending May 31, 1880, exclusive of 50,190,000 feet cut in the counties adjacent to Albemarle and Pamlico sounds and along the Pamlico and Neuse rivers, which is largely loblolly pine (*Pinus Tæda*).	108,411,000

NAVAL STORES.

Small quantities of crude turpentine were produced upon the coast of North Carolina, between the Pamlico and Cape Fear rivers, soon after the earliest settlement of the country. It was sent to Great Britain or converted into spirits of turpentine and rosin for home consumption. The demand for ships' stores had greatly increased the North Carolina production as early as 1818, although the field of operations was not extended south of the Cape Fear river, nor more than 100 miles from the coast, until 1836. The large demand for spirits of turpentine created during that year induced manufacturers to test the yield of trees on the west side of the Cape Fear river, up to that time considered unproductive. The result was satisfactory, although overproduction and low prices deferred until 1840 the development of this region. Since 1840 this industry has been gradually carried southward. Naval stores were produced in South Carolina in 1840, and in Georgia two years later. Turpentine orchards were established in Florida and Alabama in 1855, and more recently in Mississippi and eastern Louisiana.

The naval stores manufactured in the United States are principally produced from the resinous exudations of the long-leaved pine (*Pinus palustris*), and in small quantities from the loblolly pine (*Pinus Tæda*), and the slash pine (*Pinus Cubensis*) of the Florida coast. The trees selected for "boxing" are usually from 12 to 18 inches in diameter, although trees with trunks only 8 inches through are now sometimes worked. A deep cut or "box" is made in the trunk of the tree, by a cut slanting downward, some 7 inches in depth, and generally 12 inches above the ground, and met by a second cut started 10 inches above the first and running down from the bark to meet it. In this manner a segment is removed from the trunk and a triangular trough formed 4 inches deep and 4 inches wide at the top.

Two such boxes, or upon a large trunk sometimes four, are made on each tree. A "crop", the unit of production among large operators, consists of 10,000 such boxes. The boxes are cut early in November with a narrow-bladed ax specially manufactured for the purpose, and the trees are worked on an average during thirty-two weeks. As soon as the upper surface of the box ceases to exude freely, it is "hacked" over and a fresh surface exposed, the dried resin adhering to the cut having been first carefully removed with a sharp, narrow, steel scraper. The boxes, especially after the first season, are often hacked as often as once a week, and are thus gradually extended upward until upon trees which have been worked during a number of seasons the upper surface of the box is often 10 or 12 feet above the ground. For these long boxes the scraper is attached to a wooden handle, generally loaded with iron at the lower end to facilitate the operation of drawing down the resin. Once in four weeks, or often less frequently, the resin caught in the bottom of the box is removed into a bucket with a small, sharp, oval steel spade attached to a short wooden handle. The product of these "dippings", as this operation is called, is placed in barrels and transported to the distillery. The first season a turpentine orchard is worked boxes are usually dipped eight times, yielding an average of 300 barrels of turpentine to the crop. The second year the number of dippings is reduced to five, the product falling off to 150 barrels, while for the third season 100 barrels are considered a fair yield from three dippings. To this must be added the yield of the "scrapes", which for the first year is estimated, for one crop, at from 60 to 70 barrels of 280 pounds each, and for succeeding years at 100 barrels.

Trees can be profitably worked in North Carolina by experienced operators during four or five years, or, upon a small scale, in connection with farming operations and by actual residents, several years longer; farther south the trees seem to possess less recuperative power, and in South Carolina four years is given as the outside limit during which an orchard can be profitably worked, while in Georgia, Florida, and Alabama they are often abandoned at the end of the second and always at the end of the third year. Twenty-five men, including overseers, wagoners, distillers, coopers, and laborers can work ten crops. The average wages of such a force is $1 a day per man, so that the cost of labor necessary to work a crop during the season of thirty-two weeks is $480.

The following grades of turpentine are recognized in the trade: "Virgin dip", or "Soft white gum turpentine"—the product the first year the trees are worked; "Yellow dip"—the product of the second and succeeding years, and becoming darker colored and less liquid every year; "Scrape" or "Hard turpentine"—the product of the scrapings of the boxes.

Rosin is graded as follows: "W"—Window-glass; "N"—Extra pale; "M"—Pale; "K"—Low pale; "I"—Good No. 1; "H"—No. 1; "G"—Low No. 1; "F"—Good No. 2; "E"—No. 2; "D"—Good strain; "C"—Strain; "B"—Common strain; "A"—Black.

Window-glass is the lightest grade, and is only produced from the first dippings of "virgin" trees—that is, trees worked for the first time. The resinous exudation becomes darker colored and less volatile every year, as the box grows older, and the rosin produced is darker and less valuable. Trees worked during several years produce a very dark brown or black rosin. Spirits of turpentine made from virgin trees is light colored, light in weight, and free from any taste; the resinous matter yielded in succeeding years gains more and more body, and the additional heat required in distilling it throws off some resin combined with the spirits, producing in it a strong, biting taste and greater weight.

Tar, produced by burning the dead wood and most resinous parts of the long-leaved pine in covered kilns, is graded as follows: "Rope yellow", or Ropemakers' tar—the highest grade, produced with a minimum of heat from the most resinous parts of the wood; "Roany," or "Ship smearing"—the next running of the kiln; "Black" or "Thin"—the lowest grade, made from inferior wood, or the last running of the kiln, and therefore produced with the maximum of heat.

The following statistics of the production of naval stores during the census year were prepared by Mr. A. H. Van Bokkelen, of Wilmington, North Carolina, to whom I am indebted for much information in regard to the methods used in carrying on this industry:

States.	Turpentine.	Rosin.
	Gallons.	*Barrels.*
Alabama	2,005,000	158,482
Florida	1,036,350	68,281
Georgia	3,151,500	277,500
Louisiana	250,000	20,000
Mississippi	250,000	20,000
North Carolina	6,279,200	663,967
South Carolina	4,593,200	333,940
Total	17,565,250	1,542,170

Eighty thousand barrels of tar were manufactured during the census year in North Carolina, and 10,000 barrels in the other southern states.

The total value of this crop of naval stores at centers of distribution, and of course including freight from the forest and different brokerage charges, was not far from $8,000,000. The net profits of the industry, even in the case of virgin trees, is very small, and at present prices is believed to be unprofitable except to the most skillful operators. The low price of southern timber-lands and the facility with which rights to operate tracts of forest for turpentine have been lately obtainable in several states have unnaturally stimulated production. The result of this has been that manufacturers, unable to make a profit except from virgin trees, abandon their orchards after one or two years' working and seek new fields of operation; the ratio of virgin forest to the total area worked over in the production of naval stores is therefore constantly increasing. It is estimated by Mr. Van Bokkelen that during the years between 1870 and 1880 an average of one-third of the total annual product of the country was obtained from virgin trees, and that in 1880 one-fourth of the crop was thus produced, necessitating the boxing in that year of the best trees upon 600,000 acres of forest. The production of naval stores is carried on in a wasteful, extravagant manner, and the net profits derived from the business are entirely out of proportion to the damage which it inflicts upon the forests of the country; the injury is enormous. Lumber made from trees previously worked for turpentine is of inferior quality, although it is probably less injured than has been generally supposed. Comparatively few trees, however, once boxed are manufactured into lumber. It is estimated that 20 per cent. of them, weakened by the deep gashes inflicted upon their trunks, sooner or later are blown down and ruined; fires, too, every year destroy vast areas of the turpentine orchards, in spite of the care taken by operators to prevent their spread. It is customary in the winter, in order to prevent the fires which annually run through the forests of the Southern Pine Belt from spreading to the boxes, to "racket" the trees; that is, to remove all combustible material for a distance of 3 feet around the base of each boxed tree. Fire, carefully watched, has then been set to the dry grass between the trees, in order to prevent the spread of accidental conflagrations, and to give the box-choppers a firmer foothold than would be offered by the dry and slippery pine leaves. In spite of these precautions, however, turpentine orchards, especially when abandoned, are often destroyed by fire. The surface of the box, thickly covered with a most inflammable material, is easily ignited, and a fire once started in this way may rage over thousands of acres before its fury can be checked.

The manufacture of naval stores, then, decreases the value of the boxed tree for lumber, reduces the ability of the tree to withstand the force of gales, and enormously increases the danger to the forest of total destruction by fire.

Wilmington, the most important distributing point for this industry in the United States, handles 80 per cent. of all the naval stores manufactured in North Carolina. Previous to 1870 Swansboro', Washington, and New Berne were also large shipping points.

SOUTH CAROLINA.

The forest covering of South Carolina resembles in its general features that of the states immediately north and south of it. The pine forest of the coast, nearly coinciding in area with that of the Tertiary deposits, covers the eastern portion for a distance of 150 miles from the coast. The middle districts are occupied with hard-wood forests, or forests in which pines of various species are mixed with oaks, hickories, and other deciduous trees. The forests of the Alleghanies, rich in species and magnificent in the development of individual trees, spread over the mountains and valleys, which occupy the extreme western part of the state. The streams which flow through the Coast Pine Belt, often bordered by wide, deep swamps, are ill-suited to lumber operations, and less serious inroads have therefore been made into the pine forests of South Carolina than into those of North Carolina or Georgia. The merchantable pine, however, has been removed from the immediate neighborhood of the coast, from the banks of the Little Pedee river, and from along the lines of railroad.

The most accessible hard-wood timber has been cut from the forests of the middle districts, although vast quantities still remain remote from railroads or protected in deep river swamps, inaccessible except during a few months of summer. The western counties still contain great bodies of hard-wood timber, yet undisturbed except to supply the wants of the scattered population inhabiting this almost inaccessible mountain region.

The manufacture of rough red and white oak split staves and headings for the European and West Indian trade, already an important industry in this state, is capable of large development; rice tierces and rosin barrels are also largely made in the coast region from pine. At Plantersville, in Georgetown county, and at other points along the coast quantities of hand-made cypress shingles are manufactured in the swamps.

During the census year 431,730 acres of woodland were reported destroyed by forest fires, with a loss of $291,225. These fires were set by careless hunters, by the careless burning of brush upon farms, and by sparks from locomotives.

BURNING OFF DEAD HERBAGE.

The pine belt of the coast, in South Carolina as well as through its entire extent from Virginia to Texas, suffers from fires set every spring by grazers for the purpose of improving the scanty herbage growing among the trees of this open forest. These fires run rapidly over the surface stripped by the fires of previous years of any accumulation of vegetable material, without inflicting any immediate injury upon the old trees of the forest unless a turpentine orchard is encountered, when, the resinous surfaces of the boxes being once fully ignited, nothing can save the trees from total destruction. If the mature trees of the forest are not under normal conditions greatly injured, however, by this annual burning of the dead herbage beneath them, the forest itself, as a whole, suffers enormously from this cause. Slight and short-lived as these fires are, they destroy the vegetable mold upon the surface of the ground, all seeds and seedling trees, and all shrubbery or undergrowth, which, in protecting the germination of seeds, insures the continuation of the forest. They deprive the soil of fertility and make it every year less able to support a crop of trees, and in thus robbing the soil they influence largely the composition of succeeding crops. Few young pines are springing up anywhere in the coast region to replace the trees destroyed, but where seedlings protected from fire appear upon land long subjected to annual burning, they are usually, although not universally, of less valuable species, and not the long-leaved pine which gives to this forest its principal economic importance. These annual fires are slowly but surely destroying the value of the Southern Pine Belt. They destroy all seeds and seedling trees, the fertility of the soil, and its power to produce again valuable species.

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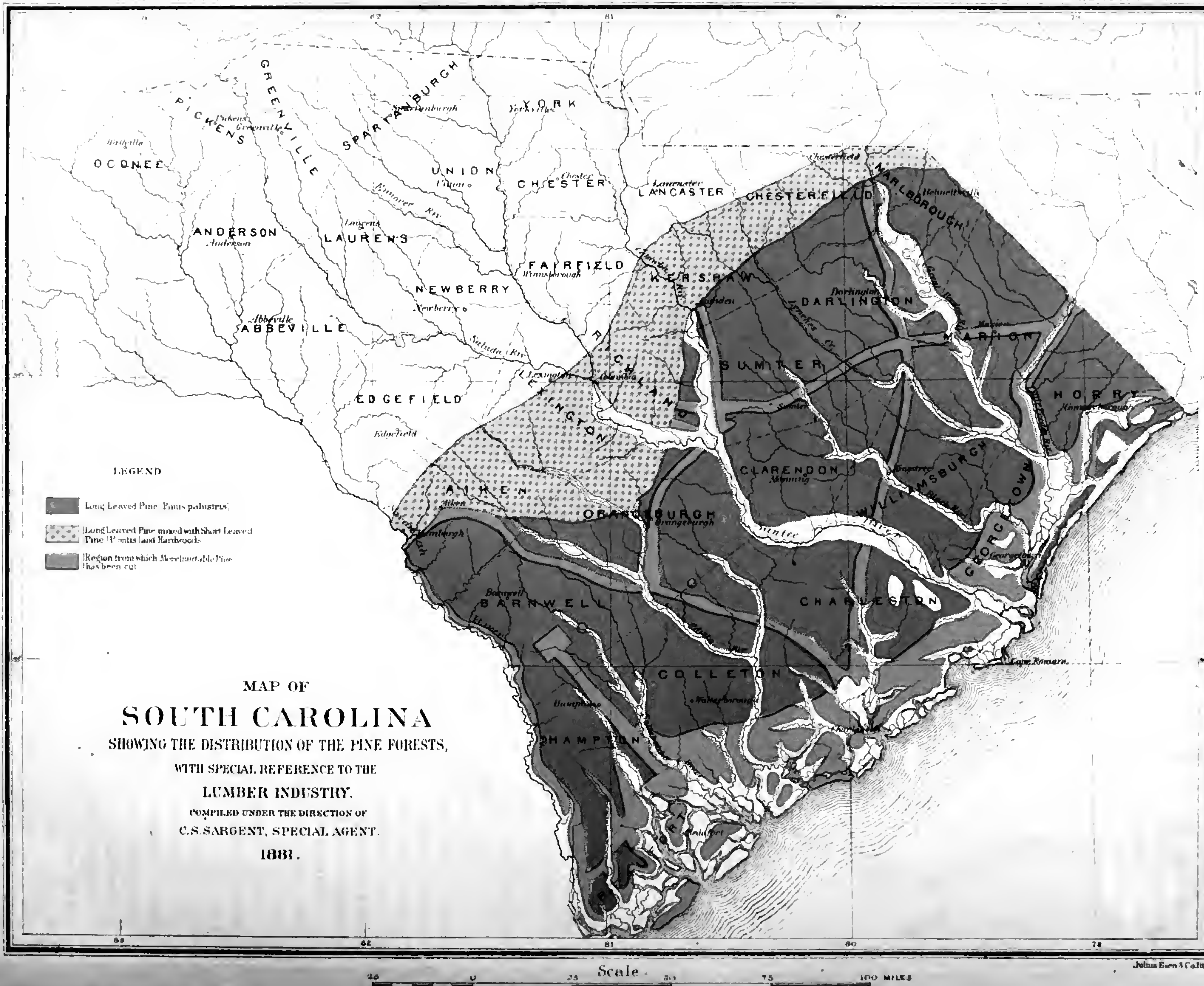
SOUTH CAROLINA GEORGIA FLORI


CHARLESTON
BARNWELL
ORANGEBURGH
HAMPTON
BULLOCH
WASHINGTON
TATNALL
APPLING
GADSDEN
LEON
MADISON
WAKULLA
COLQUITT
MARION
SUMTER
HILLSBOROUGH
BREVARD
MONROE
DADE
BAY OF FLORIDA

ALABAMA MI


LEGEND
Long Leaved Pine (Pinus palustris)
Long Leaved Pine mixed with Short Leaved Pine (P. mitis) and Hardwoods
Region from which Merchantable Pine has been cut
MAP OF
SOUTH CAROLINA
SHOWING THE DISTRIBUTION OF THE PINE FORESTS,
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C.S.SARGENT, SPECIAL AGENT.
1881.
OCONEE
PICKENS
GREENVILLE
SPARTANBURGH
YORK
UNION
CHESTER
LANCASTER
CHESTERFIELD
MARLBOROUGH
ANDERSON
LAURENS
FAIRFIELD
KERSHAW
DARLINGTON
NEWBERRY
ABBEVILLE
MARION
SUMTER
RICHLAND
EDGEFIELD
LEXINGTON
HORRY
CLARENDON
WILLIAMSBURGH
AIKEN
ORANGEBURGH
GEORGETOWN
BARNWELL
CHARLESTON
COLLETON
HAMPTON
Cape Romain
Scale
25 0 25 50 75 100 MILES
Julius Bien & Co.lith

The following estimates of the amount of long-leaved pine standing in the state were made up from information obtained from Mr. Edward Kidder, of Wilmington, North Carolina, in regard to that part of the state north of the Edisto river, and from Mr. W. G. Norwood, of Blackshear, Georgia, for the southern part of the state. They are based on what is believed to be less accurate information respecting the northern part of the state than has been obtained in regard to the pine forests of the other states, and allowance should be made for possible large errors. The estimates are, however, probably largely below the actual productive capacity of the pine forests of the state which may be expected to exceed by 25 or 30 per cent. the following figures:

LONG-LEAVED PINE (*Pinus palustris*).

Counties.	Feet, board measure.	Counties.	Feet, board measure.
Aiken	209,000,000	Kershaw	171,000,000
Barnwell	340,000,000	Lancaster	5,000,000
Beaufort	49,000,000	Lexington	76,000,000
Charleston	458,000,000	Marion	326,000,000
Chesterfield	183,000,000	Marlborough	191,000,000
Clarendon	332,000,000	Orangeburgh	465,000,000
Colleton	453,000,000	Richland	88,000,000
Darlington	337,000,000	Sumter	380,000,000
Fairfield	7,000,000	Williamsburgh	536,000,000
Georgetown	128,000,000		
Hampton	202,000,000	Total	5,316,000,000
Horry	380,000,000	Cut for the census year ending May 31, 1880	124,492,000

The principal centers of lumber manufacture are Georgetown, Charleston, and various points in Hampton and Barnwell counties, where small railroad mills are located. Charleston and Georgetown are the distributing centers for naval stores manufactured in the state.

GEORGIA.

The northern counties of Georgia are covered with the forests of the Alleghany Mountain region, here and in northern Alabama reaching the southern limits of their distribution and considerably reduced in the number of species composing them, the pines, firs, beeches, and other northern trees being generally replaced by the broad-leaved species of the Mississippi basin. From the base of the mountains forests of oak mixed with pines extend southward, occupying the central portion of the state and mingling with the trees of the Maritime Pine Belt along its northern limits. In the southern and coast counties great areas of swamps are still covered with forests of cypress, protected by their inaccessibility from the attacks of the lumberman.

The merchantable pine in the immediate vicinity of the principal streams and along the lines of railroad has been removed, and serious damage has been inflicted upon the pine forests of the state by the reckless manufacture of naval stores. Vast areas covered with pine, however, still remain, while the hard-wood forests of the central and northern portions of the state contain a large quantity of the most valuable hard woods.

The manufacture of cooperage stock is still in its infancy, and this and other industries requiring an abundant and cheap supply of hard wood seem destined soon to reach an enormous development in the upper districts of Georgia and the other states of the south Atlantic division.

During the census year 705,351 acres of woodland were reported devastated by fire, with a loss of $167,620. The greatest number of these fires was traced to carelessness in clearing land, to sparks from locomotives, and to hunters.

The following estimates of the amount of long-leaved pine standing in the state of Georgia May 31, 1880, were prepared by Mr. W. G. Norwood, of Blackshear, in that state, a timber viewer and expert of high standing. He obtained his results by dividing the whole pine belt into irregular regions over which the average cut per acre could be obtained, allowance being made for clearings, farms, areas of culled forests, streams, swamps, etc. The area in each of these regions, by counties, was measured upon a large-scale map and the standing timber computed. These estimates include merchantable pine still standing on land partly cut over, or which has been worked in the manufacture of turpentine. The boxed areas include nearly all the regions from which any pine has been removed, and extend beyond them in all directions into the uncut forests and along rivers and railroads.

Similar methods, practically, were adopted in preparing the estimates of the amount of pine standing in Florida and the other Gulf states. The results thus obtained are not, of course, strictly accurate, and are not supposed to be so. The estimates are intended to show the average productive capacity of the pine forests over large areas, and to indicate generally in what part of the state the principal bodies of pine still occur. Liberal allowance has been made in computing areas of swamp and cleared land, and it will probably be safe to add 10 per cent. to these estimates of the pine standing in any of the southern states.

The following is an estimate of the amount of pine timber standing in the state May 31, 1880:

LONG-LEAVED PINE (*Pinus palustris*).

Counties.	Feet, board measure.	Counties.	Feet, board measure.	Counties.	Feet, board measure.
Appling	543,000,000	Floyd	19,000,000	Polk	36,000,000
Baker	134,000,000	Glascock	17,000,000	Pulaski	408,000,000
Baldwin	35,000,000	Glynn	47,000,000	Randolph	126,000,000
Berrien	410,000,000	Hancock	76,000,000	Richmond	21,000,000
Bibb	38,000,000	Haralson	21,000,000	Schley	28,000,000
Brooks	281,000,000	Harris	22,000,000	Screven	188,000,000
Bryan	60,000,000	Houston	101,000,000	Sumter	101,000,000
Bulloch	733,000,000	Irwin	488,000,000	Talbot	44,000,000
Burke	298,000,000	Jefferson	206,000,000	Tattnall	768,000,000
Calhoun	117,000,000	Johnson	291,000,000	Taylor	53,000,000
Camden	82,000,000	Jones	40,000,000	Telfair	598,000,000
Charlton	240,000,000	Laurens	1,064,000,000	Terrell	104,000,000
Clay	96,000,000	Lee	128,000,000	Thomas	311,000,000
Clinch	350,000,000	Liberty	236,000,000	Twiggs	84,000,000
Coffee	578,000,000	Lowndes	236,000,000	Upson	32,000,000
Colquitt	339,000,000	McDuffie	10,000,000	Ware	161,000,000
Crawford	45,000,000	McIntosh	65,000,000	Warren	80,000,000
Decatur	653,000,000	Macon	52,000,000	Washington	240,000,000
Dodge	417,000,000	Miller	164,000,000	Wayne	160,000,000
Dooly	334,000,000	Mitchell	379,000,000	Webster	48,000,000
Dougherty	90,000,000	Monroe	18,000,000	Wilcox	292,000,000
Early	299,000,000	Montgomery	791,000,000	Wilkinson	152,000,000
Echols	183,000,000	Muscogee	35,000,000	Worth	512,000,000
Effingham	6,000,000	Paulding	2,000,000	Total	16,778,000,000
Emanuel	956,000,000	Pierce	220,000,000		
Cut for the census year ending May 31, 1880 (excluding 28,335,000 feet cut in the region of short-leaved pine and mixed growth).					272,743,000

The principal centers of lumber manufacture are situated along the coast at Brunswick, Darien, Savannah, and Saint Mary's. Logs sawed at these points are now driven down the various streams for a considerable distance from the coast. Large quantities of pine lumber are also manufactured in different mills located along the lines of railroad in Appling, Polk, Floyd, and other pine counties. Savannah and Brunswick are the principal points of distribution of the naval stores manufactured in the state.

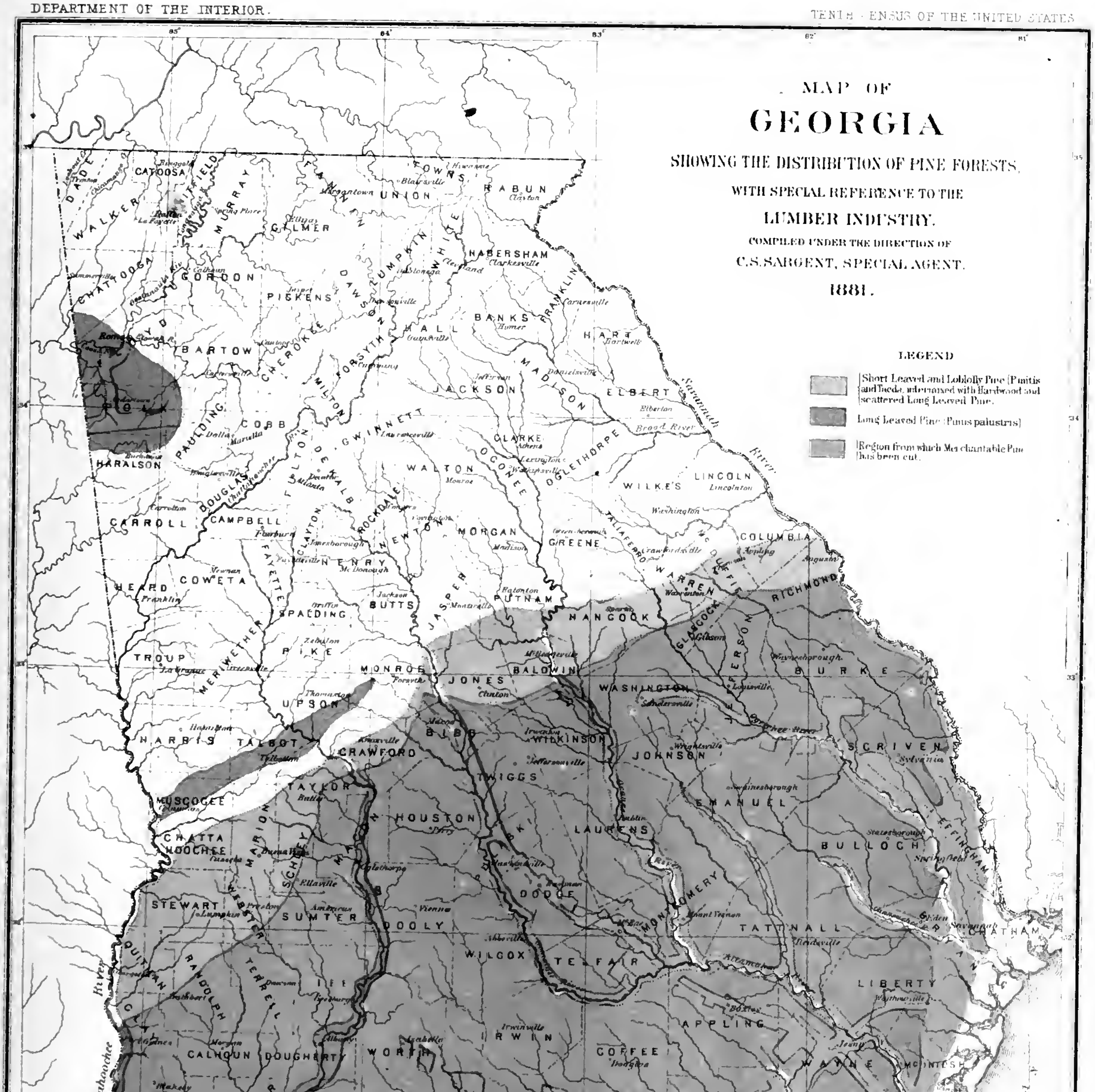
FLORIDA.

The forests of the Southern Pine Belt cover the state as far south as cape Malabar and Charlotte harbor. The long-leaved pine is replaced along the sandy dunes and islands of the coast by oaks (of which the live oak is alone of commercial importance), scrub pines, and palmettos, while a deciduous forest, largely of northern composition, occupies the high, rolling lands in a large part of Gadsden, Leon, Jefferson, and Madison counties. The pine forests gradually decrease southward in density and value, and south of latitude 29° N. are of little present commercial value. Forests of pitch pine (*Pinus Cubensis*), however, extend far south of the region occupied by the more valuable long-leaved pine bordering the coast and covering the low ridges of the Everglades. Great areas of swamp occur everywhere through northern and central Florida, covered with forests of cypress, red cedar, gum, and bordered with bays, magnolias, and other broad-leaved evergreens; while the hummocks or low elevations, covered with rich soil and everywhere common, bear oaks and other deciduous trees, often of great size.

South of cape Malabar and Tampa bay the character of the vegetation changes, and the North American arborescent species are replaced by the semi-tropical trees of the West Indies. These occupy a narrow strip along the coast, cover the keys and reefs, and spread over some of the hummocks of the Everglades. This semi-tropical forest is confined to the saline shores of the innumerable bays and creeks of the region, or to the coral and sedimentary calcareous formation of the keys and hummocks. The species of which it is composed are here at the northern limits of their range; individual trees are comparatively small and the forests of the southern extremity of the Florida peninsula are commercially unimportant, although sufficiently extensive and varied to supply the scanty population of this region with lumber, fuel, and material for boat-building and the manufacture of fishing apparatus.

The forests of Florida have not suffered greatly from fire. Much of the state is uninhabited and unfit for agriculture or grazing. The danger, therefore, of fires set in clearing land for farms spreading to the forest is less than in other parts of the south, while the numerous streams and swamps everywhere intersecting the pine forests and the natural dryness of the sandy ridges, thinly covered with vegetable mold, check the spread of fires when started.

During the census year 105,320 acres of woodland were reported as burned over, with an estimated loss of $69,900. The largest number of these fires was set by grazers to improve the pasturage for their stock.



Scale
25 0 25 50 75 100 MILES

Julius Bien & Co. lith.

The following estimates, by counties, of the long-leaved pine still standing in Florida east of the Apalachicola river were prepared by Mr. A. H. Curtiss, of Jacksonville; those for west Florida by Dr. Charles Mohr, of Mobile, Alabama:

LONG-LEAVED PINE (*Pinus palustris*).

Counties.	Feet, board measure.	Counties.	Feet, board measure.	Counties.	Feet, board measure.
Alachua	525,000,000	Holmes	150,000,000	Putnam	121,000,000
Baker	144,000,000	Jackson	233,000,000	Saint John's	66,000,000
Bradford	138,000,000	Jefferson	23,000,000	Santa Rosa	213,000,000
Brevard	63,000,000	Lafayette	425,000,000	Sumter	103,000,000
Calhoun	81,000,000	Levy	346,000,000	Suwannee	622,000,000
Clay	77,000,000	Liberty	75,000,000	Taylor	218,000,000
Columbia	455,000,000	Madison	122,000,000	Volusia	59,000,000
Duval	67,000,000	Manatee	200,000,000	Wakulla	72,000,000
Escambia	90,000,000	Marion	315,000,000	Walton	409,000,000
Hamilton	311,000,000	Nassau	104,000,000	Washington	187,000,000
Hernando	142,000,000	Orange	87,000,000	Total	6,615,000,000
Hillsborough	102,000,000	Polk	210,000,000		
Cut for the census year ending May 31, 1881 (excluding 77,500,000 feet, estimated, grown in Alabama and sawed in western Florida).					208,054,000

In this estimate no account is made of timber remaining on lands which have been cut over, or of that injured by the manufacture of turpentine.

The principal centers of lumber manufacture are Pensacola, Millview, and Blackwater, in Escambia and Santa Rosa counties. The logs sawed here and at other points upon Pensacola bay are driven down the streams from the forests of Alabama, the accessible pine in this part of Florida having been long exhausted. A large amount of pine lumber is also manufactured at Ellaville, in Madison county, upon the upper Suwannee river, and at Jacksonville, Saint Mary's, and at various points upon the lower Saint John river. Logs driven from the lower Suwannee river are sawed at Cedar Keys, where are situated the most important mills in the United States devoted to the manufacture of red cedar into pencil stuff.

Jacksonville, Saint Mary's, and Fernandina are the largest centers of distribution for the naval stores manufactured in the state.

The following extracts are taken from Mr. Curtiss' report upon the forests of Florida:

"In visiting western Florida I have had particularly in view the examination of the timber of a part of the state which is unlike all others in physical conformation, and consequently in vegetation. This region differs but little from the country bordering the southern Alleghanies, and may perhaps be regarded as the southern terminus of the Appalachian range. It commences about 40 miles north of the Gulf of Mexico, and extends northward between the Chipola and Okalokonee rivers into southwestern Georgia and southeastern Alabama. North of this there is little to connect it with the southern mountains except the rugged banks of the Chattahoochee river. The surface is undulating, hilly, often precipitous. The soil, like that of the Piedmont region of Virginia and Carolina, abounds in red clay, and is therefore adapted to crops which do not succeed in other portions of Florida. The vegetation is extremely varied and interesting, comprising most of the plants of northeastern Florida, a large portion of those found in the Piedmont country and in the rich river bottoms of the interior, and a considerable number found only on the limestone with which much of this country is underlaid. In the river bottoms, which are inundated at seasons, there is found a great variety of trees, some of which attain a size probably not equaled elsewhere. In this small portion of the state of Florida is to be found nearly every species of tree growing within the limits of the state, except those semi-tropical species found on the coast south of Cedar Keys and Mosquito inlet. Fully fifty American arborescent species here reach their southern limit. A few species show marked diminution in size, and all northern species which extend southward of this Chattahoochee region here attain in Florida their largest dimensions.

"There are two trees in this region of particular interest, as they are not known to grow anywhere else; these are the stinking cedar (*Torreya taxifolia*) and the yew (*Taxus Floridana*). There is reason to believe that the *Torreya* occurs also along the Wakulla river, and perhaps elsewhere in the state, but there is no positive knowledge of its occurrence except along the Apalachicola river, on the limestone hills which border it at intervals on the east

"The forests of this region are still almost intact. Some poplar and tulip wood is cut from the river banks for northern markets, but the valuable timber on these rich shores is as yet almost untouched. The country southwest of this region, though of very little agricultural value, contains an immense quantity of the best cypress timber, hardly yet disturbed by the lumberman.

"Two mills have recently been established at Apalachicola, one of which saws nothing but cypress lumber. The product of this mill is sent to New Orleans. As white-pine lumber must soon become scarce, the attention of dealers ought to be directed to southern cypress, which will prove a good substitute for it. Although there is plenty of valuable pine in this country the swamps render it somewhat inaccessible, and the mills at Apalachicola are more easily supplied with logs rafted down the river from Georgia. Many hewed logs of large dimensions are shipped from this point. The country near Apalachicola in surface and timber growth is much like that of northeastern Florida, all the good timber having been cut.

"PENCIL CEDAR.

"The favorite variety of red cedar, of tall and straight growth, is becoming scarce, but there remains a large quantity of quality sufficiently good for pencils in nearly all sections of the state north of a line drawn from cape Canaveral to the north end of Charlotte harbor. There is no red cedar in southern Florida, the Dixon mill at Tampa having exhausted the supply within reach of that place; but new mills have been established near Webster, in Sumter county, and at the head of Crystal river, at present the best source of supply.

"CYPRESS.

"The main body of cypress in southern Florida is located in the 'Big Cypress', a region of which I have heard much from persons who were in an expedition which went through it during the last Indian war. They entered it at the 'Little Palm hummock', 18 miles northeast of cape Romano. Traveling east about 12 miles they came to the 'Big Palm hummock', when they turned and traveled nearly due north for six days, averaging 12 miles a day. Their guide then informed them that the cypress extended 12 miles farther north; so it would seem that the main body of the 'Big Cypress' has a length of about 85 miles and a width, as they think, of about 20 miles. The cypress grows in belts running north and south, the main central belt being about 6 miles wide and consisting of large timber. There are narrow strips of cypress and pine alternating with prairie, although probably two-thirds of the whole region is covered with cypress. According to these estimates there must be at least 1,000 square miles covered with cypress timber in this region, which in times of high water could be floated out by the numerous creeks and inlets flowing toward the Gulf. There are also large quantities of heavy cypress on the swampy borders of Peace creek, the Hillsborough river, the Withlacoochee, etc., many trees squaring from 2 to 4 feet.

"The long-leaved pine extends south to Prairie creek, in about latitude 27° N. The pine between Prairie and Peace creeks, which is sawed at the mill near Ogden, belongs to this species. Timber in this region is quite shaky, and from all reports it is evident that the yellow pine in Manatee, Orange, and Hillsborough counties is quite inferior, being mostly of the rough-barked, sappy variety called in this region bastard pine. The long-leaved pine occupies nearly the whole of the interior of the peninsula north of a line drawn from Charlotte harbor to cape Malabar. At its southern limit I saw trees which measured over 2 feet in diameter and which would furnish logs 30 feet long.

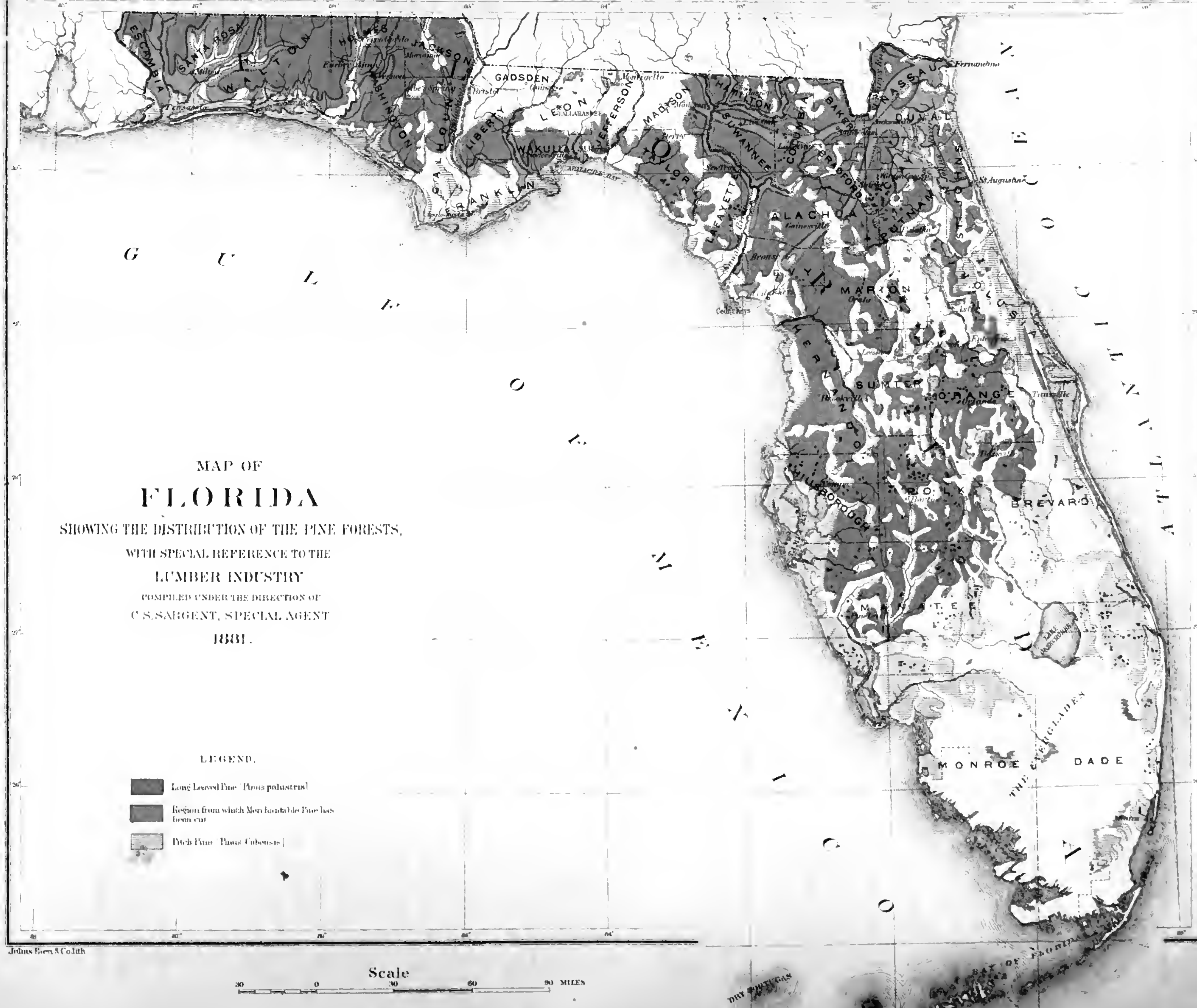
"Pitch pine (*Pinus Cubensis*) appears on the west coast at Margo, 10 miles north of cape Romano, and extends northward to Prairie and Fishhead creeks, being the only pine of this region. From Charlotte harbor northward it is confined to a belt from 10 to 15 miles wide, bordering the Gulf, extending to Tampa and as far northward as Pensacola, being also scattered through the interior. This tree seldom exceeds 2 feet in diameter or 50 feet in height, and will afford a great quantity of framing timber, although it will be probably generally used in the production of naval stores, for which it is nearly or quite equal to the long-leaved pine.

"One of the most important facts in regard to the pine forests of Florida is their permanence. Owing to the sterility of soil and the liability to inundation of most of the state, it is certain that but a very small portion of Florida will ever be cleared of its forest covering. Taking into consideration the great area covered with valuable pine forests, and the fact that there will be a continuous new growth if the spread of forest fires can be checked, only trees of the largest size being cut, it is evident that Florida will furnish a perpetual supply of the most valuable pine lumber."

The following notes upon the pine forests of western Florida were furnished by Dr. Charles Mohr, of Mobile, Alabama:

"The pine forests occupying the region between the valley of the Apalachicola river and the banks of the Choctawhatchee, and from the headwaters of the Chipola to the bay of Saint Andrew's, are yet mostly in their primeval condition and contain a vast body of valuable timber. The district between the Choctawhatchee and the Perdido is the seat of the oldest and most active lumbering industry of the whole Gulf coast. The numerous streams flowing through the pine forests of eastern Alabama to the large bays upon the coast of western Florida make fully 4,000 square miles of southeastern Alabama comparatively accessible and tributary to the region from which the lumber finds an outlet by way of the bay of Pensacola.

"The better class of the somewhat elevated and undulating timber-lands which surround Escambia, Blackwater, and Saint Mary de Galves bay were long since stripped of their valuable timber. These forests having been culled time after time during the last quarter of a century, are now completely exhausted. The low, wet pine barrens, with their soil of almost pure sand, which trend eastward along the shores of Santa Rosa sound and Choctawhatchee bay, have never borne a growth of pine sufficiently large to furnish more than a small supply of timber of very inferior quality. The ridges between the Choctawhatchee river and the Yellow river are also, for the most part, arid, sandy wastes, never yielding more than a few hundred feet of lumber per acre.



MAP OF
FLORIDA
SHOWING THE DISTRIBUTION OF THE PINE FORESTS,
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1881.
LEGEND.
Long Leaved Pine (Pinus palustris)
Region from which Merchantable Pine has been cut
Pitch Pine (Pinus Cubensis)
GULF OF MEXICO
ATLANTIC OCEAN
ESCAMBIA
SANTA ROSA
WALTON
HOLMES
JACKSON
WASHINGTON
CALHOUN
GADSDEN
LIBERTY
FRANKLIN
LEON
WAKULLA
JEFFERSON
MADISON
TAYLOR
LAFAYETTE
HAMILTON
SUWANNEE
COLUMBIA
BAKER
NASSAU
DUVAL
BRADFORD
CLAY
ST. JOHNS
PUTNAM
ALACHOA
MARION
LEVY
VOLUSIA
SUMTER
ORANGE
HERNANDO
POLK
HILLSBOROUGH
BREVARD
MANATEE
MONROE
DADE
THE EVERGLADES
DRY TORTUGAS
Julius Bien & Co. lith
Scale
30 0 30 60 90 MILES

"The well-timbered portion of west Florida commences with the southern border of Holmes county. This region is now, however, nearly exhausted along water-courses large enough for rafting, while of late years canals and ditches dug into the forest afford facilities for floating timber growing remote from streams to the mills. According to those best informed regarding the amount of timber still standing in this section, there is scarcely enough left between the Escambia and Choctawhatchee rivers, in western Florida, to keep the mills on the coast supplied for another half-dozen years, even if the whole of the pine standing could be made available.

"The lumber business of Perdido bay is entirely concentrated at Millview, where three large saw-mills are established. The production of lumber commenced here in 1865, increasing rapidly from 10,000,000 feet, board measure, in that year, to three and four times that amount. All the lumber manufactured upon Perdido bay is sent to Pensacola by a railroad constructed for the purpose. Only about 400 pieces of hewed timber are shipped from Millview, although the railroad has carried an average of 37,000,000 feet of lumber annually to Pensacola, the maximum annual yield of the Millview mills having been 45,000,000 feet.

"Pensacola is the most important port of lumber export on the Gulf coast. During the year ending August 30, 1879, 403 vessels, of a combined capacity of 217,487 tons, carried from the harbor of Pensacola 3,090,469 cubic feet of hewed square timber, 3,769,527 cubic feet of sawed square timber, and 60,000,000 feet of sawed lumber, board measure. Of the squared timber four-fifths is shipped to Great Britain.

"The peninsula between the junction of the Escambia and the bay of Saint Mary de Galves is low, and, along the shore-line, bordered with marshes. The timber needed to supply the mills located upon the shores of these waters has during the past forty years been drawn from this region, and when new forests have replaced the original growth they have been cut over and over again, and still furnish a small amount of timber, as the turpentine-distiller has not followed the log-getter in these regions. The supply of timber here, however, at present is too small to be taken into account in view of the enormously increased demands of the mills. There are three large mills on Blackwater bay producing 40,000,000 feet of lumber a year. Three-fourths of this lumber is produced in the establishment of Messrs. Simpson & Co., near the mouth of the Blackwater river, at Bagdad, about half a mile below Milton. Mills sawing square timber are situated 20 or 30 miles above the mouth of the Blackwater and use mostly water-power. The mill of Messrs. Milligan, Chaffin & Co., on this river, 20 miles above Milton, sends 28,000 pieces of square sawed timber to Pensacola, averaging 32 cubic feet each; 5,000 such pieces are furnished by a few very small water-mills higher up, swelling the whole amount of square timber to 33,000 pieces. The last-named firm has acquired by purchase large tracts of public land along Black and Coldwater rivers. To reach the timber growing on their land a canal 20 miles long, with sluices that intersect the small tributaries of these streams, has been dug. By means of this canal a sufficient supply of logs is secured to keep the mill running through the year. The large manufacturers of Bagdad have adopted a similar system, and by these means, and by the construction of tramways tapping the more remote and isolated regions tributary to the waters of Black and Yellowwater rivers toward the northern part of the state, the exhaustion of the timber-lands through the whole breadth of western Florida, as far as the banks of the Choctawhatchee river, will certainly be accomplished before the end of the next five years. A sash, door, and blind factory located at Bagdad consumes a large amount of cypress lumber. This is procured from the mills situated along the shores of the upper Choctawhatchee bay, and is grown along the banks of the Choctawhatchee river. The cypress lumber is exclusively used in the manufacture of sashes, blinds, doors, moldings, and particularly in the construction of houses, of which every year a considerable number is shipped by the way of New Orleans to the treeless regions of western Louisiana and Texas. This establishment manufactures a large amount of fencing, the rails of cypress, the posts of red and white cedar, rounded and capped. This is shipped to New Orleans and to the settlements in southern Florida. Of late years it has commenced sawing pencil-boards of red cedar. The logs, of very superior quality, are obtained from the hummocks and bottom lands bordering upon the Choctawhatchee. The lumber for this purpose must be entirely free from knots, of even, close grain, the woody fibers perfectly straight. These logs are cut in sections 6 inches in length, and the carefully-selected pieces sawed into slabs 2 inches broad and a quarter of an inch in thickness. Fifty gross of these slabs are packed in a case, and the establishment produces about six hundred cases annually. These are mostly shipped to a pencil factory in Jersey City, a small number going also to Germany.

"The saw-mills situated on the shores of Choctawhatchee bay extend from the mouth of Alaqua creek to Freeport, and westward to Point Washington; the logs sawed at these mills are for the most part brought down by raft from the upper waters of the Choctawhatchee and its tributaries. The lumber sawed here is mostly long-leaved pine, with a small amount of cypress. The product of these mills is mostly shipped to New Orleans in small schooners carrying from 15,000 to 20,000 feet each. The capacity of the mills upon this bay is in excess of their production, the difficulty of obtaining logs causing most of them to remain shut during half the year.

"The causes which up to the present time have prevented the destruction of the pine forests about Saint Andrew's bay, which is traversed by one fine river and bordered by another, must be traced to the difficulty of navigating these streams and to the want of a convenient outlet to the Gulf at Apalachicola. There are few saw-mills upon this bay, supplying only the local demand, and even these are furnished with logs floated down the Chattahoochee from beyond the confines of the state."

SOUTHERN CENTRAL DIVISION.

ALABAMA.

The northern and northeastern portions of Alabama, embracing the foot-hills of the southern Alleghany mountains and the valley of the Tennessee river, are covered with a rich and varied forest growth of broad-leaved trees, in which oaks, hickories, ashes, walnuts, and cherries abound. South of the Tennessee river the rolling country is covered with oaks, through which belts of short-leaved pine occur. In Cherokee and Saint Clair counties isolated bodies of long-leaved pine appear, while a narrow strip of the same species stretches nearly across the state between the thirty-third and thirty-second degrees of north latitude. South of this central belt the country is again covered with forests of hard woods, which farther south, in the rolling pine-hill region, are mixed with a heavy growth of the long-leaved pine; and this species occupies, or once occupied, almost exclusively, outside of the numerous river bottoms, the sandy plain extending along the coast and reaching nearly 100 miles inland from the shores of the Gulf. Great regions of swamp covered with heavy forests of cypress occur in the southern part of the state, especially in the region watered by the lower Tombigbee and Alabama rivers.

The forests of northern Alabama still contain great bodies of hard-wood timber, although the demands of the rapidly-increasing iron industry located here have already stripped of their tree covering many of the low hills of northeastern Alabama. The best pine has been gathered from Mobile and Baldwin counties, in the neighborhood of Mobile bay, from the lines of railroads and the banks of streams heading in the southern part of the state and flowing to the Gulf through western Florida.

The pine forests of southern Alabama have long suffered from the reckless manufacture of naval stores.

During the census year 569,160 acres of woodland were reported destroyed by fire, with an estimated loss of $121,225. Of these fires the largest number were set to improve grazing, or by careless farmers and hunters.

The manufacture of cooperage and wheel stock, furniture, and other articles of wood is still in its infancy in Alabama and the other Gulf states. Such industries, in view of the magnificent forests of hard wood covering great areas in this region and the rapid exhaustion of the best material in the north and west, must in the near future be largely transferred to the southern states.

The cypress swamps adjacent to Mobile bay yield a large number of hand-split shingles and give employment to many persons, principally blacks.

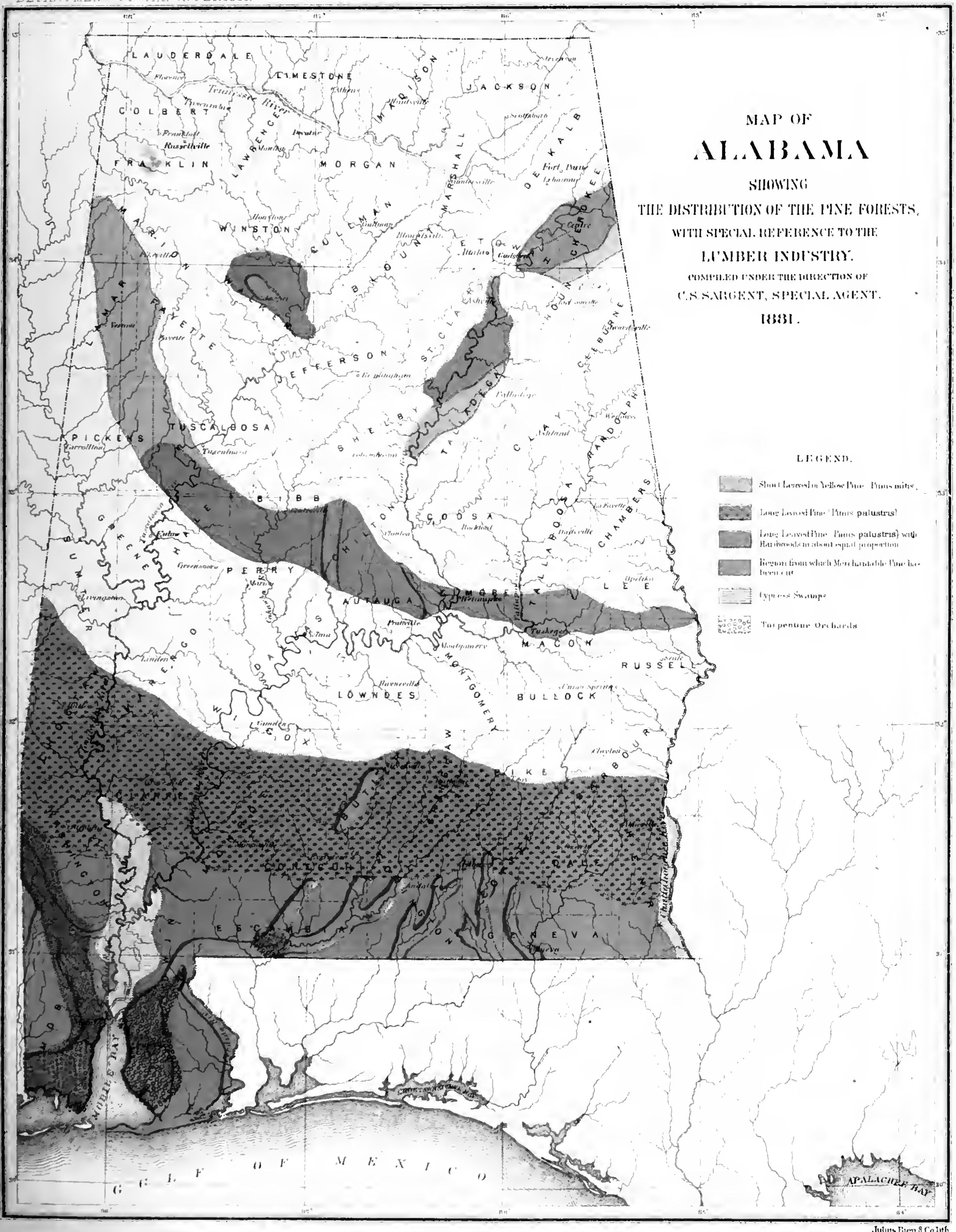
The following estimate of the amount of pine standing in the state May 31, 1880, was prepared by Dr. Charles Mohr, of Mobile, who carefully examined the whole pine region of the Gulf states:

LONG-LEAVED PINE (*Pinus palustris*).

Regions.	Feet, board measure.
East of Perdido river	4,055,000,000
West of Perdido river	2,000,000,000
In the region of mixed growth	10,000,000,000
In the Central Pine Belt	1,750,000,000
In the Coosa River basin	900,000,000
In the Walker County district	180,000,000
Total	18,885,000,000
Cut for the census year ending May 31, 1880 (including 77,500,000 feet, estimated, grown in Alabama and sawed in western Florida).	245,396,000

SHORT-LEAVED PINE (*Pinus mitis*).

In the Central Pine Belt	1,875,000,000
In the Coosa River basin	432,000,000
Total	2,307,000,000
Cut for the census year ending May 31, 1880, none reported.	


MAP OF
ALABAMA
SHOWING
THE DISTRIBUTION OF THE PINE FORESTS,
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT.
1881.
LEGEND.
Long Leaved Pine (Pinus palustris)
Long Leaved Pine (Pinus palustris) with Hardwoods in about equal proportion
Cypress Swamps
Turpentine Orchards
LAUDERDALE
LIMESTONE
MADISON
JACKSON
COLBERT
LAWRENCE
MORGAN
FRANKLIN
MARSHALL
DE KALB
WINSTON
CULLMAN
BLOUNT
ETOWAH
CHEROKEE
MARION
LAMAR
FAYETTE
JEFFERSON
ST. CLAIR
CALHOUN
CLEBURNE
PICKENS
TUSCALOOSA
SHELBY
TALLADEGA
CLAY
RANDOLPH
BIBB
CHILTON
COOSA
TALLAPOOSA
CHAMBERS
GREENE
SUMTER
HALE
PERRY
AUTAUGA
ELMORE
LEE
MACON
RUSSELL
MARENGO
DALLAS
LOWNDES
MONTGOMERY
BULLOCK
WILCOX
BUTLER
PIKE
BARBOUR
CHOCTAW
CLARKE
MONROE
CONECUH
COFFEE
DALE
HENRY
WASHINGTON
ESCAMBIA
COVINGTON
GENEVA
MOBILE
BALDWIN
Tennessee River
MOBILE BAY
GULF OF MEXICO
APALACHEE BAY
Julius Bien & Co. lith.
Scale
100 MILES

In this estimate no account is made of small timber standing on some 1,282,000 acres which have been cut over, and from which the merchantable pine has been practically removed, or on 600,000 acres injured by the manufacture of turpentine.

There are fewer pine trees per acre in the region of mixed growth than in the pine belt proper, with which it mingles on the north; but the individual trees being larger, the average amount of standing pine per acre is greater, although generally of poorer quality.

Mobile is still the principal center in the state for the manufacture of pine and cypress lumber; a large amount of pine lumber is manufactured also along the line of the railroads penetrating the pine belt in Etowah county, and considerable hard wood is sawed in counties bordering the Tennessee river for local use and northern shipment. Mobile is also the distributing point for the naval stores manufactured in the state.

The following notes upon the forests of Alabama are extracted from Dr. Mohr's report:

"THE MARITIME PINE REGION.

"West of Mobile the road traversed for a distance of over 5 miles the plain, or so-called 'second bottom', composed of a more or less tenacious or sandy yellow clay. It has an elevation above the alluvial of the river of 15 to 25 feet, and is bordered on the west by the ridges of the stratified drift, which extend to within 6 to 18 miles of the shore-line. Near the coast this plain, flat and devoid of drainage, forms for many miles the low, wet savannas sparsely covered with a stunted growth of long-leaved pines; near the estuaries it is interspersed with tracts covered with a black, light soil, rich in humus and bearing a luxuriant growth of broad-leaved trees associated with a few *Coniferæ*, and with the wooded swamps which extend over the depressions about the base of the higher land, and follow the low, inundated banks of the numerous streams. The prevailing forest tree of this plain, now much cultivated in the vicinity of Mobile, is the long-leaved pine. Situations offering a moister and somewhat richer soil along the hummocks and gentle acclivities bordering the swamps and the bottoms of the water-courses are occupied by the loblolly pine. With this is often associated the pitch pine (*Pinus Cubensis*), which prefers, however, the more or less inundated and always wet, swampy forest, where its spreading crown towers above the gum trees and white cedars. Wherever in the plain the long-leaved pine has been cut down, this pitch pine principally and the loblolly pine spring up to replace it.

"Many acres can be seen in this region covered with thrifty seedlings of this pitch pine, and trees have sprung up, to my own knowledge, since 1865, which are now from 20 to 25 feet in height with a diameter of trunk of from 4 to 6 inches; and trees from 50 to 60 feet in height with a circumference of from 3 to 4 feet, forming quite extensive forests, may be seen upon the shores of the bay from which the primeval forest was removed about fifty years ago.

"Ascending the highlands of drift, with its porous soil composed of irregular strata of white or ferruginous sands, gravels, and pebbles interspersed with layers of clay, the home of the long-leaved pine, which here arrives at perfection and forms the entire forest growth over immense areas, is entered. Upon this formation, after the removal of the original forest, either the long-leaved pine takes possession again of the soil or is replaced by a more or less stunted growth of various species of oak (*Quercus Catesbæi*, *cinerea*, *nigra*, *obtusiloba*, and *falcata*), the mocker-nut, and a few other small trees and shrubs. What the conditions are by which such a rotation is regulated is not apparent. It is no doubt much influenced by the conflagrations which annually sweep through the woods and which are particularly destructive to the young pines, but it cannot be explained solely upon that ground. I have, however, observed that the more broken lands with the same sandy character of surface soil, but with a more argillaceous subsoil more or less impervious to water, are mostly covered with this second growth of deciduous trees, and that the flat table-lands with either a sandy or gravelly soil are invariably covered again with a second growth of the long-leaved pine. Among such young growths of this species I have never been able to discover a single seedling of the other pines.

"CYPRESS SWAMPS OF THE TENSAS RIVER.—The river was extraordinarily high, the lowlands being overflowed to a depth of more than 10 feet. The torrents which had fallen during the past three weeks caused a heavier freshet than any that had been experienced since the spring of 1875. Since that year no such opportunity has been offered for getting heavy cypress timber from the depths of these swampy forests. No idle man was to be found on shore; everybody who could swing an ax, paddle a boat, or pilot a log was in the swamp engaged in felling and floating cypress timber. All the mill-hands worked in the swamps; fields and gardens were left untouched, and even clerks from the stores were sent to the swamps as overseers.

"We soon entered the deep, dark forest stocked with some fine and large cypress trees, and came upon two negroes, each standing in his little skiff, engaged in felling a tree of the largest size. It was astonishing to witness the steadiness and celerity with which they performed their work, considering the instability of their footholds in the narrow boats. Every stroke of the ax told at the designated place, and it took them scarcely longer to cut a tree in this way than if they had been working upon solid ground. The top of the tree when felled is sawed off close to the first limbs by one man working under water a single-handled cross-cut saw. Another, provided with a long pole armed with a sharp iron spike, seizes the trunk and tows it, with the aid of the slow current, to one of the lake-like sheets of still water which, interspersed with streams, are so common in these lowlands. Here the trunks are made into rafts and can be floated down the river to the mills along the banks below after the subsidence of the flood. The greatest part of this large timber is only accessible during the time of a high stage of water, so that the energies of the whole population are devoted during the times of freshets to getting out as much of it as possible. The large number of logs harvested shows clearly with what activity the destruction of these treasures of the forest is being pushed; and the reports, as of heavy thunder, caused by the fall of the mighty trees, resounding at short intervals from near and far, speak of its rapid progress.

"In 1831 Mr. Vaughn found these cypress swamps untouched by the ax. At present their resources are so diminished by the inroads made upon them during the last twelve years that, with a prospect of a rapidly-increasing demand for cypress lumber in the near future, he judges that they will be completely exhausted during the next ten years. This opinion is shared by all mill-owners here, who believe that in less than that time their business must come to an end. There is no hope that the supply will be continued by the natural increase of young trees. It is rare to find small trees among the large specimens. Seedlings and saplings are not found in these deep, swampy forests, and only occur in the openings and upon the banks of water-courses. The fact that the almost impenetrable shade, excluding the admission of light and air to a soil almost constantly drenched with water, is unfavorable to the growth of a new generation of the cypress, threatens to exclude it from localities where formerly this tree attained its greatest perfection. In swamps open to the influences of light and air, and not liable to prolonged periods of inundation, a growth of seedlings and small trees, especially along the banks of the smaller tributaries of the larger streams, springs up. The extremely slow growth of the cypress, however, during all stages of its existence, even if young trees spring up, destroys all hope of an adequate supply of this timber to meet the wants of coming generations. Trees of small size are as frequently cut as large ones. Saplings from 4 to 12 inches in diameter even are cut and supply the farmer, the builder, and the mechanic with material for many useful purposes. Logs not over 30 inches in diameter, however, are not worked up in the Tensas mills, which only use logs of larger size, the saplings being sent in rafts with pine logs to the saw-mills of Mobile. It is rare that a tree over 3 feet in diameter is found perfectly sound. Trees above 4 feet through are almost always invested with signs of decay. No timber seems to be open to so many defects as that of the cypress. Many of the trees are 'wind-shaken'; that is, portions of the body of the wood have separated in the direction of the concentric rings, causing annual splits which extend throughout a great length of the trunk, and if occurring repeatedly in the same stick render it unfit for use. A considerable number of the larger trees are rotten in sections. Logs cut from such trees may appear perfectly sound at both ends, but are found hollow and rotten in the interior. The inspection of cypress logs requires great experience and care to protect the buyer from loss. But there is one disease which particularly affects this timber, the cause of which is a perfect mystery to all interested in the matter. (*a*) From the center of the tree outward, although never extending into the sap-wood, occur great numbers of spindle-shaped, narrow excavations with perfectly smooth, rounded walls more or less tapering toward the ends, parallel with the bundles of woody fibers and nearly regularly disposed in the direction of the annual rings of growth. These cavities vary from one-half an inch or less to a foot in length, and are found from a few lines to an inch in width. They are filled with a yellowish-brown powder, the result of decayed, woody substance, although the walls of the cavities appear perfectly sound and unaffected by decay. These excavations are called 'pegs', and timber so affected 'peggy' timber. The cavities have no communication with the surface apparently, and remain always inclosed within the surrounding belt of sap-wood. It is only in the case of very old trees that the larger cavities produced by the junction of the pegs sometimes reach openings produced by external decay or accident. Undoubtedly these pegs cause the large hollows so often found in the center of large-sized and apparently perfectly healthy trees. Some of the timber of medium-sized specimens is honey-combed with these pegs. Such peggy stuff is useful for poles and pickets, which are found not less durable than if made from solid lumber.

"Two varieties of cypress timber are recognized according to the color, firmness, and heaviness of the wood, and are known as white cypress and black cypress; the latter has darker, closer grained, and more resinous wood than the former, and will sink in water. Its weight makes impossible the transportation of black-cypress logs by floating under ordinary circumstances, and the lumberman, unable always to recognize these peculiarities of the wood in the standing tree, cuts a chip before felling, which thrown into the water indicates, by its floating or sinking, whether it is black or white cypress. Trees of the heavy variety are deadened during the months of August and September by cutting a deep ring through the bark, and in the spring of the second season the timber is found sufficiently light to float.

"The cypress region of southern Alabama, which must be regarded as one of the great resources of its forest wealth, commences upon Mobile river, about 16 or 18 miles above its entrance into Mobile bay, extending through the lowlands upon both banks of this river, in Baldwin and Mobile counties, where it covers an extreme area of from 75 to 80 square miles. It extends northward to the junction of the Alabama and Tombigbee rivers, covering

a This injury to the cypress is caused by a fungoid plant not yet determined, although widely distributed along the Gulf coast.—C. S. S.

large tracts in the delta between them, follows northward the course of these streams, and covers the extensive swamps which border their banks and the mouths of their numerous tributaries. Upon the Alabama the cypress swamps extend to the lower part of Clarke county. Next to the Mobile River region the largest supply of cypress can be drawn from the extensive bottoms of the Tombigbee, about the mouth of Bassett creek, near Jackson. During the freshet of the present year (1880) a large number of logs from this vicinity will be sent to the mills on the Tensas.

"BALDWIN COUNTY.—A quarter of a century ago a pine forest, unequaled in the magnificence of its tree growth, and supposed at that time to contain an inexhaustible supply of timber, covered Baldwin county through its whole extent. To-day this forest, from the line of the Mobile and Montgomery railroad, along the eastern shore of Mobile bay, and along all the water-courses as far as Bonsecours bay, upon the Gulf, is entirely destroyed, and presents a picture of ruin and utter desolation painful to behold.

"The production of naval stores has been carried on in this region without regard to any of its future interests, and, the forest being exhausted, manufacturers have been driven to seek new fields of operation. In the old turpentine orchards, long abandoned, no young trees have sprung up. Too far remote to make it possible to get their timber to the saw-mills, the large trees which have sufficient strength to withstand the effects of the barbarous process of boxing drag out their precarious existence for years after the smaller and weaker trees have been laid low, and shade the ground sufficiently to prevent the start of a young growth. The wood of these old boxes, as dead pines are called, is, after the loss of their vitality, charged throughout with an excess of resinous matter, and is in that condition sold as 'fat' or 'light' wood, being greatly esteemed as fuel for the generation of steam. For this purpose this final product of the pine forest is carried to the city of Mobile in broad flatboats, propelled by one huge square sail, and steered by a ponderous horizontal beam serving as a rudder. In a few years, however, this, the least valuable and the last product of the pine forest, will have forever disappeared, and with it the last remnant of the original forest growth of this part of the state. Occasionally, under the shade of the trees left standing, a young growth of pine is found, and on the high and undulating table-land between Mobile bay and Fish river, where the soil is light and very porous, a low and scanty oak scrub has taken possession of the ground. Toward the banks of the water-courses, however, where the largest trees were first cut to furnish timber to the mills once situated on Fish river, thus early leaving the ground open to atmospheric influences, fine and promising groves of long-leaved pine now often cover areas of wide extent. I measured many trees in these young second-growth pine forests, grown up within the last twelve to twenty-five years, standing from 15 to 30 feet in height with a diameter of trunk of from 4 to 6 inches, of thrifty growth, and rapidly overcoming the small oak growth with which it had to contend for the possession of the soil. It is the turkey and the upland willow oak alone which occur in these thin soils, too poor to support the Spanish and black oaks.

"The banks of the North Branch of the Fish river are composed of marsh or white drift sand. The arid, sandy ground is covered with a dwarf growth of live oak and myrtle live oak, observed here for the first time, and which farther east formed by far the largest part of the oak scrub covering the shore-lines of the large bays of western Florida. Two or three miles beyond the forks of Fish river a belt of pine forest is reached, not yet destroyed by the mutilations of the 'box-cutter' nor bereft of its best growth by the log-gatherer; it covers the highlands and declivities between Fish river and the waters which find their way into Perdido bay. This may be regarded as a virgin forest, only slightly invaded up to the present time along the Blackwater creek, Hollenger's creek, the Perdido river, and the bay shore. The mills situated on Perdido river and bay depend entirely for their present and future supply of logs upon this forest of southern Baldwin county, although I learn that it is expected to supply them during the next five years only, even if their production of lumber does not increase. This forest extends over six townships and covers an area estimated at from 125,000 to 150,000 acres.

"THE FORESTS OF THE CHATTAHOOCHEE IN EASTERN ALABAMA, MIXED FOREST GROWTH, ETC.

"The forests which once covered the wide bottom lands of the Chattahoochee in the neighborhood of Franklin, Alabama (opposite Fort Gaines), are now reduced to small patches of woodland confined to the base of ranges of low hills bordering the plain valley to the southeast. The tree growth was found here to differ in no way from that found lower down, except that the short-leaved pine (*Pinus mitis*) occurs more frequently. The crab apple and the cockspur thorn are frequent along the borders of the woods, but the pond pine (*Pinus serotina*), which might have been expected here, was not observed. In the sandy, wet, and deeply-shaded bottoms of a sluggish stream winding along the base of these hills I found the spruce pine (*Pinus glabra*) abundantly associated with the loblolly bay, red and sweet bays, and stately magnolias. The live oak is not found here, and it is doubtful if it extends in this part of the Gulf region more than a few miles north of the thirty-first degree of latitude. The low hills do not rise more than 150 feet above the plain; in entering them the second division of the sylvan vegetation characteristic of the eastern Gulf states is reached—a forest of mixed growth, which must be regarded, on account of its extent as well as the variety of its vegetation, as one of the important natural features of the region. I am of opinion that the deciduous-leaved trees have an equal representation in this forest with the conifers. This certainly was the case before the settlement of the country, but as the broad-leaved trees occupy the best land, the areas of hard-wood forest have been more reduced by the demands of agriculture than have the forests of pine.

"The distribution of the different species of trees throughout this region depends upon the nature of the soil and the topographical features of the country. In general it can be stated that the marls and calcareous Tertiary strata which form the lower ridges and more or less undulating uplands and plains are chiefly occupied by trees with deciduous leaves, and by a few yellow pines. Here oaks predominate, and especially the post oak (*Quercus obtusiloba*), which prefers the level or gently-swelling ground with a generous, warm, and open soil; with it is frequently found the black oak (*Quercus tinctoria*), the Spanish oak and black-jack upon soils of poorer quality, the last, particularly, preferring one of closer, more argillaceous character mixed with fine sand. The black-jack finds here its best development, rivaling often in size the post oak; it enters largely also into the undergrowth of the post-oak woods, forming dense thickets on lands too poor to sustain a heavier tree growth.

"The hickories are unimportant features in the forests of this region. In the dry uplands they seldom attain more than medium size, although in the more shaded and richer situations the mocker-nut and pig-nut are not rare.

"The long-leaved pine, on account of the broad extent it covers, its gregarious habit, and the splendid growth it attains here, must be regarded as the most important timber tree of this region. Confined to a siliceous, dry, and porous soil, it occupies the high ridges invariably covered with a deposit of drift, often found widely spread over the more elevated highlands. For this reason the pine forests crown the hills and cover the more or less broken plateaus. They are found also toward the southern boundaries of this region, where the sands and gravels of the drift of the lower pine region encroach upon and mingle with the strata of older formations. Under these circumstances it is evident that the line of demarkation between this and the pine region of the coast is difficult to determine. The best distinction is found in the fact that in the pine forests of the lower pine region the growth of pines upon the uplands is never broken by patches of oak, and that the short-leaved pine never occurs there. Another point of distinction is found in the nature of the second growth, which springs up after the large pines have been removed. In the pine woods in the region of mixed tree growth the subsoil, of Tertiary origin, seems more favorable to the growth of oaks than to a second growth of the long-leaved pine. This is replaced generally by oaks mixed with the short-leaved pine and various deciduous trees. It is safe to assert that the southern limits of this region coincide with a line following the northern boundary of the coast drifts, along which the lower strata have completely disappeared beneath it.

"PIKE COUNTY.—On the broad ridges which form the divide between the waters of the Pea and Conecuh rivers, upon a purely sandy soil, are found, within the forest of long-leaved pine, tracts with strictly-defined outlines from a half mile to several miles in width, covered with a dense vegetation of small trees and shrubs peculiar to the perpetually moist and cool hummocks of the coast. The soil covered with this growth presents no unusual features; it is as poor and arid as that covering the rest of these heights. Surrounded on all sides by pine forests, not a single pine tree is seen within the limits of these glades, called by the inhabitants 'pogosines', an Indian name the meaning of which I was unable to learn.

"The trees are of small growth, the willow oak, the water oak, beech, red maple, and black gum rarely rising to a height of more than 30 feet among the sourwoods, junipers, hornbeams, hollies, papaws, fringe-trees, red bays, and other trees of the coast. These glades verge upon deep ravines from which issue large springs, and from this fact I conclude that, below their sandy, porous soil, strata must exist perpetually moistened by subterranean waters near enough to the surface to supply the moisture necessary to support such a luxuriant vegetation.

"FORESTS OF THE TENNESSEE VALLEY.

"The character of the forest vegetation changes upon the limestone formation of the valley of the Tennessee. This new region of tree growth extends from the northeastern confines of Alabama to a short distance beyond the Mississippi state line with a width of from 35 to 40 miles, and reaching beyond the northern boundary of the state. Its prominent feature is the total absence of pine and the scarcity of other evergreen trees. A few scattered saplings of the loblolly pine are found on its lower borders, waifs strayed from their natural habitats, the lower part of Morgan county, the true northern limit of this species, in Alabama at least. The red cedar is the only evergreen tree common among the forest growth of this limestone region, and the durability of its wood combined with its beauty places this tree among the most useful produced in this region. The red cedar forms here almost exclusively the second growth after the removal of the original forest, covering everywhere with extensive groves the dry, rocky hillsides and flats. The timber, however, of this second growth is only fit for the most ordinary purposes. The trees branch low, and the trunks are consequently full of knots and unfit for anything except fence posts. The fertile portions of this region have been largely denuded of their forest growth, although more than half is still covered with wood, a considerable portion with almost virgin forest. This is particularly true of Lauderdale and Colbert counties and the mountainous portions of the counties of Madison and Jackson. The vast quantities of oak, ash, walnut, and poplar timber contained in these counties can be sent to northern markets as soon as the Tennessee river has been made navigable by the removal of the obstacles at the Mussel shoals.

"The road from Decatur to Moulton, in Lawrence county, leads through broad and fertile valley lands, broken, as the mountains are approached, by limestone ridges jutting out into the plain. The beautiful Moulton valley, inclosed by the low foot-hills of the Sandy Mountain range which form its southern boundary, shows only along the base of the mountains a remnant of its original tree covering. Here the water oak, willow oak, red oak, mulberries, elms, and ashes were the trees found in the lower situations, and on rolling, higher land the white oak, the black oak, post oak, sassafras, and dogwood formed the prevailing forest growth. The lower flank of the steep escarpment of the highlands, a terrace of limestone cliffs mostly destitute of soil, bears a stunted tree growth. Here the red cedar and the upland hickory abound, and where the surface is less broken and a deeper soil covers the rock, chestnuts make their appearance with white oaks and the shell-bark and mocker-nut hickories. The ascent is less precipitous as the sandstone ledges are reached, and here the yellow pine (*Pinus mitis*) and the scrub pine (*Pinus inops*) are prominent among the oak forests of the mountains. When the crest of this abrupt decline is passed the oak forest is reached. It covers the extensive table-land between the Coosa and the eastern tributaries of the Tombigbee, and extends southward from the valley of the Tennessee to the lowlands commencing below Tuscaloosa, occupying an area of nearly 6,000 square miles.

"General Remarks.

"The forests of long-leaved pine are principally confined to the following limited regions east of the Mississippi river: 1. The Great Maritime Pine region. 2. The Central Pine Belt of Alabama. 3. The Pine Region of the Coosa.

"Pine forests of more or less extent, too, mixed with woodlands composed of deciduous-leaved trees, occupy the ridges covered with a porous siliceous soil in the region of what I have called the mixed tree growth, and which upon its southern borders verges upon the Coast Pine Belt. Upon the heights of the low ranges of the metamorphic region of Alabama are also found more or less extensive tracts of this pine, generally, however, of inferior quality and size, while as far north as the thirty-fourth degree of latitude patches of thinly-scattered pine are met on the brows of the mountains, and, rarely, on the plateau of the carboniferous sand.

"The pine forests of Alabama, from the Escambia to the Mississippi state line, in the counties of Monroe, Baldwin, Washington, Mobile, and in portions of Clarke county, cover 3,500 square miles. Of these about 1,000 square miles have already been more or less destroyed in the manufacture of naval stores. Allowing 25 per cent. for land under cultivation, or covered by a forest of different trees, by water, etc., there are still 1,875 square miles left of this forest to supply the demands of the future.

"The whole amount of long-leaved pine lumber received at the port of Mobile averages about 60,000,000 feet, board measure, representing the product of mills at that place and along the various railroad lines leading to it. The amount of hewed square timber received is still small, but the business of exporting timber of this sort promises to assume large proportions in the near future.

"The pine belt of central Alabama.—This forest occupies the deposits of drift which, in a strip varying from 10 to 30 miles in width, traverses the state from east to west. It is nearly in the center of the line connecting its eastern and western limits that its greatest width is found. This forest is estimated to cover 550 square miles, no allowance being made for lands cultivated or covered by other trees. The timber, both in quality and quantity, is unsurpassed by that growing on the best sections of the lower pine region. The manufacture of lumber and its export to northern markets has only been carried on in this region to any large extent during the last three or four years, and it is now rapidly assuming large proportions. The most important saw-mills in this region are situated on the line of the Louisville and Nashville railroad, between Clear creek and Elmore, Elmore county, and produced in the aggregate 67,000,000 feet of lumber, board measure, during the years 1879-'80. Considerable lumber is also produced along the line of the Selma, Rome and Dalton railroad, in Chilton county.

"Naval stores are not yet manufactured in this region.

"The pine region of the Coosa.—A detached belt of drift largely composed of coarse pebbles stretches from the eastern base of the Lookout Mountain range through the valley of the Coosa river, near Gadsden, covering nearly the whole of Cherokee county, to the Georgia state line. This forest is estimated to cover from 400 to 450 square miles, although much of the best timber nearest to the river has already been exhausted. Logs are driven down the Coosa and sawed at Gadsden. The manufacture of lumber at this place has been carried on for a number of years, and amounts to an average of 20,000,000 feet.

"Naval stores.

"The manufacture of naval stores in the central Gulf states is almost entirely restricted for the present to the forest contiguous to Mobile and to the railroad lines leading to that port and to the southern confines of the pine belt in Mississippi. It is only during the past two seasons that turpentine orchards have been worked near Pascagoula, Mississippi, Pearl river, and in eastern Louisiana above Covington. The first turpentine distilleries were established on the Gulf coast a little more than a quarter of a century ago, along Fish river on the eastern and Dog river on the western shores of Mobile bay. The business soon assumed such proportions as to lead to the destruction of the forests covering hundreds of square miles, particularly in Baldwin county. The production of naval stores in this county, as well as in the lower part of Mobile county, has at present nearly ceased, on account of the exhaustion of the forest. It is, however, now carried on with the greatest activity on the line of the Mobile and Ohio railroad. Between Mobile station, in Mobile county, and Quitman, Mississippi, there are at this date not less than thirty-three stills in operation, while along the Louisville and Nashville railroad there have been during the last five years fifty-three stills established in Alabama and Mississippi. These, with few exceptions, are controlled by Mobile capital, their whole product being handled from that market, so that the returns contained in the annual reports of the board of trade of Mobile fairly represent the whole production of naval stores in this pine region.

"According to the statements contained in the report for 1880, the crops amounted in the years 1879–'80 to 25,409 barrels of spirits of turpentine and 158,482 barrels of rosin. During a period of eight years, between 1873 and the close of the business year of 1880, 160,000 barrels of spirits of turpentine and 800,000 barrels of rosin have been produced in this same district. (a)

"The increase in prices during the last few years for all kinds of naval stores, and particularly the active demand for the best class of rosin, have given an increased impetus to this business, in consequence of which many of the older orchards have been abandoned and new ones started, while the number of new boxes cut during the present season is greater than ever before. There are no returns to be obtained of the production prior to 1875, but it can be safely assumed that up to that year 250 square miles of pine forest had been boxed. The production since 1875 must have involved a further destruction of 640,000 acres, or 1,000 square miles of forest. With the low price at which pine lands are held there is not the slightest regard paid to the utilization of their resources, and under the present system they are rapidly destroyed, regardless of the needs of the future and with the sole object of obtaining the quickest possible returns on the capital invested.

"It may be of interest to mention here the results obtained by a practical manufacturer by submitting the refuse of saw-mills, that is, slabs and sawdust, to a process of combined steam and dry distillation, with the view of utilizing the volatile products of such waste. He obtained from one cord of slabs 12 gallons of spirits of turpentine, 25 gallons of tar, 120 gallons of weak pyroligneous acid, and 12 barrels of charcoal. From one cord of lightwood he obtained 12 gallons of spirits of turpentine, 62½ gallons of tar, and 60 gallons of pyroligneous acid. The sawdust obtained from sawing 10,000 feet of pine lumber, subjected to distillation during one day, produced 22 gallons of spirits of turpentine."

MISSISSIPPI.

The forests of Mississippi originally extended over nearly the entire state. Prairies of no great area, situated in the northern central part of the state, presented the only break in its tree covering. The forest consisted of a belt of long-leaved pine, occupying the coast plain and reaching from the eastern confines of the state to the bottom lands of the Mississippi river, and from the coast nearly to the line of Vicksburg and Meridian. The northeastern portion of this long-leaved pine forest spread over a high rolling country, and here the pines were mixed with various hard-wood trees; north of the long-leaved pine forest a long belt gradually narrowing toward the north and occupied by a growth of short-leaved pine and of hard woods reached nearly to the northern boundary of the state, while south of the Tennessee river, in Tishomingo, Prentiss, and Itawamba counties, a considerable area was covered with forests of the short-leaved pine. The remainder of the state was clothed with a growth of hard woods, which in the swamps of the Yazoo delta and the bottom lands of the Mississippi river formed vast and almost impenetrable forests, where cypresses, gums, water oaks, ashes, and other trees which find their home in the deep, inundated swamps of the South Atlantic region attained noble dimensions and great value.

The pine forests have been removed from the immediate neighborhood of the Pascagoula and Pearl rivers and from their principal tributaries within the southern tier of counties; the most accessible timber has been cleared from the Biloxi, Blind, Jordan, Wolf, and Tchefuncta rivers, flowing into Mississippi sound, and from the line of the Chicago, Saint Louis, and New Orleans railroad. The long-leaved pine of Mississippi is, however, still practically intact, and these forests are capable of supplying an immense amount of timber as soon as the means of transportation can be furnished for it. A small amount of pine has been cut in the northeastern pine region from along the line of the Memphis and Charleston railroad.

The hard-wood forests outside of the bottom lands have been largely cleared from many counties in providing for the requirements of agriculture. Such land when abandoned is again covered in the central part of the state with a growth of old-field pine, and in the north, and especially in the northeastern counties, by a vigorous growth of short-leaved pine (*Pinus mitis*), which seems destined to become the most important timber tree of that region. The forests which cover the swamps of the state are still almost intact, although the most accessible cypress, which has long been cut in the Yazoo delta and the valley of the Pearl river to supply the New Orleans market, has become scarce.

During the census year 222,800 acres of woodland were reported destroyed by fire, with a loss of $78,500. Of these fires the largest number was set by hunters, and by farmers carelessly starting fires in clearing land or to improve pasturage.

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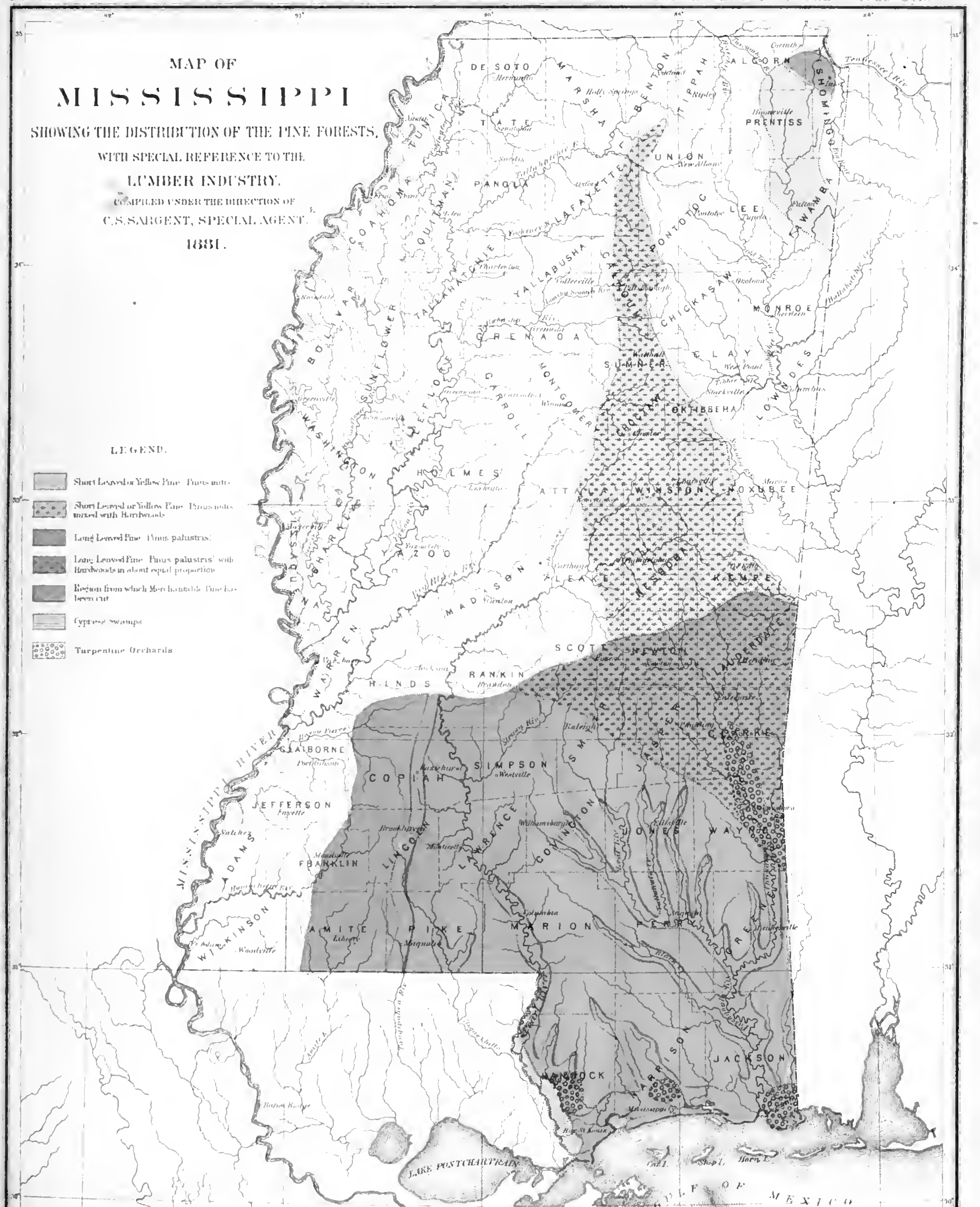
a These figures differ somewhat from those prepared by Mr. Van Bokkelen. See page 493.—C. S. S.



Julius Bien & Co. lith

Establishments for the manufacture of wagons, wheel stock, cooperage, etc., have been established at different times in the northern part of the state. The industries, however, which depend upon the hard-wood forests for material are still in their infancy in Mississippi, and are capable of enormous development.

The following estimates of the standing-pine supply of Mississippi, May 31, 1880, were prepared by Dr. Charles Mohr, who carefully explored the forests of the state:

LONG-LEAVED PINE (*Pinus palustris*).

Regions.	Feet, board measure.
In region west of Pearl river, tributary to the Chicago, Saint Louis, and New Orleans railroad.	6,800,000,000
East of Pearl river	7,600,000,000
Region of mixed growth, exclusive of 200,000 acres injured by the manufacture of turpentine.	3,800,000,000
Total	18,200,000,000
Cut for the census year ending May 31, 1880	108,000,000

SHORT-LEAVED PINE (*Pinus mitis*).

In the northeastern belt	1,600,000,000
In northern region of mixed growth	5,175,000,000
Total	6,775,000,000
Cut for the census year ending May 31, 1880	7,775,000

In this estimate no account is made of small timber standing on some 2,912,000 acres which have been cut over, and from which the merchantable pine has been practically removed.

The region of mixed growth, which adjoins the pine belt upon the north, contains a smaller number of pine trees per acre than the pine belt proper; but, the individual trees being larger, the average amount of standing pine per acre is here greater, although generally of poorer quality, than nearer the coast.

The principal centers of lumber manufacture are at the mouth of Pascagoula river, in Jackson county, at Mississippi City, in Harrison county, along the lower Pearl river, upon the line of the Chicago, Saint Louis, and New Orleans railroad in Lincoln county, and in the northeastern counties, where are located many small railroad mills, manufacturing in the aggregate a large amount of yellow-pine lumber (*Pinus mitis*).

The pine forests of the state have up to the present time suffered but little damage from the manufacture of naval stores. Turpentine orchards, however, have been recently established in the vicinity of the coast, near the mouth of the Pascagoula river, and at other points in the coast counties.

The following remarks are extracted from Dr. Charles Mohr's report upon the forests of Mississippi:

"THE PINE FORESTS OF SOUTHERN MISSISSIPPI.—In the vicinity of Scranton, near the mouth of the Pascagoula river, little is left of the original pine forest. The old clearings are covered with fine loblolly pine, from 40 to 60 feet high, upon rather close, dry soil. The pitch pine (*Pinus Cubensis*) forms dense groves, with seedling trees from 20 to 30 feet in height upon lands of lighter soil extending to the sea-shore. Oaks are not common. Fine groves of stately live oaks, however, line the banks of the river up to Moss Point, 4 miles distant.

"The annual export of lumber during the last four or five years has averaged 45,000,000 feet from the Pascagoula river. The largest percentage of this lumber is manufactured into boards and scantling for ordinary building purposes, and is shipped to Cuba, the Windward islands, to Mexico, Brazil, and a small part, in the form of deals 2 or 3 inches in thickness, intended for ship-building, to France, Spain, Holland, Belgium, and Germany. Large quantities of charcoal burned upon the banks of Black and Red creeks are sent to New Orleans in small coasting schooners, which run also from the bay of Biloxi and the bay of Saint Louis. At Moss Point eleven saw-mills, which furnish the lumber manufactured upon it, are situated on both banks of the East Pascagoula river. The combined capacity of these mills amounts to 220,000 feet a day, although the annual production during the past years has scarcely exceeded 40,000,000 feet. The timber manufactured in these mills comes from the Pascagoula and its tributaries, the Leaf and Chickasawha rivers and their sources, the Bogue Homo, Tallahala, Bay, and Okatuma creeks, as far up as the southern limits of Covington and Jones counties. A small number of logs also comes from the Escatawpa. The logs received at these mills average 20 inches in diameter and 40 feet in length Sticks of such average dimensions are only furnished from first-class timber-lands, which, according to the best judges, produce six or seven trees of that size to the acre. Only lands lining the streams just mentioned, in a belt not exceeding 3 miles in width on each bank, have been up to this time invaded by the log-getter to supply these mills.

"The vastness of the timber resources yet contained in the region embraced in the northern half of Harrison and the whole of Greene and Perry, up to the southern confines of Marion and Jones counties, is astonishing. As is the case in Alabama, however, trees furnishing first-class spars for masts are difficult to find; they have been cut by spar-hunters in every part of the forest which could be reached by teams.

"Cypress lumber is not manufactured in this region, and the loblolly pine furnishes so small a part of the timber manufactured that it need not be considered. In Jones and Covington counties, about the headwaters of the upper tributaries of the Pascagoula, the country is rolling, intersected by numerous small, swift streams and rivulets. This region is magnificently timbered, and devoid of the barren ridges of almost pure sand so frequently found in the pine belt of Alabama.

"The low, flat, more or less wide pine lands bordering upon the marshes of the coast are sparsely covered with pine, while the trees growing in this wet, boggy soil, devoid of drainage and overlying a subsoil impervious to water, are stunted and of little value. The lower part of Harrison county is covered with these pine meadows, which fact accounts for the comparatively small importance of the bay of Saint Louis as a lumber-producing center.

"At Pearlington, on the Pearl river, is established the large saw-mill of Poitevent & Favre, capable of producing 100,000 feet of lumber a day; at Logton, 2 miles farther up the river, are two mills, and 5 miles above these, at Gainesville, there is another. The largest part of the logs sawed at these mills is cut upon the banks of the Abolochitto creek, in Hancock county, and its tributaries extending into the lower part of Marion county, 50 or 60 miles distant. The remainder comes from the banks of the Pearl and the upper and lower Little rivers, which empty into it 10 miles above Columbia.

"The cypress is nearly exhausted from the lower Pearl river, and the 20,000 or 30,000 feet of this lumber which are sawed annually at Pearlington are derived from the cypress swamps on the upper waters of the Pearl and Jackson rivers, where there is still a large amount of this timber of good size.

"The eastern bank of the Pearl river, within the Maritime Pine Belt, is sparsely settled, and forests, the especially in Hancock county and the upper part of Marion county, are unsurpassed in the quality and quantity of their pine timber. It is estimated by good judges that these forests will yield an average of 2,000 feet of lumber, board measure, to the acre. Up to the present time a strip of land scarcely 3 miles in width, embracing the banks of the water-courses, has been stripped of its timber growth, and fine spar timber is yet to be found here a few miles back from all the streams. Almost the whole of these rich timber-lands supplying the mills on Pearl river form a part of the public domain.

"The almost unbroken pine forests covering the upper tier of counties between the Pearl and Pascagoula rivers, toward the northern confines of the pine region, are still practically intact. The wealth of these forests has as yet found no outlet to the markets of the world. Thinly settled, they are still largely the property of the government, but in view of the speedily-increasing demand for lumber and the profits derived from the lumber business, such a condition of affairs must soon come to an end. It can be safely asserted that by far the largest part of the timber, felled in the Abolochitto region is taken from government land. There can be no question of this when it is considered how insignificantly small is the area of land which has been legally entered by private persons along that stream. The necessity of adopting proper measures to protect the timber wealth upon the public domain from depredations of such enormous extent forces itself upon the most casual observer, while to one who looks closer at the consequences of the continuance of the existing state of affairs the urgency becomes appallingly apparent. The ever-increasing consumption of timber at the mills upon Pearl river, of which one alone can cut 100,000 feet of lumber a day, will prove a powerful stimulus to a people who, since the development of the lumber business in these regions, have almost completely abandoned their former agricultural and pastoral pursuits and now depend entirely for their support upon cutting pine logs, to supply this enormous demand at the expense of the public property. Already plans have been made to invade this region by tramways and railroads, in order that its timber may be brought to market. This is true, too, of the region between the Pearl and the Amite rivers, down to the marshy lands of eastern Louisiana, a region in which the forests are also particularly good.

"In the state of Mississippi it is safe to estimate that, after deducting 25 per cent. for areas of swampy and cleared land, 9,000 square miles are still covered by forests of long-leaved pine. The production of this region during the census year amounts to 108,000,000 feet; of this, 60,000,000 finds its outlet at Pascagoula, 30,000,000 by Pearl river, 6,000,000 by bay of Saint Louis, and 12,000,000 by the Chicago, Saint Louis, and New Orleans railroad to northern markets.

"In the northern part of Harrison county we crossed a tract from which twelve years ago a hurricane swept a belt a quarter of a mile wide of all tree growth. It is interesting to note the growth which has since sprung up among the prostrate charred trunks of the pines still found lying about in large numbers. Black-jack oaks, the largest not over 12 feet in height, are mixed in almost equal numbers with stunted, thin saplings of the long-leaved pine. These plainly exhibit the helplessness of the struggle to which these offspring of the great timber tree are subjected under the influence of repeated conflagrations wherever the oak scrub has sprung up and added fuel, in the abundance of its leaves, to the fires which annually sweep through these woods.

"THE NORTHEASTERN COUNTIES.—After crossing the Sucarnoochee river below Scooba, in Kemper county, the pines which had covered the ridges near the borders of Lauderdale county disappear; scarcely a stray sapling of the loblolly pine is seen as Scooba is reached. The cold, wet, calcareous soil of the flatwoods and prairies is unsuited to the growth of all coniferous trees, with the exception of the cypress. Along the railroad, as it traverses the flat prairie region, the country is sparsely wooded; large tracts of the prairie lands have always been destitute of trees, and the woodlands with which they were interspersed were cleared at the first settlement of the country. What remains of the original forest growth is now confined to localities too difficult of drainage to make agriculture profitable, and to the banks of streams subject to inundation. More or less extensive patches of woods are found also on the ledges where the limestone rock comes to the surface. In the swampy land the willow oak, the water oak, the black gum, sweet gum, white ash, and along the ponds willows and cottonwoods, prevail. The post oaks, white oaks, and cow oaks are mingled more or less freely with these trees in localities enjoying better drainage. Black-jack and black oaks, mixed with various haws, viburnums, and persimmons, occupy the rocky flats. No magnolias were seen in this region. The red, willow, and water oaks, the sycamore, and the sweet gum abound along the streams here, and are so common as to deserve special mention, while on the rolling uplands black oaks, post oaks, and white oaks, with poplars, shell-bark and pig-nut hickories, are common. From Tupelo toward Corinth the country is poorly wooded. The ascent is constant, reaching the point of highest elevation between the Gulf of Mexico and the Ohio river at Booneville. Corinth is situated on a wide pine plain, bounded on the west by the valley of the Tuscumbia river and east by the ridges which mark the water-shed of the Tennessee. The soil is here a deep calcareous clay, very stiff and heavy, hard as brick in warm, dry weather, and suddenly becoming a bottomless, stiff mire in seasons of rain. Below the valley of the Tuscumbia river the road passes over low and undulating ridges, of which the higher and steeper are yet covered with the remnants of the old oak forest. Here the Spanish and post oaks predominate in numbers; then follow the black oak and the scarlet oak, while the shell-bark hickory and the mockernut form but a small part of the tree growth of these uplands. The bottoms of the Tuscumbia, although subject to frequent overflows, are covered with a primeval forest not inferior in luxuriance and variety to that of the Mississippi river bottom lands. White-oak timber of the finest quality is found here in the greatest abundance and perfection. The most common species is the cow oak (*Quercus Michauxii*). I found that this river-bottom forest contained, by actual count, an average of from twelve to fourteen trees of this species, from 30 to 35 inches in diameter, to the acre. It is known to the inhabitants here by the name of cow oak or basket oak, being easily split into narrow, thin strips. The wood is extensively used in the manufacture of baskets used by the negroes in cotton-picking. These baskets are light, and of considerable strength and durability. Next in frequency follows the willow oak, and then the over-cup swamp oak (*Quercus lyrata*), and finally the red oak, found especially on the outskirts of the forest.

"The white ash is not so frequently seen here as elsewhere in similar localities, and does not seem to thrive on these stiff, cold soils. It is in part replaced by the green ash, which here attains the size of a large tree. The black gum is very common, and where the soil is least subjected to overflow the true white oak is found, with fine groups of beech, overtowered by large poplars. Among the smaller trees the mulberry, hornbeam, holly, and abundant papaws must be mentioned.

"The pine hills in the eastern part of Alcorn county are reached at a distance of 6 or 7 miles in a southerly direction from Corinth. Pine occurs on the dividing ridges between the waters of the Tuscumbia river and Yellow creek, or toward the south on those between the Tombigbee and the Tennessee rivers. A short distance west of Glendale station the Cretaceous strata disappear under the ferruginous sands, and mixed with a stunted growth of post oak and Spanish oak, pines appear, forming vast forests on the crests of the hills. This pine (*Pinus mitis*) takes possession of all the old clearings and fields thrown out of cultivation. The rapid growth of the seedlings, which spontaneously spring up thickly after the removal of the broad-leaved trees, leaves no chance for the seedling oaks. It is therefore a certainty that in the future the short-leaved pine will be almost the sole forest tree in this part of the state, outside of the bottom lands, and that it will probably extend its domain far beyond the original limits of its growth.

"The aspect of these pine woods resembles closely that of the lower pine region. The short-leaved pine replaces here the long-leaved pine of the coast, the scrubby post and Spanish oaks take the place of the turkey and the upland willow oaks, while the black-jack is common to both these regions of identical geological formation. The flora of the two regions also presents the same general features; the asters, goldenrods, sunflowers, and various leguminous plants are often the same or belong to closely-allied species. The pine-clad drift hills interspersed between the Carboniferous and Cretaceous regions are parts of the northern interior drift belt which extends throughout Alabama. The region of the short-leaved pine of northeastern Mississippi extends from the southern border of the valley of the Tennessee river to the southern extremity of Itawamba county, and is on an average 10 miles in width, embracing an area of nearly 600 square miles. Of this region, after the deduction of the fertile bottoms of the Tombigbee and Yellow Creek valleys, where no pines are found, two-thirds can be regarded as occupied by the pine forest. As the sole supply of pine lumber in the northern part of the state, this region is of great importance. Several saw-mills, none of which have an annual capacity of more than 3,000,000 feet, are established on the railroad line at Glendale, Burnsville, and near Iuka; portable saw-mills are worked also through this forest in its whole extent, their product being hauled in wagons for miles to the nearest station on the Mobile and Ohio and the Memphis and Charleston railroads. The largest shipments are made from Burnsville and Corinth.

"The second growth of the short-leaved pine, which is already growing with great rapidity in northern Mississippi upon exhausted fields thrown out of cultivation and wherever the forest has been cut from the ridges, should be protected and fostered by the owners of the soil. The care bestowed upon the natural seeding of this useful and valuable timber tree, and in assisting it to gain a permanent foothold on lands regarded as unfit or unprofitable for agriculture, of which tens of thousands of acres are now found in this state, would lead to results of great benefit to the community. The people have it in their power to replenish their timber resources, fast failing through the ever-progressing destruction of the original forest, without other outlay than simply assisting nature in her efforts to recover from injuries sustained in the wholesale destruction of the forest. The restoration of the forest over vast areas, now barren and unproductive wastes, would add vastly to the general welfare and prosperity through the influence such forests would exert upon the climate and salubrity of the country, by the shelter they would offer to insectivorous birds ever busy in the destruction of insects injurious to farm crops, and by the formation of protective screens against the cotton-worm, the most destructive of all insects in this part of the country; for it must be admitted as an undisputed fact that the destruction caused by the cotton-worm is far less upon the small farms where strips of woodland divide the fields than upon the plantations in the rich prairie lands where large areas are destitute of woods. Such forests would serve as windbreaks for crops growing in field and orchard, and as protection against the washing away of the light soil so peculiarly adapted to the cultivation of the great staple of the country, thus preventing the ruin of many productive fields, the *débris* from which, carried away by the rain and floods, fills the rivers and their estuaries, rendering navigation every year more dangerous.

"CENTRAL PINE HILLS.—A hilly region, the northern limit of which is near the center of Benton county, covered with upland oaks and short-leaved pines, extends eastward to the flatwoods in a belt from 8 to 12 miles in width. Farther south, in Calhoun and Sumter counties, this pine region is much wider, embracing the largest part of these and Choctaw and the western part of Oktibbeha counties; from Kosciusko, Attala county, it extends over the whole of Winston and the western part of Noxubee counties, being merged, south of Neshoba in the western part of Kemper county, with the region of mixed tree growth. This pine forest supplies a sufficient amount of lumber for the local demand, and portable saw-mills are found near the large settlements from Kosciusko to the southern limits of the region. It forms a prominent feature in the eastern Gulf states by its geographical position, and must be regarded as one of the distinct divisions which might be designated as the region of the central pine hills. Botanically this region differs from that of the mixed tree growth, upon which it borders toward the south, by the more equal distribution of the pines among the oaks, and particularly by the total absence of the long-leaved pine and other conifers, with the exception of the loblolly pine and of scattered cypress along the river banks, and by the absence of the great magnolia (*M. grandiflora*). The second forest growth in the northern part of this region consists almost exclusively of the short-leaved pine, which southward is associated with the loblolly pine. The short-leaved pine will in the future be the chief forest tree of this region.

"I have personally seen but little of the flatwoods proper, having only touched their southern limits in Kemper county. It is a region of close, cold soil, devoid of drainage, and covered with a stunted growth of post oak; and in its economic aspects as a timber region, or botanically, is of little interest or importance.

"WESTERN MISSISSIPPI.—In Copiah county, below the village of Terry, fifteen saw-mills are in operation along the railroad, obtaining their supply of logs from the heavily-timbered hills in the neighborhood. This lumber is shipped by rail to Saint Louis and Chicago. This business has already reached large proportions and is still increasing rapidly, the mills running without intermission at their full capacity throughout the year.

"Beyond Crystal Springs the country loses its rolling character; the pine hills disappear, and a short distance above the northern boundary of Copiah county, near Terry, a different geological formation is entered, and a strongly-marked change in the vegetation takes place. Horizontal strata of loam, inclosing layers of what appears a whitish sand, stretch northward over a vast extent of level country, and the long-leaved pine disappears with the gravels and sands of the drift.

"North of the pine region a large amount of rich land between the Pearl and Mississippi rivers has been brought under cultivation, especially along the bottoms of the Pearl river and along the principal railway lines. At Jackson, on the Pearl river, little is left of the original tree growth which covered its banks. Still enough is left, however, to show that it was chiefly composed of sweet gums, white oaks, elms, white ashes, etc. The railroad from Jackson to Vicksburg passes through a fertile agricultural country, where only small strips of forest remain between the large plantations and farms. Pines are not seen here, and the black walnut, originally so abundant among the oak and hickory forests which covered this region, must now be regarded as entirely exterminated. Beyond the Blackwater, in the hilly region of the bluff formation, the great magnolia covers the hillsides, although in the vicinity of Vicksburg the hills for miles around the city are entirely stripped of their forests.

"Vicksburg is the center of a considerable lumber industry, depending for its supply of timber upon the cypress rafted down from the mouth of the Yazoo river. The first mill devoted to the manufacture of cypress lumber was established in Vicksburg in 1865. Before that time all the timber from the Yazoo valley was rafted down the Mississippi river, mostly to New Orleans, as is still the case with the greatest number of the rafts. A second mill has lately been built at Vicksburg, and the combined annual capacity of the two is ten or twelve million feet. No manufactured lumber is shipped from here farther south than Baton Rouge, nearly the whole production being consumed in the erection of small dwellings in the Mississippi and Yazoo bottoms. The logs received at these mills average 25 inches in diameter, with a length of from 30 to 70 feet.

"The hillsides in the neighborhood of Vicksburg, when thrown out of cultivation, are seen covered with a stunted growth of locust, Chickasaw plums, and other shrubs. The original forests of the bluff hills consist of extensive groves of stately magnolias, stretching down the slopes and mixing with large white oaks, Spanish oaks, beeches, and towering poplars, covering the mossy ground of the small valleys with delightful shade. Many of the magnolias are from 18 inches to 2 feet in diameter. The full-grown trees, however, show that they have already passed their prime; the upper limbs have begun to die, the base of their trunks being often rotten and hollow. Small specimens and sapling or seedling trees I could not find. The large trees are cut down to supply the neighboring city with fuel, and it is inevitable that in a comparatively short time these magnolia groves will have disappeared, and that these delightfully-shaded hills must share the desolation which surrounds the town.

"THE YAZOO DELTA.—Indian bayou, one of the small water-courses between Pearl river, Deer creek, and Sunflower river, has a sluggish current even in time of high water. As is the case with all the streams of the Yazoo delta, its banks are elevated often to a height of 10 or 15 feet above the surface of the water, thus affording excellent natural drainage for the adjacent country, which is covered with a yellow-brown loam of unsurpassed fertility. As the land, however, recedes from the banks it gradually sinks down again toward the level of the bed of the stream, and the water-courses, following the general direction of the Mississippi river, inclose corresponding lines of depression nearly level with the beds of the streams. These troughs between the bayous and rivers are one of the characteristic features in the topography of the Yazoo delta. They are of various extent, depth, and shape; flat and wide, they form tracts of dark, wet forest swamp, more or less dry in summer; or, narrower and deeper, they form swamps rarely ever entirely free from water; sometimes they are inundated wooded marshes and cane-brakes, or ponds and lagoons more or less shallow and studded with the mighty trunks of the cypress. When these depressions are of considerable depth, lakes, presenting open sheets of water sometimes miles in extent, are formed, their margins, only, overgrown with the cypress. Upon these features depend the great diversity of the forest growth which yet covers the largest part of the Yazoo valley. Along the elevated ridges fronting the streams the white oak, the willow oak, the shell-bark and mocker-nut hickories, the black walnut in great numbers, the yellow poplar and the sassafras large enough to furnish canoes of great size, the mulberry, the Spanish oak, the sweet and the black gums are the principal forest trees, with an undergrowth in the openings of dogwood, various haws, crab apples, wild grapes, buckthorns, etc. In the forests covering the lower lands, which slope back to the swamps and reservoirs, the cow oak takes the place of the white oak, while the over-cup white oak occurs everywhere in the more or less saturated soil. Here the sweet gum reaches its greatest size, and here grow also in great perfection the bitter-nut, the elms, hornbeams, white ash, box-elder, and red maples of enormous size. The honey locust, water oaks, and red and Spanish oaks are equally common. Here, among the smaller trees, the holly attains its greatest development, with hornbeans and wahoo elms, while papaws, haws, and privets form the mass of the dense undergrowth, which, interspersed with dense cane-brakes, covers the ground under the large trees.

"The region covered by these splendid forests of hard woods possesses a wealth of timber of the most valuable kinds and in surprising variety. They occupy by far the greatest part of Sunflower and the adjoining counties between the Mississippi river and the hills which border upon the Yazoo to the east. Most of the clearings made in this region before the outbreak of the war, by the planters settled lower down, have since been abandoned and are again densely covered with the young growth of the trees of which the forest was originally composed. During the last few years, however, the country has been entered again for cultivation by a class of small farmers, who from being farm hands have now risen to the position of independent landholders. It is astonishing to see the utter disregard of these settlers for the forest wealth of the country, which in a short time could not fail to be of great commercial value. On the shores of Indian bayou may be seen clearings with hundreds of the finest black walnuts among the deadened trees, while many of the noblest specimens of this valuable timber tree are felled for fence rails or trifling purposes. The amount of oak and hickory timber destroyed here annually is amazing. It is generally believed, however, that not one acre in fifty over this whole region of hard-wood forest has yet been stripped of its tree covering. Quite different is the condition of the cypress growth in the great Yazoo valley. This tree, confined to low and more or less inundated bottoms bordering on the Mississippi, the Lower Yazoo, Big Sunflower, and their numerous tributaries, was once found in the greatest abundance in this region, and immense quantities of cypress lumber have been furnished by the lower parts of Issaquena and Washington and the western parts of Warren and Yazoo counties. The most valuable timber has now, however, disappeared from the immediate neighborhood of the low river banks easily accessible at seasons of high water during every winter and spring. Only groves standing remote from the banks of the water-courses, and which are only accessible to the raftsman during exceptionally high stages of water, now supply this lumber. In the upper portions of the valley, however, in the low depressions described as extending between the elevated banks of the streams, more or less limited areas of undisturbed cypress forest are found. The shallow lagoons, covered with water except during seasons of prolonged drought, and called cypress creeks, present in the spring of the year a strange sight. No object meets the eye between the immense trunks of the mighty trees, as in these cypress groves no other tree nor shrub can live in the dark, shaded, water-covered soil. These reservoirs of drainage, generally without outlet, are called cypress lakes if the water in any part of them, too deep to allow the growth of trees, confines the cypress to their more shallow borders. Here the cypress arrives at its greatest dimensions and produces timber of the finest quality. These cypress lakes and cypress brakes, remote from streams, at no time of the year connected with them, and always surrounded with a mire of forest swamp impassable to wagons, still retain their best timber. Of late years, since swamp and overflowed lands have become the property of the state, planters have added many of these cypress tracts to their estates by purchase; many others have been acquired by companies formed to construct artificial channels by which the timber may be floated to the nearest streams. The richest and most extensive of these groves of cypress, already more or less in the hands of capitalists, are found along Steele's bayou, between Deer creek and the Sunflower river, in Washington county; between that stream and the lower course of Bogue Phalia, and between the Mississippi river and Black creek above Greenville. There is also a very large body of cypress inclosing the 'California brake', upon the Little Sunflower, in the counties of Bolivar and Coahoma, extending through Tallahatchie county to the Yazoo river.

"The traffic in cypress lumber in the Yazoo region dates from 1830. In 1838 it was commenced upon the Sunflower river and Deer creek, ten years after the first settlements were established upon the banks of these streams; since that time rafts have been sent regularly to New Orleans, and camps of lumbermen have been established in every direction, the forests, particularly those upon the public domains, being regarded as the undisputed property and lawful prey of the log-getter. In consequence the cypress groves have been, if not entirely destroyed, largely culled of their best timber wherever it could be obtained without investment of capital, that is by simply floating the logs to the streams at times of freshet and overflow.

"The cutting of these cypress forests is not wisely regulated under the ownership of the state. These lands have been thrown into the market at 50 cents an acre with the condition of settlement. Beneficial as such a law might prove in the disposal of lands fit for cultivation, it results, in the case of timber-land unfit for the plow, in the reckless destruction of one of the surest sources of public revenue. The state thus sells for 50 cents what on its face is worth to the purchaser hundreds of dollars, and which, when deprived of its value and rendered forever worthless, will be turned back to the state again.

"Much of the destruction of the timber can be traced to wasteful methods practiced by the negroes. Under present methods any one having rented a plantation will, for the most trifling wants, cut down a tree, regardless of size, and without any effort to preserve for future use the parts not immediately wanted, so that the next quarter of a century will probably see the entire destruction of the vast quantities of timber stored in the whole of this great territory."

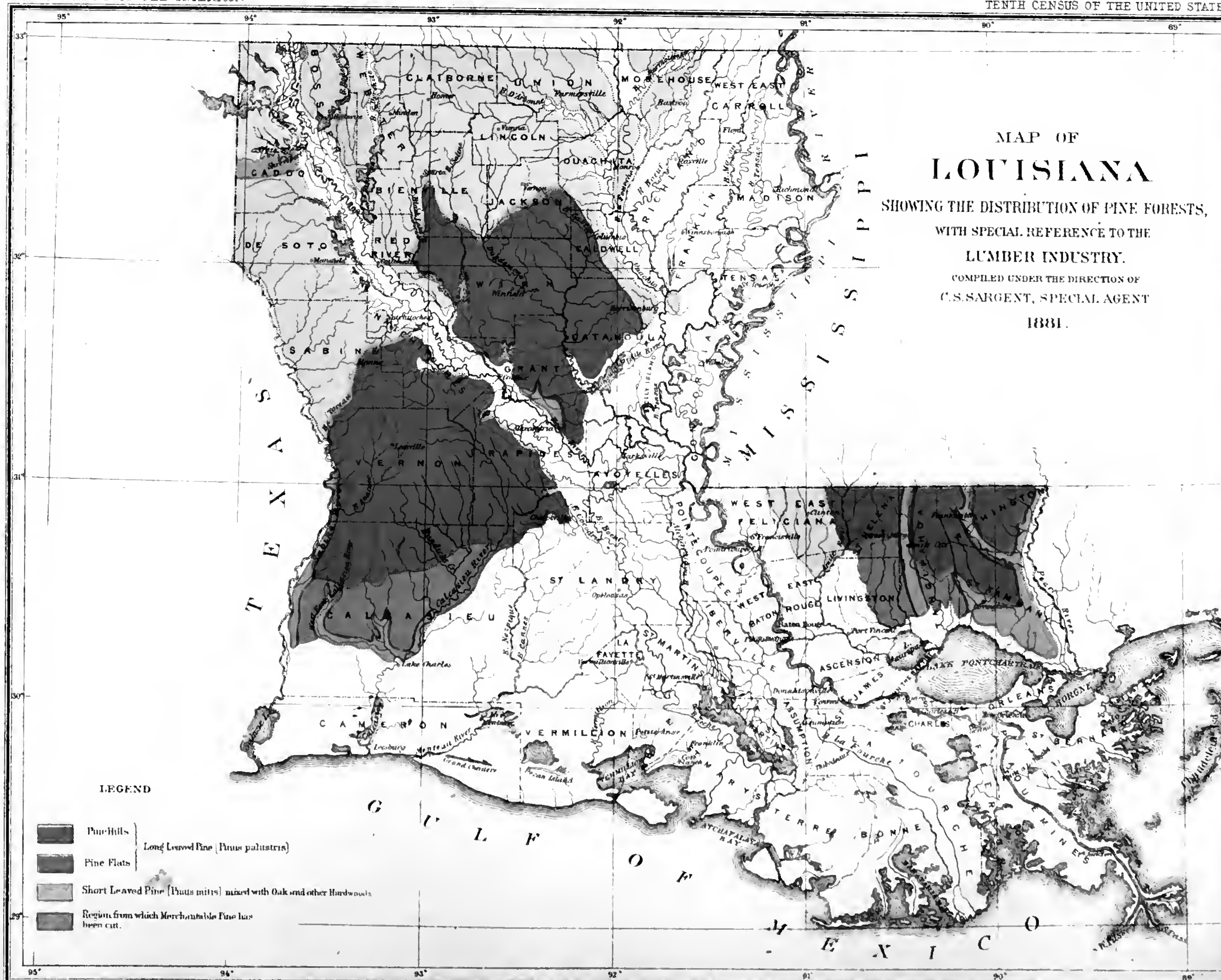
LOUISIANA.

The coast of Louisiana is bordered by saline marshes and savannas extending inland from 10 to 40 miles, or is covered with a scattered growth of cypress occupying extensive fresh-water swamps peculiar to the region. In Vermillion, Calcasieu, Saint Martin's, and Saint Landry parishes considerable treeless areas, open grassy prairies in the borders of the forest, occur. With these exceptions Louisiana was originally covered with a dense and varied forest growth. The Maritime Pine Belt covered the eastern portion of the state nearly to the Amite river, or until checked from further western development by the alluvial deposits of the Mississippi. Forests of pine, too, occupied the western part of the state north and south of the Red river. The pine flats of Calcasieu were covered with forests formed almost exclusively of the long-leaved pine, which, farther north, mixed with oaks and various hard-wood trees, extends over the high rolling country which stretches from the Sabine northeasterly nearly to the Ouachita river. The northeastern part of the state was covered, outside of the broad bottom lands of the rivers, with a heavy forest of short-leaved pine (*Pinus mitis*) mixed with upland oaks, hickories, and other deciduous trees. The bottom lands and all that part of the state bordering the Mississippi were covered with a heavy growth of the trees peculiar to such low, rich soil throughout the Gulf region. The high bluffs which occur at different points along the Mississippi, the Atchafalaya, and other streams flowing through the western part of the state were covered with a noble forest of evergreen magnolias mingled with beeches, water oaks, and gums.

The most valuable forests of the state are still almost intact, although the pine has been cut from the banks of the Pearl river and some of its tributaries, and from along the line of the Chicago, Saint Louis, and New Orleans railroad, to furnish the New Orleans market with lumber. Pine has also been cut along the Sabine river, from both forks of the Calcasieu, along the Red river in the neighborhood of Alexandria and Shreveport, and more recently in Catahoula parish, along Little river. The river swamps and rolling hills in the eastern and northern parts of the state still contain vast bodies of valuable hard-wood forest yet untouched by the ax.

The forests of Louisiana, uninvaded as yet by the manufacturers of naval stores, have not greatly suffered from forest fires. During the census year only 64,410 acres of woodland were reported as burned over by fire, with a loss of only $6,800. These fires were generally set to improve pasturage, or by careless hunters camping in the forest.

A small amount of cooperage stock is made in New Orleans almost entirely from cypress and pine, although that city has long been an important point of export for oak staves and headings brought there from Arkansas and


MAP OF
LOUISIANA
SHOWING THE DISTRIBUTION OF PINE FORESTS,
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C.S.SARGENT, SPECIAL AGENT
1881.
LEGEND
Pine Hills
Pine Flats
Long Leaved Pine (Pinus palustris)
Short Leaved Pine (Pinus mitis) mixed with Oak and other Hardwoods
Region from which Merchantable Pine has been cut.
TEXAS
MISSISSIPPI
MISSISSIPPI RIVER
GULF OF MEXICO
CADDO
BOSSIER
CLAIBORNE
UNION
MOREHOUSE
WEST CARROLL
EAST CARROLL
LINCOLN
OUACHITA
BIENVILLE
JACKSON
RICHLAND
MADISON
DE SOTO
RED RIVER
CALDWELL
FRANKLIN
TENSAS
WINN
SABINE
CATAHOULA
GRANT
CONCORDIA
VERNON
RAPIDES
AVOYELLES
WEST FELICIANA
EAST FELICIANA
ST LANDRY
CALCASIEU
POINTE COUPEE
WEST BATON ROUGE
EAST BATON ROUGE
LIVINGSTON
ST TAMMANY
LA FAYETTE
ST MARTIN
IBERVILLE
ASCENSION
ST JAMES
ORLEANS
ST BERNARD
PLAQUEMINES
CAMERON
VERMILION
ST MARY
TERRE BONNE
LA FOURCHE
ASSUMPTION
Lake Charles
LAKE PONTCHARTRAIN
Scale:
Julius Bien & Co. lith.

Tennessee by river. The magnificent hard woods common over much of the state can supply abundant material for many important industries which already at the north suffer from the exhaustion and deterioration of the local timber supply.

The following rough estimates of the amount of the long-leaved and short-leaved pine standing in the state have been prepared by measuring upon a large-scale map areas occupied by the pine forests, which coincide almost exactly with geological formations. From these areas the totals of clearings as returned by enumerators and all areas of swamp, bottom lands, and prairies are deducted to obtain the extent of territory covered with pine forests. By multiplying this area by the average stand of timber per acre, obtained by numerous observations in different parts of the state, the following estimate of the amount of merchantable pine standing May 31, 1880, is reached:

Parishes.	Long-leaved pine (*Pinus palustris*).	Short-leaved pine (*Pinus mitis*).
	Feet, board measure.	*Feet, board measure.*
Bienville	416, 000, 000	1, 837, 000, 000
Bossier		1, 574, 000, 000
Caddo		1, 696, 000, 000
Calcasieu	4, 219, 000, 000	
Caldwell	602, 000, 000	362, 000, 000
Catahoula	1, 558, 000, 000	304, 000, 000
Claiborne		1, 923, 000, 000
De Soto		1, 971, 000, 000
East Baton Rouge		. 157, 000, 000
East Feliciana	198, 000, 000	886, 000, 000
Grant	1, 574, 000, 000	
Jackson	493, 000, 000	1, 670, 000, 000
Livingston	300, 000, 000	
Morehouse		797, 000, 000
Natchitoches	1, 792, 000, 000	618, 000, 000
Onachita	16, 000, 000	1, 126, 000, 000
Rapides	2, 422, 000, 000	
Red River		643, 000, 000
Sabine	598, 000, 000	1, 074, 000, 000
Saint Helena	749, 000, 000	
Saint Landry	579, 000, 000	
Saint Tammany	1, 398, 000, 000	
Tangipahoa	1, 537, 000, 000	
Union		2, 522, 000, 000
Vernon	3, 741, 000, 000	
Washington	1, 734, 000, 000	
Webster		1, 443, 000, 000
West Feliciana		122, 000, 000
Winn	2, 662, 000, 000	
Total	26, 588, 000, 000	21, 625, 000, 000
Cut for the census year ending May 31, 1880	61, 882, 000	22, 709, 000

The principal point of lumber manufacture is Saint Charles, in Calcasieu parish, on the southern border of the western pine forest. Lumber manufactured here is shipped east and west by rail, and in small schooners to Mexican and West Indian ports.. A comparatively small amount of lumber is manufactured at New Orleans from logs cut in eastern Louisiana and towed through lake Pontchartrain and the canals to the city, and along the river front from logs rafted out of the Red, Little, Black, and other streams of northern Louisiana. New Orleans, however, is principally supplied with lumber sawed at Gulf ports, in spite of its position with reference to the most valuable hard-pine forests upon the continent, its large local demand for lumber and all saw-mill refuse, and its facilities for export, which would seem to indicate that it must become the most important center of lumber manufacture and distribution in the south. Small quantities of pine lumber have long been manufactured upon the Red river near Alexandria; short-leaved pine (*Pinus mitis*) is sawed at Shreveport, and in small quantities for local consumption at other points in the northern parishes.

MOSS GINNING.

New Orleans is the center of the "moss-ginning" industry of the United States. The "moss" (*Tillandsia usncoides*), a common epiphyte, growing in great quantities upon the cypress, live oak, and other southern trees, is gathered, by men known as "swampers", in the swamps of Louisiana, Mississippi, Alabama, and Florida. The moss when gathered is piled near the swamps and allowed to rot during ten or twelve months. It loses in this process about 90 per cent. of its weight, and is then shipped to New Orleans, where it is cleaned, dried, and ginned, losing in this latter operation 35 per cent. in weight. The prepared moss is used in upholstery, either alone or mixed with hair. The product of the New Orleans factories is principally shipped to the western states, a comparatively small amount being sent to Europe. Six moss factories are located in New Orleans, and there are also small establishments at Plaquemine and at Morgan City, Louisiana, and at Pensacola, Florida. New Orleans received during the year ending August 31, 1881, 3,500 bales of rough moss, weighing 10,000,000 pounds, and valued at $315,000. A considerable amount, however, is ginned in the country and shipped direct to consumers, or is prepared by the consumers themselves. Persons most familiar with the volume of this industry estimate that the value of the prepared moss gathered annually in Louisiana, the principal region of supply, is not far from $550,000. The amount gathered, however, varies considerably from year to year. Moss can only be profitably collected at times of high floods, when the swamps are navigable to small boats, and the moss, hanging from the branches of the trees, can be easily gathered. The wages earned by the swampers, too, are not large, and the gathering of moss is only resorted to when more profitable employment upon farms cannot be obtained.

The following extracts are from notes of a hasty journey made through the forest region of western Louisiana by Dr. Charles Mohr:

"For the investigation of the important pine region of western Louisiana I selected Alexandria as my starting point. Situated almost centrally between the forests of long-leaved pine which skirt both sides of the Red River valley, Alexandria is the seat of the actual lumber trade and the point where the lumber interests of this great timber region must be developed in the future. Little is left of the vast cypress swamps which once covered the alluvial lands on the Mississippi river below the mouth of the Red river and the lower basin of that stream. It is only in the most inaccessble swamps, cut off from all communication with the rivers, that patches of this timber remain. The ever-increasing demand for this lumber has almost exhausted the available cypress of the Red River country, and cypress is now drawn from the forest farther north bordering the Black and Ouachita rivers. The lowlands along the river front, subject to inundation and devoid of drainage, present in their tree growth the same features as the low forests of the Mississippi and the Yazoo valleys. The bitter pecan flourishes here luxuriantly, and with it the white ash, the swamp over-cup oak, the persimmon, sycamore, sassafras, sweet gum, and cottonwood. The green ash is common, and in better-drained localities the willow, white, cow, and red oaks appear, with elms and occasional pecans. Twelve or 15 miles below Alexandria the first pines are seen looming up in the forest; upon a nearer approach they are recognized as the loblolly. A short distance farther up the river, upon sandy bluffs fronting the western shore, fine specimens of the short-leaved pine are observed, associated with black oaks, Spanish oak, the black-jack, and many of the shrubs peculiar to the drift of the coast pine region east of the Mississippi. The wide bottom lands of the river upon which Alexandria is situated extend west to bayou Bœuf. This district, unsurpassed in fertility and regarded as the garden of Louisiana, has but little left of the forest with which it was once covered. The pecan trees alone of the original forest growth have been spared from the general destruction. Of these, fine specimens line the roadsides and dot the fields. The unsightly honey locust occupies the waste low places, in company with a second growth of willows, hackberries, and catalpas. The shores of bayou Bœuf are covered with a variety of trees. Cypresses line the brink of the water; beyond these, sycamores, bitter gums, sweet and white gums, pecans, water and willow oaks, red and white elms, red maple, and ash occupy the gentle acclivities, with a dense undergrowth of smaller trees—the dogwood, several haws, wahoos, catalpas, Carolina buckthorn, southern prickly ash, etc. Ascending the ridge to the uplands the deep alluvial soil is left behind, and the light sandy loams of the Tertiary strata make their appearance, and with this change of soil the vegetation changes as suddenly. Stately loblolly pines rise above the groves of post, black, and Spanish oaks, and where the ridge descends again to what might be called the second bottom of bayou Bœuf, a forest of white oak is entered, which contains a stand of timber seldom equaled. On the long, gentle swells these are associated with fine Spanish oaks, a few pig-nuts and mocker-nuts, and in the depressions with red oak, elms, ash, and other trees found on soil of good quality in the same latitude east of the Mississippi river.

"The hills formed by the sandstone drift gravels rise suddenly from the plain covered with the forest of the long-leaved pine, comparing favorably both in the size and number of the trees with the best timber districts in the Coast Pine Belt of the eastern Gulf states. Trees under 12 inches in diameter are rarely seen, as is the case everywhere in these undisturbed primeval pine forests. The soil of this region is closer, more retentive of moisture, and richer in plant-food than that in the Maritime Pine Region east of the Mississippi. The pines here are therefore of more rapid growth and below the standard of quality for which the pine produced on the poor, siliceous ridges of lower Mississippi and Alabama is so highly valued. The numerous streams which cut their way through these pine hills are fringed with many of the evergreens peculiar to the eastern Gulf coast; and magnolias, the red and white bay, wax myrtles, willows, and the devilwood are common.

"The pine region west of the Red River valley spreads westward to the Sabine, forming part of the great pine forest which extends far into eastern Texas. Southward it constantly increases in width; and its length from north to south, where it verges upon the lower maritime prairies of the Calcasieu, is not less than 100 miles. It includes the whole of the parish of Vernon, the largest part of Calcasieu, and portions of the parishes of Natchitoches and Rapides, covering an area of about 4,500 square miles. The northern portion of this belt is one vast primeval forest. The small inroads made by the scattered settlers and the few small saw-mills which supply a small local demand are too insignificant to be taken into account. In the southern portion of this forest the saw-mills on the Sabine river and at Lake Charles have already removed some timber from the banks of the principal streams.

"The region of long-leaved pine which skirts the eastern confines of the Red River valley, and which at its southern extremity almost touches the river banks, may be called the central pine region of west Louisiana. The village of Pineville, opposite the city of Alexandria, is the center of the lumber trade of this region. The high, undulating uplands formed of the Pliocene-Tertiary strata which here front the river bear a growth of loblolly and short-leaved pine mixed with upland oaks. A few miles to the eastward, however, upon the hills covered with drift, the forest of long-leaved pine appears. The surface in this central pine region is more broken, the soil poorer, more porous and siliceous than west of the Red River valley, and the timber produced here is of unsurpassed quality. An average of not less than fifteen trees to the acre, with a diameter of over 15 inches 3 feet from the ground, grow here. The production of lumber is limited to saw-mills situated 7 or 8 miles from the river. They have been gradually removed from its banks as the timber was exhausted on a line 7 or 8 miles in length north and south from Pineville. The production of these mills amounts in the aggregate to 40,000 feet a day. The lumber manufactured here supplies the population of the Red River valley as far west as Shreveport.

"The rolling uplands which extend to the edge of the river at Shreveport are covered with a heavy, cold, clayey soil almost impervious to water; they bear an open growth of oaks, among which the post oak is the prevailing species, finding here the conditions most favorable to its growth. The Spanish oak, invariably called west of the Mississippi river red oak, with fine black-jack makes up the larger part of the tree growth. Hickories, represented by the pig-nut and mocker-nut, are not frequent, and are of small size. The black oak is found in localities with somewhat rocky surface and loose subsoil, while white oaks occur along the base of declivities where an accumulation of vegetable matter has been deposited. The undergrowth in these woods is scanty, and consists for the most part of seedling oaks. Where, however, the forest has been entirely removed, the loblolly pine takes exclusive possession of the soil. These oak forests reach to the northern confines of the state and extend west into Texas. In their southern extremity toward the pine region the soil is better, and the white oak becomes the prevailing forest tree. My attention was directed to the fact that since the removal of the raft of the Red river the drainage of the upper part of the valley has been greatly improved, and many of the lakes and swamps formerly continually inundated are now dry, while the swamp forest growth, including the cypress, is dying, or has already died.

"Opposite Shreveport the valley spreads out into an extensive plain from 8 to 10 miles in width, descending imperceptibly as it recedes from the bank of the river. These lowlands are mere swamps, often deeply overflowed by the backwater of the river, which finds its way through the numerous bayous and inlets which intersect this plain. The forest growth covering these swamps is of inferior size, and consists of but few species. The cypress occupies the overflowed swamps, but it is always below medium size, and I did not notice a single specimen 2 feet in diameter. The saline, gypsum soil does not seem suited to its full development. The water locust finds here its favorite home. It is very common in moist localities not subject to constant inundation. The wood of this tree is as hard and durable as that of the common honey locust, and is employed for the same purposes; that is, in the manufacture of stirrups, blocks, hubs, etc. The green ash is frequently seen here growing with the wahoo, hornbeam, holly, and privet, and forming broad clumps of great luxuriance beneath the larger trees. After passing Cross bayou the land gently rises, and, with better drainage, the trees of the swamps disappear and are replaced by a more varied and valuable timber growth. The white ash and white and red oaks are the more common trees in the woods which skirt the base of the ridges forming the eastern limits of the valley of the Red river. At this point they are separated from the low hills of the Pliocene sandy loams by a pretty, clear stream, the Red Chute, which runs swiftly over its bed along the base of the uplands; these form long, gentle, swelling slopes, or spread out into broad flats more or less deficient of drainage. The ridges are all wooded with upland oaks and short-leaved pines, while the loblolly pine, with water and willow oaks, sweet and black gums, cover the depressions and damp flats. The tree growth upon these ridges is vigorous. I have nowhere found the short-leaved pine of finer proportions, equaling in size and length of clear trunk the long-leaved species. This region of the short-leaved pine, with its low, heavily-timbered ridges, is similar in character of soil and vegetation to the pine hills of central and northern Mississippi, and might be designated as the region of the pine hills of northern Louisiana. Between lake Bodeau and lake Bistineau the surface of the country is very often imperfectly drained, and there the loblolly pine is the prevailing tree. A few miles back of Bellevue, in Bossier parish, the level forest is interrupted by a strip of prairie from 1 mile to 3 miles wide, covered with a cold, soapy, gray soil impervious to water. On these natural meadows no tree or shrub is growing, except a peculiar *Cratægus*, new to me. (*a*) It is a small tree or large shrub, forming strictly-defined, impenetrable, dense thickets a few rods or of several acres in extent. In its arborescent form it rises to a height of from 15 to 20 feet, with a more or less bent trunk 6 or 7 inches in diameter, spreading its crooked limbs at a height of from 4 to 6 feet above the ground. The fruit is said to be as large as that of the apple haw, sweet and edible; it is eagerly eaten by swine, which fatten upon it. This tree is here called by the people 'hogs' haw'.

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a Cratægus brachyacantha, Sargent and Engelmann.

"On the decline which leads to the valley of bayou Dauchitta, the flatwoods give way to a fine growth of Spanish and post oaks, elms, and gums.

"The western bank of the bayou is confronted by hills of the post-Tertiary sands and gravels which westward form a succession of steep ridges heavily wooded with the upland oaks and short-leaved pine. The narrow creek bottoms inclosed between these ridges are watered abundantly by springs and clear streams shaded by white and red bay, hollies, azaleas, and kalmias. The great magnolia is not seen here, and the American olive is missing. In these gravelly hills, extending westward to the valley of the Ouachita river, the short-leaved pine is very common and the characteristics of the pine-hill region are prominent. These hills cover a large area extending northward into Arkansas, and toward the south merging gradually into the oak woods which border upon the bottoms of the numerous tributaries of the Red river. This pine-hill region is sparsely settled, and, remote from water and rail communication, its original stores of pine and hard-wood timber have scarcely been touched.

"An intimate knowledge of the forest growth in this section was obtained by an excursion over the hills to bayou Dauchitta above its entrance to lake Bistineau. In the localities of the best drainage in this valley the cow oak is very common, mixed with the white and post oaks, while sweet gums, black gums, water and willow oaks, and hackberries occupy lower situations. On the immediate banks and in the sloughs small cypress trees are common, mixed with the bitter pecan, the hornbeam, the water locust, and the sycamore. The loblolly pine takes possession of every opening in the forest, descending the high hills, while numerous haws border the edges of the forest. In the bottoms and along the declivities, the Chickasaw and the American plum are found of larger size than farther east. Loblollies and hickories with the black and post oaks occupy the lower declivities, and upon the heights the yellow pine mixed with upland oaks forms fine forests."

TEXAS.

The most important forests of Texas are found in the extreme eastern part of the state, where the Maritime Pine Belt of the south Atlantic region extends to about midway between the Trinity and the Brazos rivers. A forest of long-leaved pine occupies most of the territory between the Sabine and the Brazos south of the thirty-first degree of north latitude, reaching south to within 20 miles of the coast. Beyond the long-leaved pine forests, forests of the loblolly pine, mixed with hard woods, stretch westward 50 or 60 miles, while north of these two regions a third division of the pine belt, composed of a heavy growth of short-leaved pine mingled with upland oaks, occupies the rolling ridges which extend northward to beyond the Red river. The swamps which line the larger streams flowing into the Gulf, especially within the limits of the pine belt, still contain large bodies of cypress. The quality of the Texas cypress, however, is inferior to that grown east of the Mississippi river, and probably one-third of the timber growing in the valleys of the Sabine and the Nueces rivers is "peggy" or affected by dry rot.

West of the pine belt open forests largely composed of post and black-jack oaks occur, gradually decreasing in density, and finally, west of the ninety-seventh degree of longitude, entirely disappearing. Farther west, however, the "lower" and "upper cross-timbers", two remarkable bodies of timber, composed of small and stunted specimens of these oaks, extend from the Indian territory far south into the prairie region, occupying long, narrow, irregular belts where sandy or gravelly alluvial deposits overlie the limestone of the prairie region. A belt of forest, largely composed of post and black-jack oaks, varying from 20 to 50 miles in width extends southwest of the Trinity nearly to the Nueces river, its eastern border following generally, at a distance of from 50 to 60 miles inland, the trend of the coast. The bottom lands east of the one hundredth meridian are lined with the deciduous trees which occupy similar situations in the eastern Gulf states. Near the coast the bottom lands of the large rivers, often several miles in width, are covered with dense forests composed of enormous trees. Farther west the bottoms gradually narrow, the number of arborescent species covering them decreases, and individual trees are small and stunted.

West of the Colorado river the forests of the Atlantic region are replaced outside of the bottom lands by Mexican forms of vegetation; the hills are covered with a stunted growth of mesquit, Mexican persimmon, various acacias, and other small trees of little value except for fuel and fencing.

An important tree in the forest of western Texas is the cedar covering the low limestone hills which occupy hundreds of square miles north and west of the Colorado river, in Travis, Bastrop, Hays, Comal, and adjacent counties. West of the one hundredth meridian all forest growth disappears, with the exception of a few scattered cottonwoods, elms, and hackberries, confined to the narrow bottoms, and a shrubby growth of mesquit, which covers the plains of western Texas, furnishing the only fuel of the region. The mountain ranges, outlying ridges of the Rocky mountains, which occupy the extreme western part of the state, are covered with an open, stunted forest of western pines and cedars, with which mingle the post oak, the yellow oak, and other species of the Atlantic region.

The pine belt covering the eastern counties of the state is alone important as a source of lumber supply. Areas of river-bottom land covered with trees are, as compared with the area of the state, insignificant in extent, and these river belts of forest are entirely insufficient to supply even the mere local wants of the nearest settlements. The oak forests, which stretch more or less continuously between the eastern pine belt and the treeless western prairies and plains, are, except along their extreme eastern borders, composed of small, stunted trees, often hollow, defective, and of little value except for fuel, fence rails, and railway ties. The forests of the western mountains are

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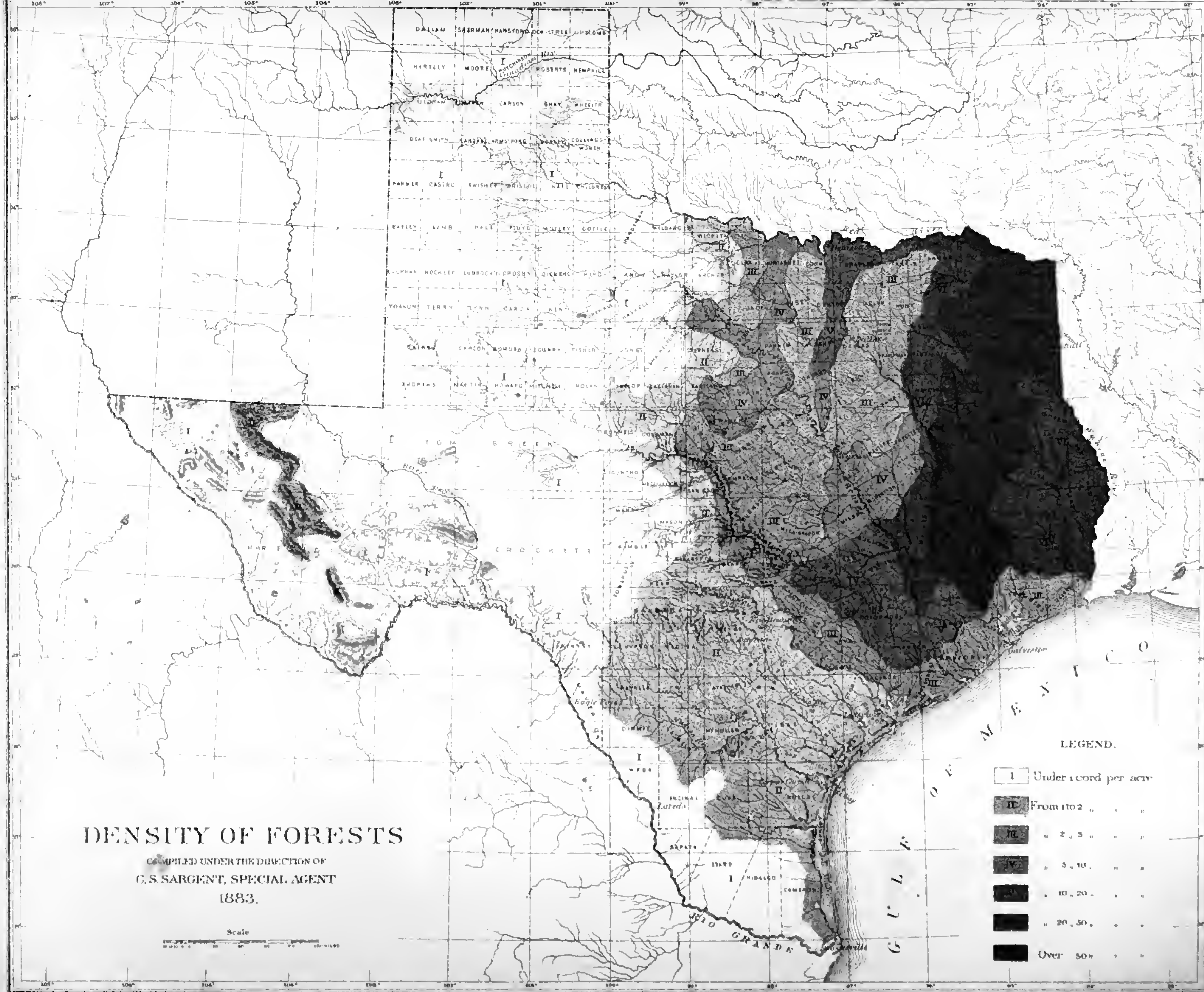
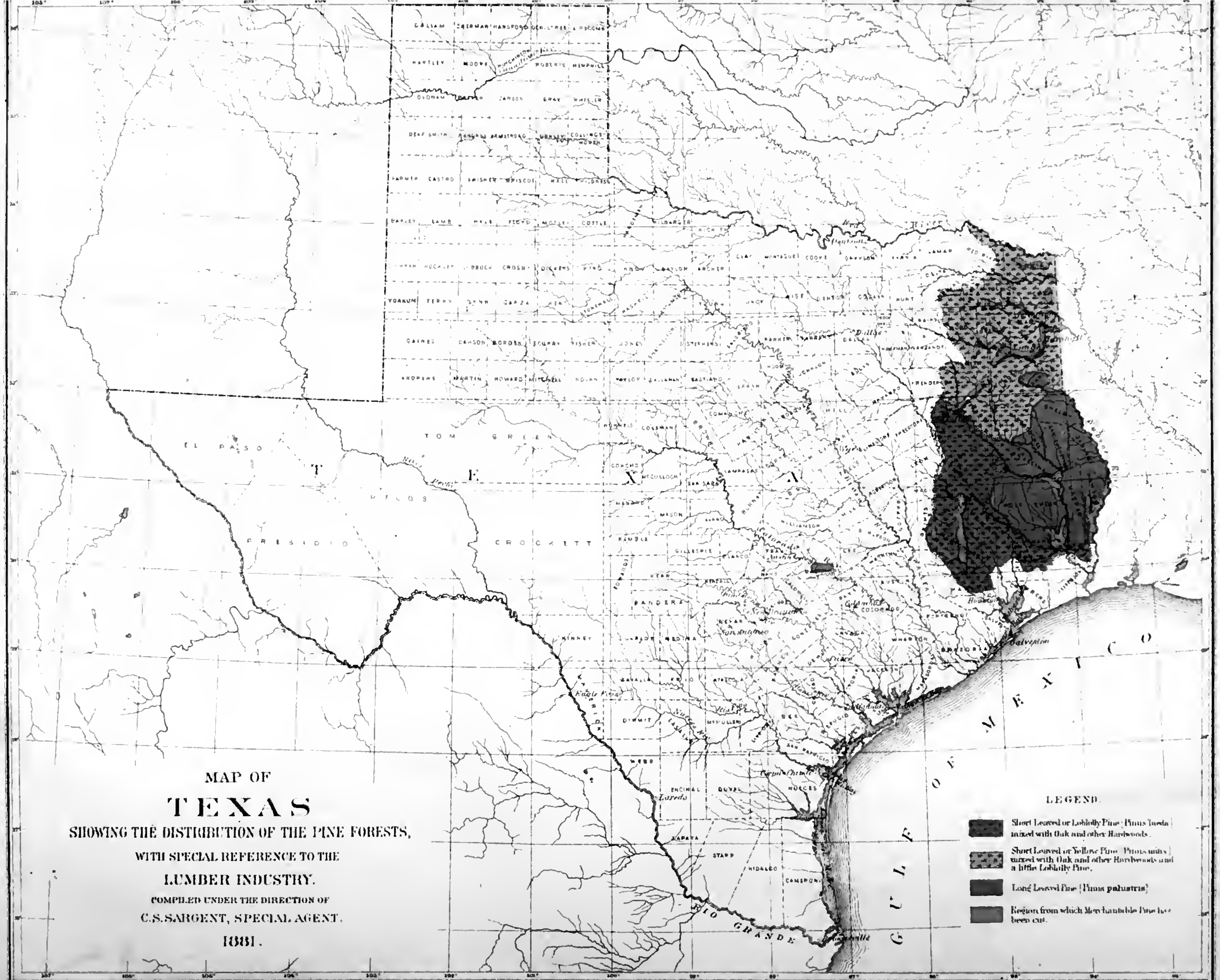


DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
Scale
LEGEND.
I Under 1 cord per acre
II From 1 to 2 " " "
III " 2 " 5 " " "
IV " 5 " 10 " " "
" 10 " 20 " " "
" 20 " 30 " " "
Over 50 " " "
GULF OF MEXICO
RIO GRANDE
TOM GREEN
CROCKETT
Julius Bien & Co. lith.

TEXAS

546 v


MAP OF
TEXAS
SHOWING THE DISTRIBUTION OF THE PINE FORESTS,
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C.S.SARGENT, SPECIAL AGENT.
1881.
LEGEND.
Short Leaved or Loblolly Pine (Pinus Taeda) mixed with Oak and other Hardwoods.
Short Leaved or Yellow Pine (Pinus mitis) mixed with Oak and other Hardwoods and a little Loblolly Pine.
Long Leaved Pine (Pinus palustris)
Region from which Merchantable Pine has been cut.
GULF OF MEXICO
RIO GRANDE
EL PASO
PRESIDIO
PECOS
TOM GREEN
CROCKETT
Galveston
Scale.
Julius Bien & Co. Lith.

not luxuriant, and at the best can only supply a limited local demand with inferior lumber. It is probably no exaggeration to say that west of the pine belt, and with the exception of the small amount of hard wood found on the bottom lands near the coast, the forests of Texas do not contain a single tree fit to manufacture into first-class lumber. The pine forests, therefore, of eastern Texas and western Louisiana are important factors in the future development of Texas, as well as of the treeless northeastern provinces of Mexico, which must draw their building material from these pineries. The position of these forests, therefore, with reference to an enormous territory destitute of timber, although adapted to agriculture and grazing, and which must soon be covered with a considerable population and a net-work of railroads, their richness of composition, and the facility with which they can be worked, give to them perhaps a greater prospective value than that possessed by any body of timber of similar extent in the United States.

During the census year 599,359 acres of woodland were reported damaged by fire, with an estimated loss of $273,990. Of these fires the larger number was set to improve pasturage, in clearing land, or through malice. These returns do not include the large areas burned in western Texas by prairie fires, checking the growth of the mesquit over a great extent of territory.

Small amounts of cooperage stock and woodenware, principally for local consumption, are manufactured in the eastern counties from oak and cypress. Manufacturers report an abundant supply of material.

The following rough estimates of the amounts of the three kinds of pine standing in the state May 31, 1880, were made by multiplying the average stand of timber per acre by the county areas occupied by the pine forests, these being obtained by deducting, from total areas of the county, estimated areas covered by clearings, bottom lands, swamps, etc.:

Counties.	Long-leaved pine (*Pinus palustris*).	Short-leaved pine (*Pinus mitis*).	Loblolly pine (*Pinus Tæda*).
	Feet, board measure.	*Feet, board measure.*	*Feet, board measure.*
Anderson		336, 000, 000	1, 763, 600, 000
Angelina	1, 340, 800, 000		1, 190, 400, 000
Bowie		2, 380, 800, 000	
Camp		579, 200, 000	
Cass		2, 470, 400, 000	
Cherokee		2, 230, 400, 000	585, 600, 000
Franklin		448, 000, 000	
Gregg		598, 400, 000	
Grimes			211, 200, 000
Hardin	1, 244, 800, 000		627, 200, 000
Harris			1, 827, 200, 000
Harrison		2, 326, 400, 000	
Henderson		521, 600, 000	
Hopkins		483, 200, 000	
Houston			3, 216, 000, 000
Jasper	2, 534, 400, 000		
Jefferson			288, 000, 000
Liberty	41, 600, 000		2, 147, 200, 000
Madison			233, 000, 000
Marion		1, 187, 200, 000	
Montgomery			2, 326, 400, 000
Morris		720, 600, 000	
Nacogdoches	1, 216, 000, 000	1, 555, 200, 000	35, 500, 000
Newton	2, 112, 000, 000		33, 000, 000
Orange	230, 000, 000		518, 400, 000
Panola	1, 193, 600, 000	1, 107, 200, 000	
Polk	2, 720, 000, 000		473, 600, 000
Red River		272, 000, 000	
Rusk	115, 200, 000	2, 492, 800, 000	
Sabine	1, 648, 000, 000		
San Augustine	1, 625, 600, 000		
San Jacinto			1, 833, 600, 000
Shelby	1, 884, 800, 000	425, 000, 000	
Smith		2, 035, 200, 000	
Titus		806, 000, 000	
Trinity	51, 000, 000		1, 987, 200, 000
Tyler	2, 550, 400, 000		
Upshur		1, 392, 000, 000	
Van Zandt		26, 000, 000	
Walker			1, 590, 400, 000
Waller			19, 000, 000
Wood		1, 600, 000, 000	
Total	20, 508, 200, 000	20, 093, 200, 000	20, 907, 100, 000
Amount cut for the year ending May 31, 1880	60, 450, 000	*a* 146, 420, 000	61, 570, 000

a Including 30,200,000 shingles.

The principal centers of lumber manufacture in Texas are Orange and Beaumont, on the Sabine and Nueces rivers, above Sabine pass. Long-leaved pine and cypress are sawed here and shipped east and west by rail, and in small quantities by schooner to Texan and Mexican ports. Loblolly pine is sawed at a number of small mills upon the line of the International and Great Northern railroad in the counties south of the Trinity river, and a large amount of short-leaved pine is manufactured in the mills upon the line of the Texas Pacific railroad in the northeastern counties, Longview, in Gregg county, being the principal center of this industry. The product of these mills is shipped west by rail to supply settlers upon the prairies of northern Texas with building material.

The following extracts are derived from the notes upon the forests of Texas made by Dr. Charles Mohr, of Mobile:

"West of Marshall, upon the Texas Pacific railroad, the surface of the land becomes more broken; the soil is lighter, more porous, and favorable to the growth of the short-leaved pine, which soon becomes the prevailing forest tree in the woods extending toward the west. Longview, a small town at the junction of the International and Great Northern and Texas Pacific railroads, is situated almost in the center of the short-leaved pine region, and is the seat of an active lumber business. These forests of short-leaved pine, more or less interspersed with oaks, extend to the northern boundary of the state, and southward with an easterly trend to the confines of the region of the long-leaved pine. The short-leaved pine finds its western limits near Mineola.

At Palestine, in Anderson county, the uplands are covered with a loamy, somewhat sandy, soil underlaid with a heavy clay. Here a more or less open oak forest is common. The black oak abounds, with the Spanish, black-jack, blue-jack, and post oak, the last, however, always the prevailing species. Next to the post oak the black-jack is the species of widest distribution in Texas, the two species being always found associated together from the northern confines of the state to the prairies of the coast, and from the east to the treeless regions of western Texas. The bois d'arc (*Maclura aurantiaca*) is common along the banks of the water-courses in eastern Texas, attaining a size large enough to be economically valuable. It is here, however, most probably adventitious from the region in the northwest, where it forms an almost uninterrupted belt of woods from 4 to 10 miles wide, extending from a short distance south of the city of Dallas to the northern frontier of the state, entering the Indian territory between Sherman and Paris. This tree attains a height of from 45 to 50 feet, with a diameter of from 1 foot to 2 feet, and is of great value.

"The timber growth immediately west of the Brazos is stunted and scanty; large areas of grass land intervene between the scrubby woods until all at once ligneous growth disappears, and the seemingly boundless prairie, in gently undulating swells, expands before the view on all sides. Near the center of Milam county a belt of open post-oak woods from 20 to 25 miles in width is entered. It extends from Belton, in Bell county, southward to the upper confines of Gonzales county. Post oaks stand here from 20 to 30 feet apart, with black-jacks and blue-jacks between them, the trees being all of small size. The soil of these oak hills is of poor quality, sandy, gravelly, and more or less broken, arid, and devoid of vegetable mold. Toward the southern limit of this belt, near Bastrop, a tract of loblolly pine is found covering nearly four townships, or about 90,000 acres. During the last twelve years all the useful timber on this isolated tract has been cut down. A second growth of pine, however, has sprung up, and is now growing vigorously under the fostering care of the owners of the land, and promises in a short time to afford a new supply of timber. A belt of post oak is found intersecting the prairie from the upper part of McLennan county, near Waco, and extending to the northern frontier of the state, where it joins the cross-timbers of the Wichita. It is known as the 'lower cross-timbers'. This belt of oak wood is nearly 150 miles long, with its greatest width of about 20 miles between Dallas and Fort Worth. At a distance of from 20 to 40 miles west of the lower cross-timbers another belt of oak extends from Comanche county to the northern boundary of the state, with a long western spur following the valley of the Brazos as far as the ninety-ninth meridian. This oak forest is known as 'the cross-timbers'.

"Taken as a whole, the country west of the Brazos river, except the basin of the Colorado, is a poorly-timbered region. The mesquit was first met with on the declivities of the prairie, which verge here upon the valley of the Colorado. The wood of this tree is hard, fine-grained, tough, heavy, and of great durability. In the western portions of the state, almost entirely destitute of other timber growth, it serves, according to its size, a variety of purposes in the economy of the stock ranch, and is there invaluable for fencing. Burning with a clear, smokeless flame and possessing great heating powers, it is unsurpassed as fuel by any other Texas wood. It serves, moreover, another important purpose in furnishing an abundance of wholesome and nutritious food to large herds of cattle, at a season of the year when long-continued droughts have destroyed the grass upon the prairie. With the increasing settlement of the treeless-prairie region during the last 15 or 20 years, this tree has spread rapidly east and north. Near San Antonio I saw extensive districts, reported to have been, a few years ago, entirely destitute of even a trace of ligneous growth, and which are now covered with copses of mesquit. Similar growths have sprung up everywhere in the prairies of western Texas. The appearance of this new growth may be traced to the influence of the vast herds of stock which range over the prairies, and which, in voiding the seeds of this tree, assist its wider distribution, and, in keeping down the grass, diminish the quantity of combustible material which feeds the prairie fires, and thus check and finally prevent the spread of the frequent conflagrations which swept year after year over these grassy plains.

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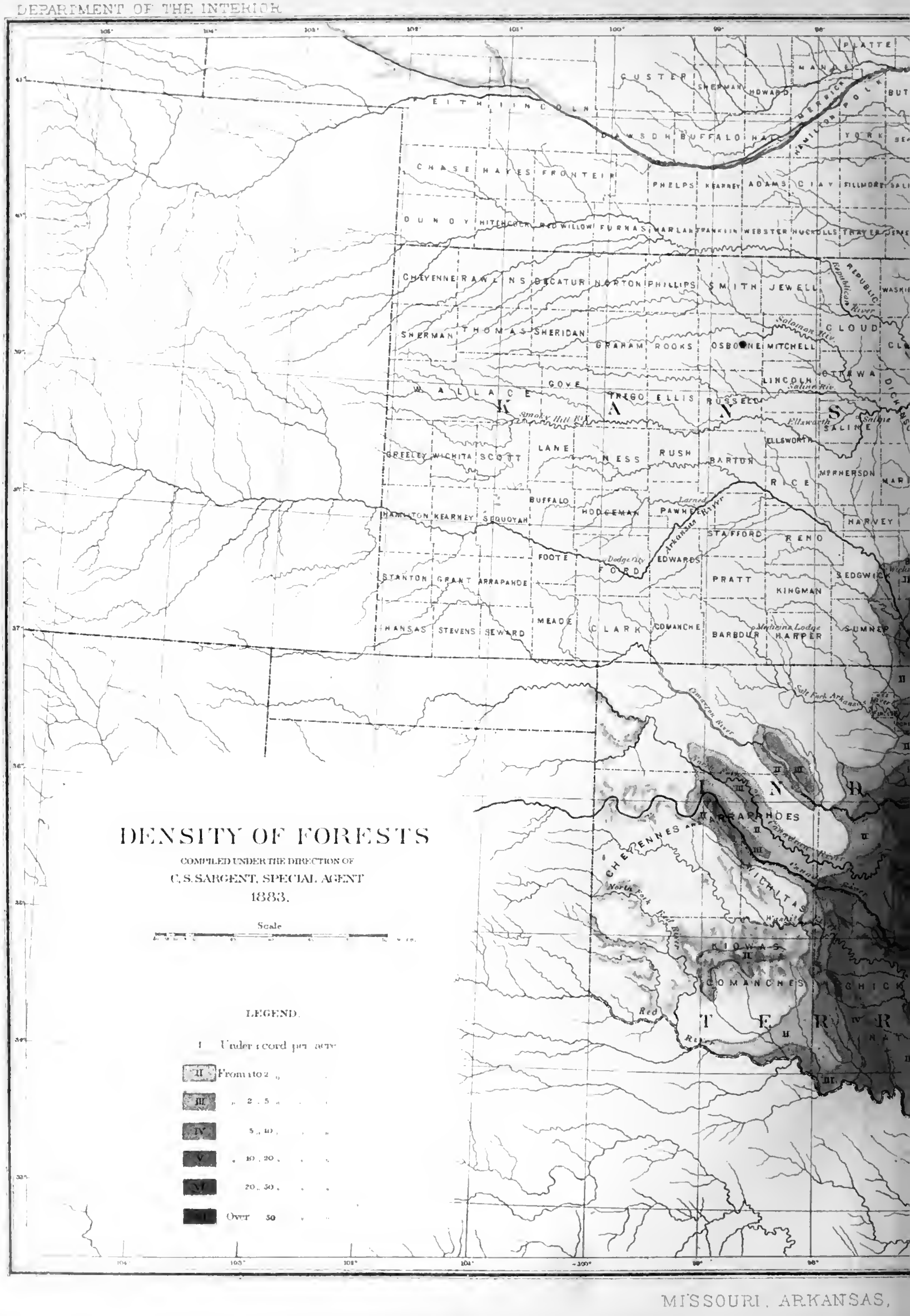
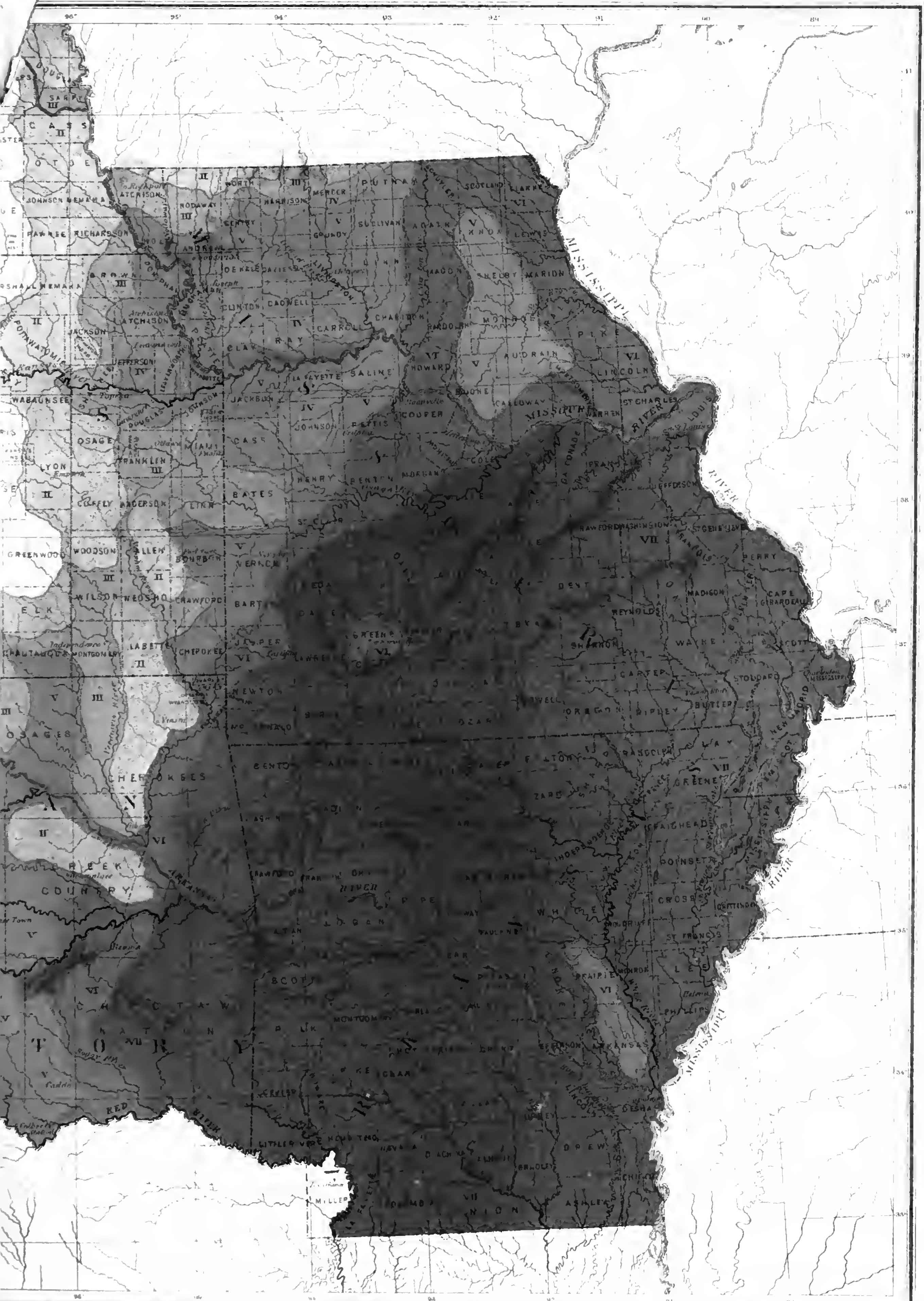

DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
Scale
LEGEND.
I Under 1 cord per acre
II From 1 to 2
III 2 .. 5
IV 5 .. 10
V 10 .. 20
VI 20 .. 50
VII Over 50
CUSTER
SHERMAN
HOWARD
PLATTE
BUFFALO
DAWSON
LINCOLN
KEITH
CHASE
HAYES
FRONTEIR
PHELPS
KEARNEY
ADAMS
CLAY
FILLMORE
DUNDY
HITCHCOCK
RED WILLOW
FURNAS
HARLAN
FRANKLIN
WEBSTER
NUCKOLLS
THAYER
YORK
HAMILTON
POLK
MERRICK
CHEYENNE
RAWLINS
DECATUR
NORTON
PHILLIPS
SMITH
JEWELL
REPUBLIC
CLOUD
SHERMAN
THOMAS
SHERIDAN
GRAHAM
ROOKS
OSBORNE
MITCHELL
LINCOLN
OTTAWA
WALLACE
GOVE
TREGO
ELLIS
RUSSELL
SALINE
ELLSWORTH
K A N S
Smoky Hill R.
Solomon Riv.
Saline Riv.
Republican River
GREELEY
WICHITA
SCOTT
LANE
NESS
RUSH
BARTON
RICE
McPHERSON
BUFFALO
HODGEMAN
PAWNEE
Larned
Arkansas River
HAMILTON
KEARNEY
SEQUOYAH
STAFFORD
RENO
HARVEY
FOOTE
FORD
Dodge City
EDWARDS
STANTON
GRANT
ARRAPAHOE
PRATT
KINGMAN
SEDGWICK
MEADE
CLARK
COMANCHE
BARBOUR
HARPER
SUMNER
Medicine Lodge
HANSAS
STEVENS
SEWARD
Cimarron River
Salt Fork Arkansas
ARRAPAHOES
CHEYENNES AND
WICHITAS
Canadian River
North Fork Red River
KIOWAS
COMANCHES
CHICK
Red River
T E R R
I N D



Julius Bien & Co lith.

"West of the Colorado river the pecan-nut is an important product, forming one of the staple articles of export. Shipments of this nut from San Antonio average annually 1,250,000 pounds, obtained from the bottom lands of the Nueces, the Rio Frio, Medina, and Rio Concho. A million pounds, obtained from the Colorado, Guadalupe, Rio Blanco, Pierderelis, Sabinal, Llano, and San Saba rivers, are shipped from Austin, and about a quarter of a million more from Indianola, gathered on the lower Guadalupe, San Antonio, Colorado, and other streams flowing into the Gulf. The nuts are worth, on an average, 5 cents a pound to the gatherer.

"On the range of low hills extending from San Antonio to Austin, which rise at some points to a height of over 500 feet above the plain, forming the base of the terraces leading to the table-land of northern Mexico, the woods are confined to the barrens and the declivities bordering upon them. The open plains on these table-lands are either entirely destitute of ligneous growth, or, when covered with deeper and more fertile soil, support low copses of mesquit. The western juniper is observed here for the first time. It is a tree of low growth, seldom exceeding 35 feet in height, or more than a foot in diameter. It branches at a short distance from the base, forming a broad, round head. The wood is of a dingy, reddish color, fine-grained, hard, and heavy, and in density and durability is not inferior to that of the red cedar. It is knotty, however, from near the base, and furnishes no sticks sufficiently long to allow its use in cabinet-making, and can only be employed for rough construction, posts, palings, etc., for which purposes it is invaluable. The home of the western cedar is found on the rugged highlands which surround the channels of the headwaters of the numerous streams which flow from the eastern declivity of these hills. Here it forms open groves, with scarcely any other woody growth among the somewhat scattered trees. These cedar woods are particularly common upon the brows of the steep escarpments from the base of which issue the large springs which form such a striking feature in this part of the state. In the vicinity of the settlements few of the full-grown trees have been left. The improvidence of the first settlers in obtaining their timber supplies and the prairie fires which ran through these cedar woods in former years have caused the destruction of large areas once covered by this valuable tree. According to my observation, the western cedar prefers a calcareous, dry soil. Its range of distribution seems limited to the hilly region bordering upon the upper part of the Colorado valley, extending toward the south a short distance below New Braunfels, and westward to the sources of the Nueces and Guadalupe rivers. Well-timbered tracts of this tree are still found west of New Braunfels as far as Boerne, in Kendall county, and on the terraces of the higher ranges in Bandera and Kerr counties."

INDIAN TERRITORY.

The forests of the Indian territory are confined to its eastern portion. West of the ninety-ninth meridian trees are only found along the narrow river bottoms, the intervening ridges being bare of all forest growth. The extreme northeastern part of the territory contains numerous extensive open prairies, south of which a heavy body of forest composed of hard woods, mixed on the high ridges with the short-leaved pine, extends southward into Texas, with a maximum width in the Choctaw nation of 60 miles. In the Cherokee nation six considerable bodies of pine, varying from 10 to 30 miles in length and 2 to 4 miles in width, occur on Spavina creek, Illinois river, Salina river, Spring creek, and Bowman's Fork, tributaries of Grand river. A large body of pine occurs also 25 miles west of Reams, a station upon the Missouri, Kansas, and Texas railroad. Smaller bodies of pine are found, too, east of Reams, and at Stringtown, where lumber is manufactured and shipped southward by rail into northern Texas.

The bottom lands of all the streams flowing through the eastern portion of the territory are heavily timbered with hard woods, and especially those of the Neosho, Verdigris, Arkansas, and Canadian rivers contain great bodies of the finest black walnut now growing. A particularly fine growth of this timber extends along the Verdigris river for 50 miles above Coffeeville.

West of the region of heavy forest the country is covered with an open growth of upland oaks, among which the most prominent are the post oak and the black-jack. These forests are interspersed with prairies, often of considerable extent, which gradually occupy the whole country outside the bottom lands. Farther west, between the ninety-seventh and ninety-ninth degrees of west longitude, the "cross-timbers" enter the territory from the south. They are composed, as in Texas, of a stunted growth of post oak and black-jack, and extend northward across the territory in straggling patches into southern Kansas. The main belt of the "cross-timbers", about 70 miles wide at the Texas boundary, gradually becomes narrower toward the north and northwest, disappearing, at about longitude 99° west, upon the ridges south of the Cimarron river.

No returns of the amount of lumber manufactured in the territory have been received, nor other than the most general information in regard to its forest covering.

ARKANSAS.

Heavy forests cover the state of Arkansas, with the exception of a few isolated prairies principally confined to Prairie and Arkansas counties, north of the valley of the Arkansas river, and the western borders of the state. North of the Arkansas river the forests are mostly composed of the deciduous trees of the Mississippi basin, through which isolated belts occur, often of considerable extent, in which the short-leaved pine, the only species found in northern Arkansas, is mixed with the hard woods. The southwestern part of the state south of the Arkansas river and west of the broad, level plain of the Mississippi is covered outside the river-bottom lands with an almost continuous forest of pine, in which the short-leaved species occupies the high, dry ridges and the loblolly the moist soil above the bottoms. Great bodies of cypress cover the extensive swamps that stretch along the eastern border of the state or line the bottoms of the White, Arkansas, Washita, and Red rivers. The hard-wood forests of the state are hardly surpassed in variety and richness, and contain inestimable bodies of the finest oak, walnut, hickory, and ash timber. Black walnut of large size is still widely scattered over the state, and is particularly abundant in the valley of the Red and other southern rivers. The pine forests are almost intact. Settlements made for agricultural purposes have been confined to bottom lands, and only during the last few years has pine lumber been manufactured in the state, except to supply a very limited local demand. Recently, however, comparatively small quantities of lumber manufactured at numerous railroad mills, principally established south of the Arkansas river, have been shipped north and south out of the state.

The forests of Arkansas have received comparatively little damage from fire. Pine generally succeeds pine even on burned land, although upon certain gravel and clay soils the second growth is largely composed of black and red oaks, or, in the southern part of the state, the sweet gum replaces other trees on bottom lands. During the census year 858,115 acres of woodland were reported devastated by fire, with an estimated loss of $259,470. The largest number of these fires was due to the carelessness of farmers in clearing land, or to hunters camping in the forest.

Industries consuming hard woods are still in their infancy in Arkansas, although doubtless destined to attain an important development. Rough white-oak staves are largely manufactured in the White River country and in the northeastern part of the state for eastern and European markets.

A considerable traffic exists in the southwestern counties in the wood of the Osage orange, used for wheel stock, and more recently as pavement in Saint Louis and other northern cities.

The following estimates of the amount of short-leaved pine standing in Arkansas May 31, 1880, were prepared by Professor F. L. Harvey, of Fayetteville:

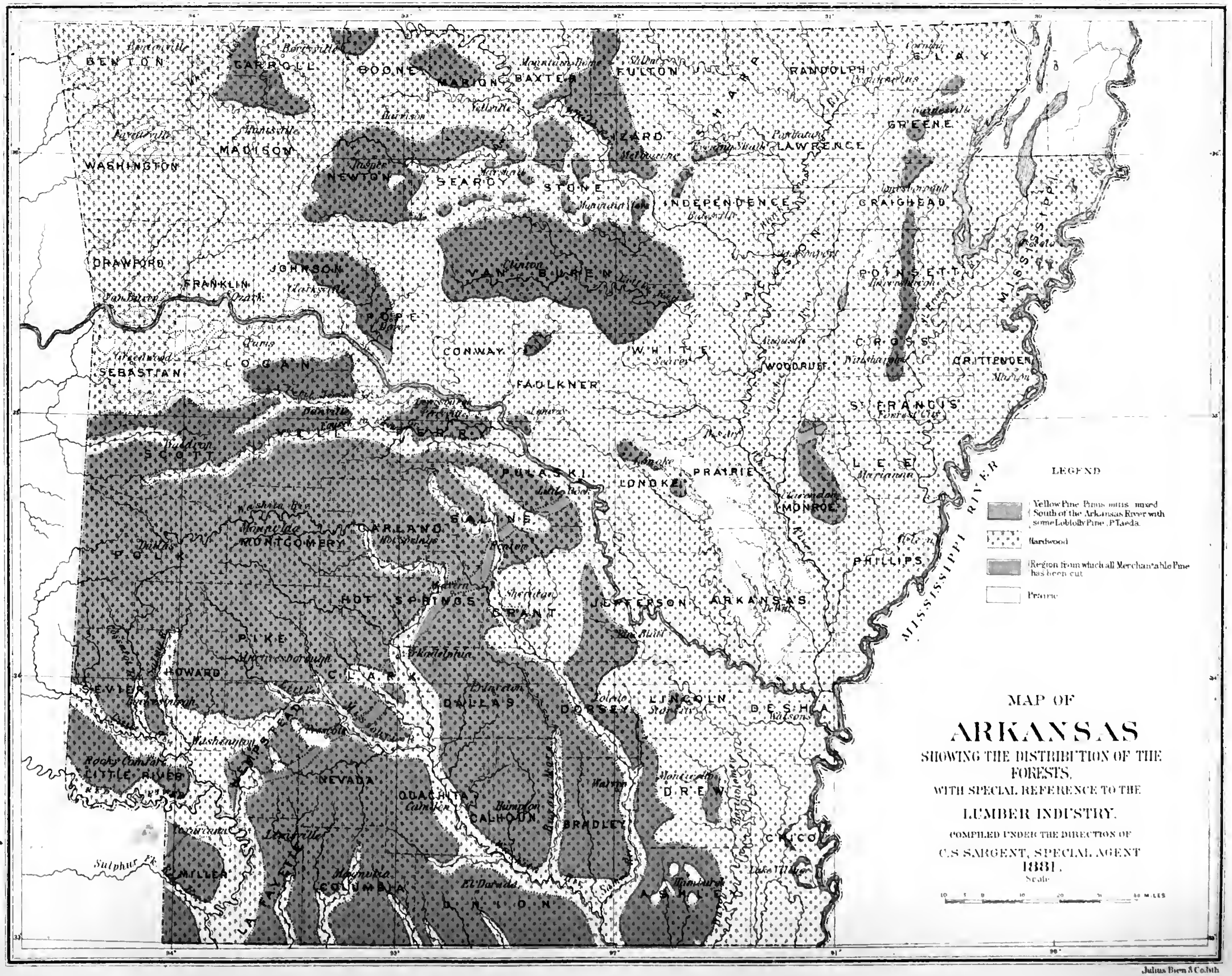
SHORT-LEAVED PINE (*Pinus mitis*).

Counties.	Feet, board measure.	Counties.	Feet, board measure.	Counties.	Feet, board measure.
Ashley	1,555,000,000	Hot Spring	1,348,000,000	Perry	1,023,000,000
Baxter	187,000,000	Howard	1,254,000,000	Phillips	21,000,000
Boone	124,000,000	Independence	93,000,000	Pike	1,095,000,000
Bradley	1,140,000,000	Izard	242,000,000	Poinsett	45,000,000
Calhoun	1,519,000,000	Jefferson	518,000,000	Polk	2,592,000,000
Carroll	159,000,000	Johnson	248,000,000	Pope	208,000,000
Clarke	1,280,000,000	La Fayette	586,000,000	Pulaski	668,000,000
Clay	3,000,000	Lee	14,000,000	Saint Francis	7,000,000
Columbia	1,866,000,000	Lincoln	105,000,000	Saline	933,000,000
Craighead	18,000,000	Little River	690,000,000	Scott	1,516,000,000
Cross	54,000,000	Logan	554,000,000	Searcy	166,000,000
Dallas	1,659,000,000	Lonoke	20,000,000	Sebastian	243,000,000
Dorsey	726,000,000	Madison	55,000,000	Sevier	969,000,000
Drew	482,000,000	Marion	207,000,000	Sharp	35,000,000
Faulkner	42,000,000	Miller	622,000,000	Stone	179,000,000
Fulton	146,000,000	Monroe	180,000,000	Union	2,364,000,000
Garland	1,865,000,000	Montgomery	2,281,000,000	Van Buren	435,000,000
Grant	207,000,000	Nevada	1,453,000,000	White	23,000,000
Greene	38,000,000	Newton	707,000,000	Yell	1,300,000,000
Hempstead	1,176,000,000	Ouachita	1,384,000,000		
Total					41,315,000,000
Cut for the census year ending May 31, 1880 (including 57,043,000 shingles and 2,891,000 laths)					129,781,000

TENNESSEE.

The western counties of Tennessee are covered with heavy forests, similar in distribution and density to those which occupy the Yazoo region of western Mississippi. The river swamps in this part of the state still contain large bodies of cypress, while the hills are covered with oaks, hickories, and other hard-wood trees. The central portion of the state, now largely cleared for cultivation, was once covered with forests of hard wood, remnants of which are still found upon rocky ridges or land unfit for agriculture. Nearly through the center of this middle district, extending north and south, "the cedar glades" occupy an extensive region of Silurian limestone. Here the characteristic growth consists of red cedar (*Juniperus Virginiana*), often forming stunted forests of considerable extent, to the exclusion of other species, or is mixed with the honey locust, a characteristic species, also, of this well-marked region.

544


MAP OF
ARKANSAS
SHOWING THE DISTRIBUTION OF THE
FORESTS,
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C.S. SARGENT, SPECIAL AGENT
1881.
Scale
LEGEND
Yellow Pine Pinus mitis mixed South of the Arkansas River with some Loblolly Pine, P. Taeda.
Hardwood
Region from which all Merchantable Pine has been cut
Prairie
BENTON
CARROLL
BOONE
MARION
BAXTER
FULTON
RANDOLPH
CLAY
MADISON
WASHINGTON
NEWTON
SEARCY
STONE
IZARD
LAWRENCE
GREENE
INDEPENDENCE
CRAIGHEAD
CRAWFORD
FRANKLIN
JOHNSON
VAN BUREN
POINSETT
POPE
CONWAY
WHITE
CROSS
SEBASTIAN
LOGAN
WOODRUFF
CRITTENDEN
FAULKNER
ST FRANCIS
SCOTT
PULASKI
LONOKE
PRAIRIE
LEE
MONROE
GARLAND
MONTGOMERY
POLK
SALINE
PHILLIPS
HOT SPRINGS
GRANT
JEFFERSON
ARKANSAS
PIKE
HOWARD
SEVIER
CLARK
DALLAS
DORSEY
LINCOLN
DESHA
LITTLE RIVER
HEMPSTEAD
NEVADA
OUACHITA
CALHOUN
BRADLEY
DREW
CHICOT
MILLER
LAFAYETTE
COLUMBIA
UNION
ASHLEY
MISSISSIPPI RIVER
MISSISSIPPI
Julius Bien & Co. lith

The eastern part of the state, occupied by the Cumberland plateau and the high ranges of the southern Alleghany mountains, is covered with a heavy forest of oak and other hard woods, mixed at high elevations with hemlock, pine, and spruce, and constituting one of the finest bodies of timber now standing in the United States. It contains, besides white and chestnut oak of fine quality, much yellow poplar, black walnut, and cherry. In the southeastern counties, especially in the valley of the Tennessee river, the hard-wood forests have been, however, already destroyed over large areas to furnish charcoal for the iron-manufacturing industry established here.

During the census year 985,430 acres of woodland were reported devastated by fire, with a loss of $5,254,980. Of these fires the largest number was set in the careless clearing of land for agriculture or to improve grazing, and by hunters, locomotives, etc.

Mr. A. G. Willey, of Manchester, Tennessee, has supplied the following statement in regard to the effects produced upon the forest growth by the annual burning of dead herbage to improve pasturage:

"EFFECT OF FIRES UPON THE FOREST.

"The practice of burning timber-land, said to have been of Indian origin, has been continued by the white settlers. The native grasses do not die down when killed by frost; they simply die standing, and the young grass in the spring has to push through the old tuft, which is often 6 or 8 inches high. The fires are set in the timber and old fields to burn these tufts, that stock may graze four or six weeks earlier than if the old herbage had been left upon the ground. In the barrens and on the Cumberland plateau the timber is principally oak of various kinds, which do not shed their leaves at once when killed by frost, or rot when partially green, but remain dry upon the trees and fall gradually during winter and spring. The largest portion, therefore, are on the ground in February, the time when fires are set. The effect of these fires is to destroy all the natural sources of fertility, grass, leaves, and fallen timber. Had these been allowed to accumulate, what are now called barren lands would be the most fertile in the state. The practice kills, too, the young trees, so that some of the most valuable timber that the land is suitable to produce is unable to stand. The black-jack, post oak, black oak, etc., however, on account of the protection afforded by their thick bark, are able to gain some headway, and so crowd out more valuable trees. The state law makes it a misdemeanor with heavy penalty for any one to set fire to and burn a neighbor's land; but the difficulty of detection and conviction in such cases makes this law non-effective. These are the causes and effects of forest fires in this section; they never occur here in summer."

Considerable cooperage and wheel stock is manufactured in Tennessee, but, except in the eastern part of the state, manufacturers report a scarcity and deterioration of the best hard woods, especially white oak. In the eastern counties the manufacture of oak staves and other industries using hard woods are capable of large development.

The principal center of lumber manufacture in the state is Nashville, where several mills saw large quantities of black walnut, poplar, cherry, ash, oak, etc., received by raft from the upper Cumberland river in Tennessee and Kentucky. The local market takes about one-third of the lumber manufactured here, the remainder being sent north and east by rail. Memphis, on the Mississippi river, is also an important manufacturing center. The mills here are largely supplied by rafts from Missouri, Arkansas, and Tennessee, and saw large quantities of cypress, ash, poplar, hickory, gum, and black walnut. Considerable hard-wood lumber manufactured in Dyer, Lincoln, Obion, and Smith counties, and pine and hard-wood lumber in Knox and Jefferson, largely from logs obtained in the vicinity of the mills, is principally consumed locally.

KENTUCKY.

The forests of Kentucky resemble in general features those of Tennessee. Cypress, gum, and various water oaks occupy the river swamps of the western counties. The central region, now largely cleared and devoted to agriculture, was once covered with the oaks, walnuts, and hickories of the Atlantic region, while over the eastern and southeastern counties the dense forests of the Alleghany mountains extended. The eastern counties still contain great bodies of the best hard wood, especially black walnut, white oak, cherry, and yellow poplar, which are particularly fine and abundant in Bell, Harlan, and other southeastern counties. These forests, protected by the falls of the Cumberland river, which have prevented the driving of logs from its upper waters, and inaccessible to rail communication, are still practically uninjured, and probably unsurpassed in the amount, quality, and value of the timber which they contain. The destruction of forests to supply numerous iron furnaces with charcoal has been great in the northeastern counties, and no small part of this region has already been cut over.

During the census year 556,647 acres of woodland were reported devastated by fire, with an estimated loss of $237,635. Of these fires by far the largest number was traced to farmers carelessly clearing land for agricultural purposes.

In Barren, Edmonson, and other central counties extensive tracts of prairie existed at the time of the earliest settlement of the state. The presence of these prairies in the midst of a heavily-timbered region is ascribed to the annual burning to which they were subjected by the aborigines. With the disappearance of the

Indians trees sprang up, and this region is now well covered with a vigorous growth of black oaks of different species. White oaks, however, are not abundant, and other species common to the region, such as the walnuts, the yellow poplar, and the beech, are wanting in these young forests, indicating perhaps the effect of fires in checking the subsequent growth or development of many useful timber trees.

PASTURAGE OF WOODLANDS.

The forests of Kentucky, as well as those of all the central and southern portion of the United States, suffer severely from the almost universal custom of using woodlands for pasturage. The evil resulting from this practice is only more apparent in Kentucky and Tennessee, because in these states the amount of live stock is proportionately larger than in other parts of the south, while in the thickly-settled agricultural sections of these states the ratio of woodland to total area is smaller. The pasturage of woodlands necessitates, or at least induces, the annual burning of the dead herbage, by which underbrush, young trees, seedlings, and seeds are destroyed and the succession and permanence of the forest endangered. What the fires spare, browsing animals devour; hogs root out seedlings, and by selecting the sweet acorns of the white oak in preference to the bitter fruit of the black oaks, are gradually changing the composition of the oak forests. Comparatively few white oaks spring up in the forests of the more thickly settled portions of the central Atlantic region, and this change of forest composition must be ascribed to the preference of domestic animals for the palatable fruit of what, as regards their timber, are the most valuable species. The injury, too, inflicted by the constant stamping of animals and consequent packing of the land about the stems of old trees is very great, and all reports speak of the gradual dying of old trees left standing in the grazing regions of Kentucky and Tennessee.

The spread of the mistletoe (*Phoradendron flavescens*), consequent upon the removal of the forest and the increase in the number of birds (the mistletoe seems to require a certain amount of light and air for its development; it does not flourish or increase rapidly in the dense forest, and cannot spread except by the agency of birds), is a cause of serious injury to the forest of this whole region. It slowly but surely destroys the trees upon which it obtains a foothold. The black walnut especially suffers from the growth of this parasite, which seems destined to destroy the finest walnut timber left standing in the settled portions of the southern central region.

Large quantities of cooperage and wheel stock are produced all over the state, and manufacturers generally report no scarcity or deterioration of timber, with the exception of white oak. The principal centers of lumber manufacture are at the mouth of the Tennessee river, in McCracken county, where a large amount of cypress, sycamore, gum, oak, walnut, and other hard wood is manufactured for the northern market from logs rafted down the Tennessee and other streams flowing into the Mississippi; at Frankfort, where poplar, oak, ash, walnut, pine, cherry, hickory, and maple logs, rafted from the upper waters of the Kentucky river, are sawed, the lumber being shipped north and east by rail; and at Louisville, where walnut, poplar, and oak lumber is manufactured for local consumption. The manufacture of pumps and water-pipes from logs of the Jersey pine (*Pinus inops*), at one time an important industry at Louisville, has, since the general introduction of city and town water-works, become unremunerative and unimportant.

NORTHERN CENTRAL DIVISION.

OHIO.

The forests of Ohio were originally composed of deciduous species, among which, in the eastern and especially in the northeastern counties, white pine and hemlock existed in isolated bodies of no great extent.

The original forest has now been generally removed, except from Ottawa, Miami, Montgomery, and a few other western counties, and from swamps and other lands unfit for agriculture; everywhere the walnut and other valuable timbers have been culled, and Ohio must soon depend almost exclusively for the lumber which it consumes upon the northern pineries and the hard-wood forests of the south.

During the census year 74,114 acres of woodland were reported destroyed by fire, with an estimated loss of $797,170. Of these fires the largest number was traced to carelessness in clearing land, to hunters, sparks from locomotives, etc.

The production of cooperage stock has long been an important industry in the state; it has already suffered from a scarcity and deterioration of white oak, for which elm, beech, maple, and poplar are now often substituted. Manufacturers of wheel stock, furniture, woodenware, etc., report abundant material for present consumption.

Ohio is sixth among the states in the volume of its lumber-manufacturing interests. The business is widely distributed throughout the state, generally in the hands of small manufacturers operating portable mills, which threaten the rapid destruction of the remnants of her forests.

INDIANA.

Indiana was once almost entirely covered with noble forests of deciduous trees. Along its western borders these were interrupted, however, by numerous small prairies, the extreme eastern outposts of the great treeless region which, toward the north, extended over the counties of Benton, Newton, and Jasper, and over considerable portions of Lake, Porter, La Porte, Pulaski, White, Tippecanoe, and Warren counties. These prairies have gradually decreased in area with the settlement of the country, and those originally of small extent are now covered with a vigorous growth of the forest trees of the region.

The forests of Indiana are characterized by an almost entire absence of coniferous trees. Stunted white and gray pines occupy the sand-dunes which border the southern shores of lake Michigan, and "the knobs"—low, gravelly hills of small extent, in the southeastern river counties—are covered with a heavy growth of the Jersey pine. Swamps in the southwestern counties contain cypress, which finds here the northern limit of its distribution. The broad bottom lands and low ridges of this part of the state are covered with a forest growth probably unsurpassed in the development of individual trees, and rarely equaled in the richness of its composition.

The forests of the state have been largely removed in the development of its agriculture. No large bodies of the original timber remain. The black walnut with which the forests of Indiana once abounded has been everywhere culled and is now rare, while the best yellow poplar, oak, and other valuable timbers have been largely consumed.

During the census year 90,427 acres of woodland were reported injured by fire, with an estimated loss of $130,335. These fires were set by farmers carelessly clearing land, by hunters, and by sparks from locomotives.

The forests of Indiana have long supplied material for a large manufacture of cooperage stock, furniture, wagon stock, woodenware, etc. The cooperage and furniture manufacturers already feel the scarcity and deterioration of the highest grades of oak and walnut, and very generally predict the entire exhaustion at no very distant day of the forests of the state.

Indiana is fifth among the states in the value of its lumber-manufacturing interests. Evansville, upon the Ohio river, in Vanderburgh county, is an important manufacturing center on account of the capital invested there in he lumber business and the amount of its product. The business, however, as in Ohio, is generally in the hands of small manufacturers operating portable mills and sawing logs hauled to them by farmers. At the present rate of destruction the forests of the state must soon lose all commercial importance.

ILLINOIS.

The forests of Illinois were originally confined to the southern portion of the state, the broad bottom lands of the Mississippi and the Illinois, and the southern third of the delta formed by these rivers. The remainder of the state was covered by broad, rolling prairies. The forest growth in this prairie region was confined to the narrow river bottoms and occasional open park-like groves of burr, scarlet, red, black-jack, or post oaks, known as "oak openings", through which the prairie fires swept, destroying all undergrowth, without doing great injury to the full-grown trees. Prairie fires have gradually decreased in frequency and violence since the settlement of the state, and these open groves are now filled with a vigorous growth of young seedlings and shoots; their characteristic features have disappeared, and the area of the forest is gradually increasing.

The shores of lake Michigan are covered with a stunted growth of white pine; the dry, rocky hillsides in the western part of Union county, one of the southern counties of the state, bear a few yellow pines (*Pinus mitis*), and cypress is found in the southern river swamps. With these exceptions, of little importance commercially, the forests of Illinois are composed of deciduous species.

During the census year only 48,691 acres of woodland were reported destroyed by fire, with an estimated loss of $45,775. These fires were generally traced to hunters, and to farmers permitting brush fires to escape to the forest.

The production of cooperage stock was once an important industry in southern Illinois. The business has greatly diminished, owing to the exhaustion of the local supply of the best hard woods. Bass, gum, hackberry, elm, sycamore, and other woods formerly considered of little value, are substituted for oak, and Illinois now receives most of its hard wood from Kentucky, Tennessee, and other southern states.

Illinois is eleventh among the states in the volume of its lumber-manufacturing interests. It owes this position to the fact that many large mills sawing pine logs rafted down the Mississippi river from the forests of Wisconsin are established within its borders, and not to the extent and value of the forests of the state. The manufacture of Illinois-grown lumber is small and totally inadequate to supply the wants of the present population of the state.

Chicago, owing to its general commercial importance and its position with reference to the great pine forests of the northwest, has become the greatest lumber-distributing center in the world.

According to the statistics gathered by the *Northwestern Lumberman* of Chicago, and published in that journal January 29, 1881, there were received in Chicago during the year 1880 1,419,974,000 feet of lumber by lake and 145,563,118 feet by rail, a total of 1,565,537,118 feet, an increase of 96,817,127 feet over the total receipts of 1879; 650,922,500 shingles were received during the same year.

Lumber was received from the lake ports during the year 1880, as follows:

Points of shipment.	Lumber.	Shingles.	Points of shipment.	Lumber.	Shingles.
	Feet.	*Number.*		*Feet.*	*Number.*
Ahnapee	150,000	....	Menominee	225,110,000	700,000
Alpena	4,517,000	....	Monastique	202,000	....
Ashland	5,200,000	1,311,000	Muskegon	451,854,000	23,660,000
Bay de Noquet	3,670,000	....	North Bay	110,000	....
Bayfield	980,000	....	Oconto	11,003,000	395,000
Benton	3,876,000	....	Ontonagon	2,508,000	2,886,000
Black Creek	4,825,000	....	Oscoda	739,000	....
Black River	0,858,000	....	Packard's pier	2,681,000	....
Canada ports	755,000	....	Paul's pier	560,000	....
Caseville	200,000	....	Pensaukee	6,866,000	3,100,000
Cedar River	17,383,000	100,000	Pentwater	9,596,000	25,572,000
Charlevoix	1,541,000	....	Perry's pier	45,000	....
Cheboygan	33,250,000	....	Peshtigo	51,600,000	7,020,000
Clay Bank	....	650,000	Pierport	3,355,000	....
Copper Harbor	70,000	....	Point Saint Ignace	12,985,000	....
Cross Village	233,000	....	Portage Lake	735,000	....
Depere	250,000	1,611,000	Port Huron	344,000	....
Duck lake	1,340,000	....	Port Sheldon	180,000	....
Escanaba	5,182,000	3,457,000	Red River	200,000	3,857,000
Ford River	17,850,000	6,915,000	Rogers City	1,066,000	....
Frankfort	9,565,000	....	Saginaw River	11,026,000	....
Grand Haven	90,166,000	114,000,000	Saint Joseph	1,662,000	....
Green Bay	1,577,000	22,502,000	Saugatuck	4,014,000	4,000,000
Hamlin	12,822,000	11,026,000	Sault Ste. Marie	522,000	....
Hancock	300,000	....	Silver Lake	2,185,000	600,000
Holland	857,000	....	South Haven	3,650,000	300,000
Kewaunee	110,000	5,881,000	Sturgeon Bay	11,640,000	10,078,000
L'Anse	0,430,000	170,000	Suamico	3,065,000	2,480,000
Leland	970,000	....	Traverse	23,280,000	....
Lincoln	1,205,000	300,000	Whitefish Bay	730,000	....
Ludington	103,713,000	34,330,000	White Lake	66,603,000	24,756,000
Ludwig's pier	125,000	....			
Mackinaw City	275,000	....	Total	1,419,974,000	583,340,000
Manistee	165,217,000	250,011,000	Receipts by rail	145,563,118	67,582,500
Manitowoc	70,000	300,000			
Marquette	2,411,000	522,000	Grand total	1,565,537,118	650,022,500
Masonville	1,030,000	....			

Lumber was received by rail during the year 1880, as follows:

Names of lines.	Lumber.	Shingles.
	Feet.	*Number.*
Baltimore and Ohio railroad	9,096,000	....
Chicago and Alton railroad	988,000	70,000
Chicago and Eastern Illinois railroad	26,799,000	....
Chicago and Grand Trunk railway	1,506,418	80,000
Chicago and Northwestern railway	11,727,900	44,642,000
Chicago, Burlington, and Quincy railroad	3,716,800	....
Chicago, Milwaukee, and Saint Paul railway	12,473,000	13,180,500
Chicago, Rock Island, and Pacific railway	2,224,000	....
Illinois Central railroad	2,940,000	....
Lake Shore and Michigan Southern railway	18,636,000	1,385,000
Michigan Central railroad	24,798,000	8,175,000
Pittsburgh, Cincinnati, and Saint Louis railway	12,481,000	....
Pittsburgh, Fort Wayne, and Chicago railway	17,567,000	50,000
Wabash, Saint Louis, and Pacific railway	610,000	....
Total	145,563,118	67,582,500

The following account of the early lumber trade of Chicago is condensed from a paper prepared by Mr. George W. Hotchkiss, secretary of the Chicago lumber exchange, and printed in the *Northwestern Lumberman* under date of March 19, 1881:

"Colonel Mann, residing at Calumet, brought the first raft of lumber to Chicago. It was square building timber, poled from the mouth of the Calumet to the mouth of the Chicago river. The value of this raft was $100, and its owner found considerable difficulty in disposing of it. In 1834 or 1835 Captain Carver opened a lumber-yard on the river bank, near the present site of the State-street bridge, and about the same time a man named Harrison owned a small schooner which went to some point across the lake and brought in white wood. This little vessel could not enter the river, on account of the bar across its mouth, and her cargo was unloaded upon scows and rafts, which were floated southward for half a mile or more, around the end of the bar, before they could be headed for the deep water of the river. In 1835 or 1836 a man named Rossiter had a small dock and yard on the river, between Clark and La Salle streets, and by this time other yards were started on the river. About the year 1836 a man named Cammack had a pit-mill on the north branch of the river. His son acted as pit-man, the old man being the top-sawyer. It is not unlikely that the first lumber used in Chicago was manufactured by this method, although about the same time a wind saw-mill was located not far from the present Kinzie-street bridge, which found abundant occupation in sawing white-wood timber, which then grew in the immediate neighborhood, mixed with elm, ash, basswood, and a few oak trees. History does not record, however, that the market was overstocked by the product of this mill, or that the lumber dealers of that day hurried to issue a new price-list low enough to crush the aspirations of their dangerous competitor. In fact, history is so perfectly silent upon the subject of this saw-mill that it is probable its work did not cut much of a figure in the lumber trade of that day, and that, in fact, it proved a veritable windmill, of less caliber than the muscle of the Cammacks, who no doubt found greater profit, if harder work, in driving their pit-saw. Captain Carver's lumber-yard was on the river bank, just west of the present State-street bridge, having a light, temporary dock, upon which the small vessels bringing lumber to the river unloaded. There was at this time (1836 or 1837) no other lumber-yard in the village upon the river. Captain Carver afterward (about 1839) sold out to George W. Snow, who occupied the same ground for a number of years.

"The earliest lumber of which Mr. Hilliard has any recollection came from Saint Joseph, Michigan; but shortly after his arrival at Chicago a man named Conroe built a mill at Manitowoc, Wisconsin, and Jones, King & Co., who were then doing a hardware and general business, received and handled his lumber as a side issue. A small pocket saw-mill, built by a man named Huntoon, in 1836, was located on the river bank not far from the present Chicago-avenue bridge. It was too small to do much work, but was esteemed a very useful and really wonderful mill at that time. The North Side was pretty well timbered with elm, oak, and white wood, and from this timber the mill obtained its stock. After the streets were cut out the wet nature of the ground compelled one who would visit this saw-mill to pick his way to it by jumping from log to log. It was so far from the village to the mill that it was seldom visited, except by those who enjoyed a Sunday walk and could find no objective point of greater interest for their stroll. The lumber-yard of Tuckerman & Higginson was located in 1843 on the north side of the river, near the present northwest end of Clark-street bridge. Clark street above Kinzie street had been cleared of timber, and a clear view was to be had as far as the eye could reach in a western direction, broken only by a few scattering trees which had been left as sentinels upon the plain. At this time George W. Snow had a yard on the river, near State street, and a Mr. Rossiter had also a yard between Newberry & Doles' warehouse, on the south branch of the river, west of what is now Clark street. Barber & Mason had a yard a little farther west, near Wells street. J. M. Underwood and Sylvester Lind each had a yard on the west side of the river, near Randolph street. This was in 1844. Mr. Higginson obtained his supply of lumber in those days from Hall & Jerome, of Menominee, Michigan, Elisha Bailey, of Peshtigo, Wisconsin, and —— Fisk, of Depere. In 1845 he had a contract for 1,000,000 feet with William F. Ferry, of Grand Haven. Lumber came also from Kalamazoo river, Saint Joseph, and Muskegon. In 1844 Mr. Higginson purchased a cargo from Mr. Rose, of Muskegon, and, as it was a beautiful lot of lumber, running 33⅓ per cent. upper grades, he was willing to pay a good price, obtaining it at $5 75 per thousand feet. The first cargo of Saginaw lumber which reached Chicago was brought by James Fraser, one of the original proprietors of the plat of Bay City, who built two mills at Kawkawlin, in latter years known as the Ballou mills. This was in the year 1847 or 1848, and the cargo attracted a good deal of attention, because it was the first lot of circular-sawed lumber that had ever been seen by any of the dealers, and because of its general cleanness of appearance, the attractiveness of a lot of circular-sawed sidings among it, and its excellent quality. All these combined to make the cargo a novelty in its way, and it found a sale at $8 per thousand feet, an extra good price for those days. Average cargoes at this time were quoted at $6 50 to $7 for mill-run lumber, culls out, and it did not need a very coarse piece to rank as a cull. Culls were rated at half price. The retail market held common lumber at about $8 during the summer, and $9 was asked for dry lumber through the winter. Common included everything below first and second clear; third clear, selects, picks, and finishing grades generally, being an invention of a later day. First clear sold at from $12 to $16, and second clear at $10 to $12; clear, undressed flooring brought $12, and common flooring $10. The lath trade was mostly in what was known as board lath, although narrow lath arrived in small quantities. The trade of the city in 1843 was about 12,000,000 feet, and this was considered as remarkable as to us were last year's sales of 1,500,000,000 feet, or about 140 times as much more."

MICHIGAN.

Michigan once possessed a tree covering of great density, richness, and variety. The hard-wood forests of the Ohio valley covered the southern portion of the state, extending to just north of the forty-third degree of latitude. North of this hard-wood belt the character of the forest changed; the white pine appeared, occupying the drier and more gravelly ridges, and, gradually increasing in size and frequency, became the most important element in the forests of the central and northern portions of the southern peninsula. In the northern peninsula, especially in the basin of the Menominee river, it covered the sandy plains almost to the exclusion of other species. The forests of hard wood, occupying low, rich soil between the pine-covered ridges, were valuable in their stores of sugar maple, birch, ash, beech, oak, and other northern trees, while the swamps common in the northern part of the state abounded in tamarack and yellow cedar of large size and excellent quality.

North of the central portion of the lower peninsula large tracts of barren plains exist. One of the most extensive of these tracts occupies a considerable portion of Crawford county, covering an area of several hundred square miles. A second barren region exists in Lake county, and there are others in Ogemaw and Iosco counties; similar barrens occur in the northern peninsula, the largest in Schoolcraft and Marquette counties. The soil covering these barrens is a light sandy loam, supporting a stunted growth of gray pine, birches, poplars, and scrub oak. These sandy plains owe their existence, perhaps, to the continual burning of the forest, prostrated possibly, in the first instance, by tornadoes, and thus affording abundant material for a fire hot enough to consume the vegetable mold of the surface and render the soil unfit to produce a second growth of heavy timber, or in many instances any tree growth whatever.

Serious inroads have already been made upon the forests of Michigan. The hard wood has been generally cleared from the southern counties, now largely occupied by farms, and the timber remaining in this part of the state, in small, scattered bodies, can hardly suffice for the wants of its agricultural population. The merchantable white pine has been cut from the banks of the principal streams and the shores of the lakes, and what now remains is remote from water transportation or scattered in isolated bodies of comparatively small extent. The hard-wood forests of the pine belt, however, although greatly injured by fire in parts of the state from which the pine has been cut, and invaded along their southern borders by agricultural settlements, contain, especially in the northern third of the lower peninsula and through the northern peninsula, vast quantities of valuable timber.

FOREST FIRES.

The forests of Michigan have long suffered from destructive fires. These have generally originated in the neighborhood of the loggers' camps or upon the farms of the agricultural pioneer, while the virgin forest has generally, although not always, escaped serious conflagrations. The timber-prospector and the hunter are responsible for many fires in the primeval pine forest of the northwest; but, as a rule, fires follow and do not precede the lumberman. The reason is obvious: The logger in his operations leaves the resinous tops, branches, and chips of the pine trees scattered far and wide; these by the following midsummer become dry as tinder, and afford abundant material to feed a fire started by a careless hunter, log-cutter, or farmer clearing land near the forest. Such fires, which too often follow the cutting of pine forests of the northwest, have inflicted incalculable injury upon the country. They have destroyed vast quantities of hard-wood timber; they have consumed the young

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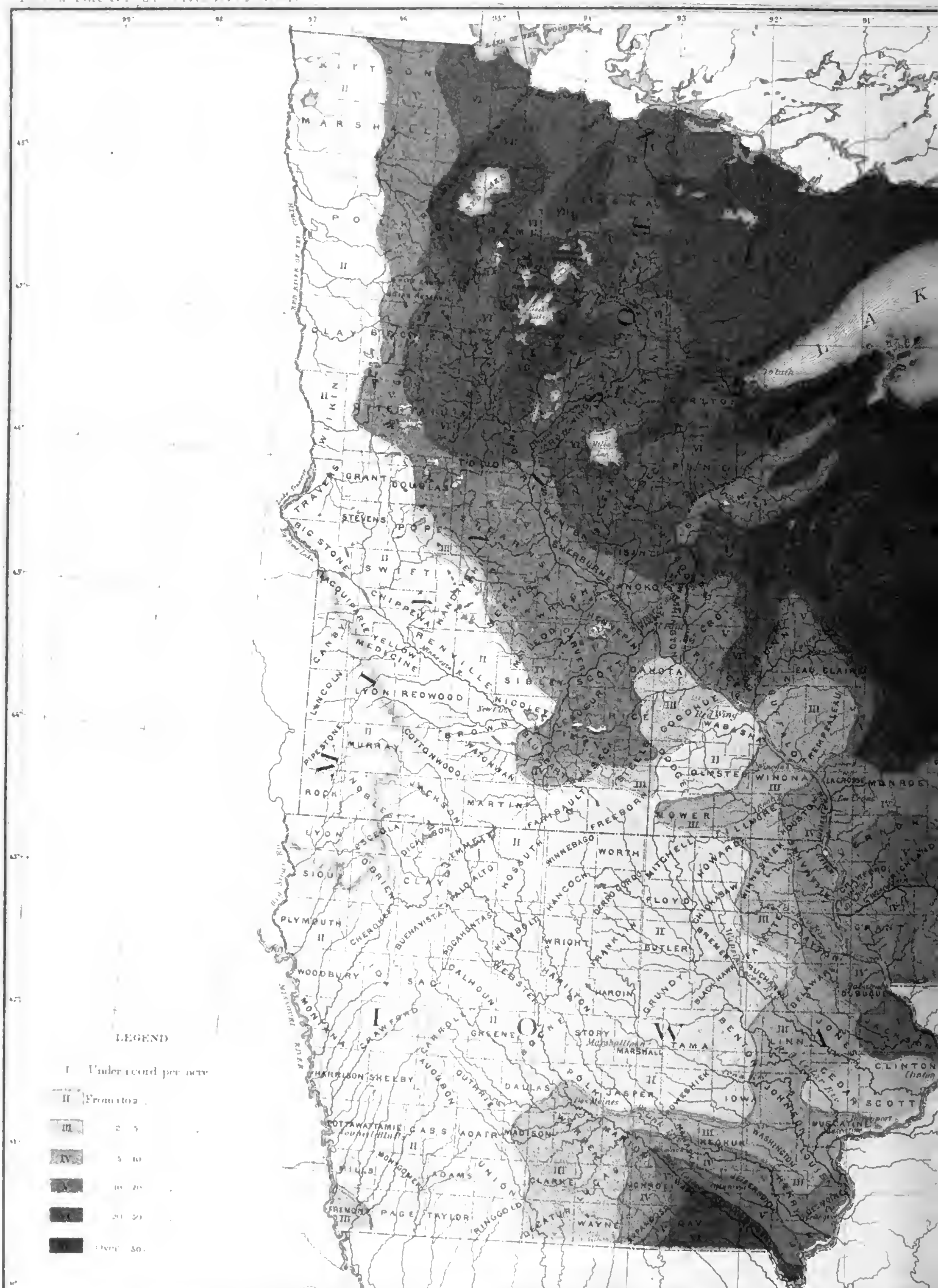
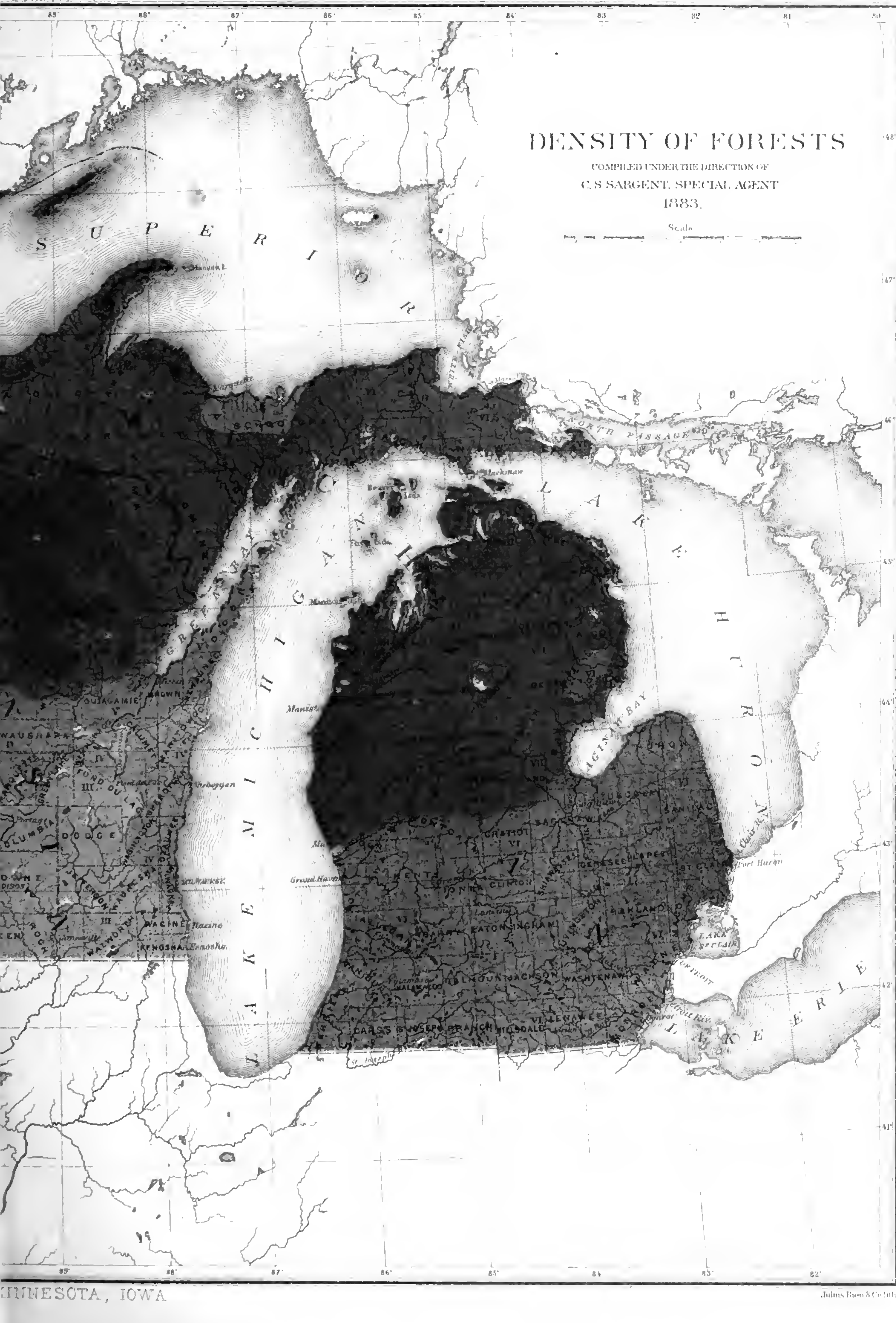


MICHIGAN WISCONS



INNESOTA, IOWA

Julius Bien & Co. lith.

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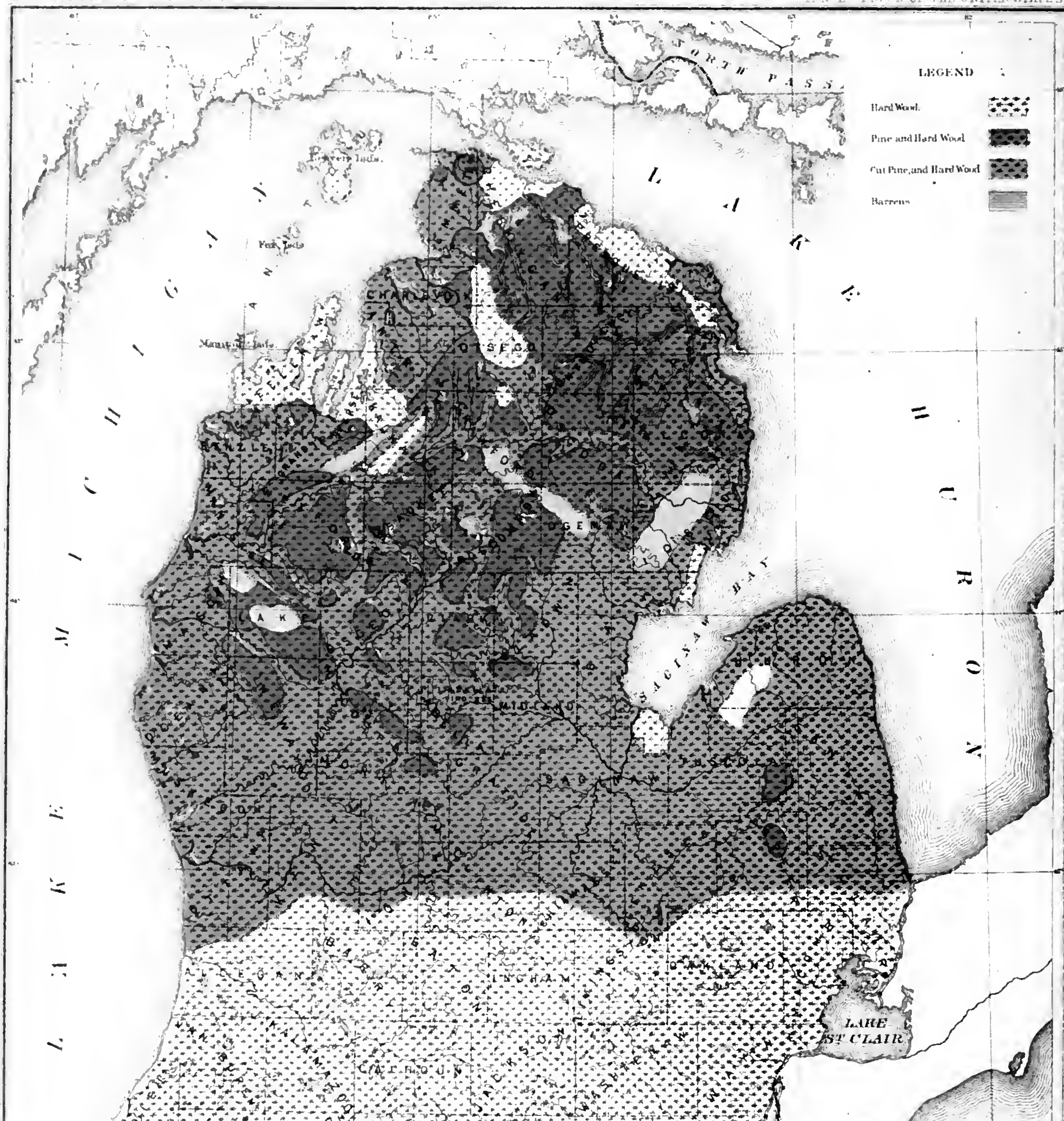
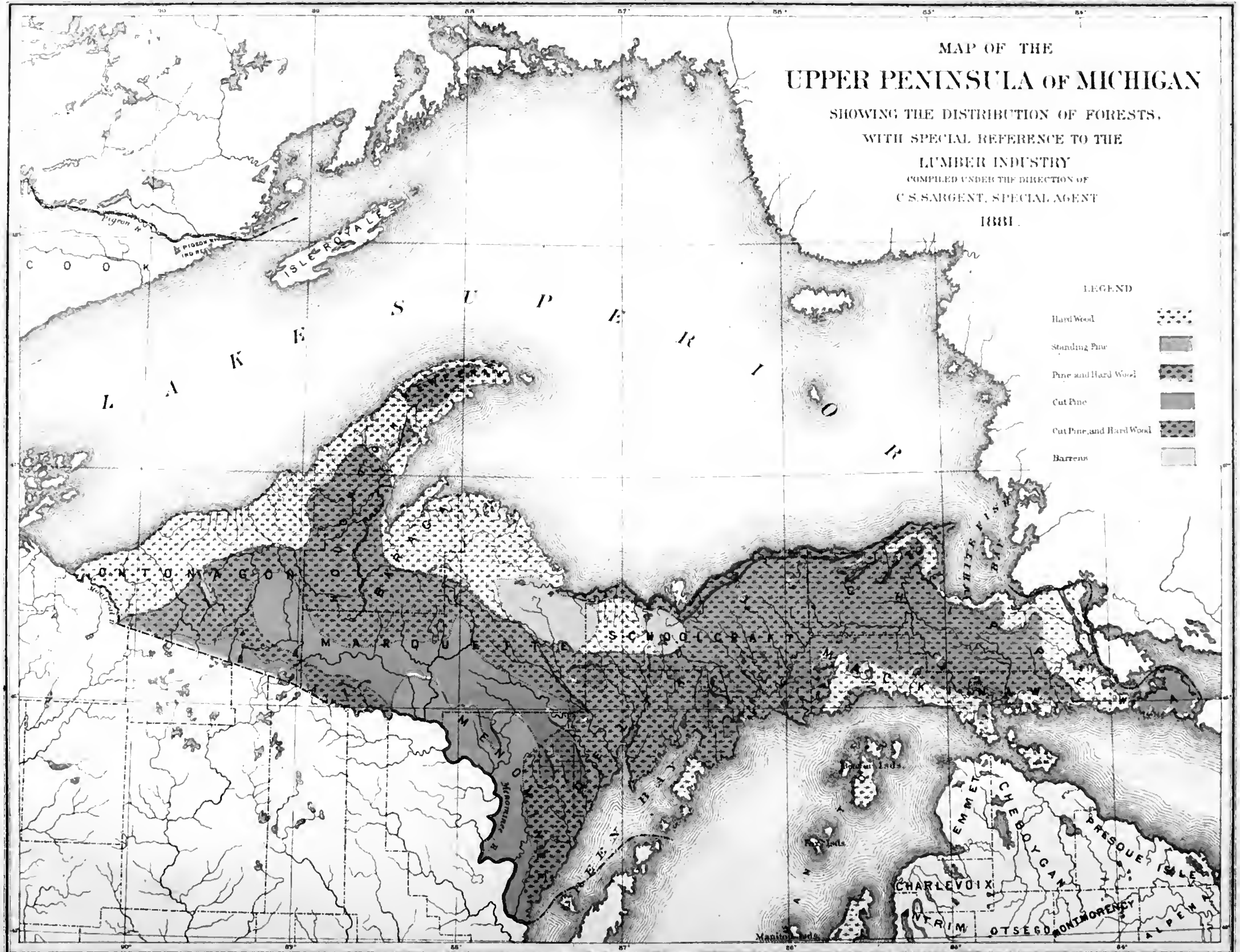

LEGEND
Hard Wood.
Pine and Hard Wood
Cut Pine, and Hard Wood
Barrens
LAKE MICHIGAN
LAKE HURON
SAGINAW BAY
LAKE ST CLAIR
LAKE ERIE
INGHAM
CALHOUN
JACKSON
OAKLAND
MAP OF THE
LOWER PENINSULA OF MICHIGAN
SHOWING THE DISTRIBUTION OF FORESTS, WITH SPECIAL
REFERENCE TO THE LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1881.
Julius Bien & Co. lith
Scale
100 MILES



Scale
25 0 25 50 75 100 MILES

pine trees left by the logger; they have robbed the soil of its fertility, and made it unfit to produce another crop of pine until the growth and decay of generations of other plants shall have restored its lost constituents. In the dense, unculled forest, on the other hand, fires, although often destructive, are less dangerous in the absence of dead material to feed the flames than when the ground is strewn with dead branches, tops, and resinous chips.

During the census year only 238,271 acres of woodland were reported destroyed by fire, with an estimated loss of $985,985. Of the 267 fires reported, 161 were traced to fires set in clearing land for agricultural purposes, and which escaped to the forests; 59 to hunters, 43 to sparks from locomotives, 3 to smokers, while only 1 was reported set by Indians.

The hard-wood forests of Michigan have long afforded abundant material for large and important industries engaged in the production of cooperage stock, handles, oars, agricultural implements, excelsior, wood pulp, etc. Manufacturers, especially in the southern part of the state, now report, however, a scarcity and general deterioration of stock. The best oak timber has been everywhere culled to supply the wants of railroads or the demands of the Canadian market. Elm, bass, and other soft woods, which a few years ago were considered of little value, are now in great demand and are fast disappearing, except from regions remote from railroads. Much hard wood, especially in the southern peninsula, has been destroyed by fire, or, if not destroyed, rendered almost worthless for manufacturing purposes by partial burning.

Next to Vermont and New York, Michigan produces a larger amount of maple sugar than any other state. During the year 1879 3,423,149 pounds were manufactured in the state.

STATISTICS OF GROWING TIMBER.

The following estimates of the merchantable timber standing in Michigan May 31, 1880, were prepared by Mr. H. C. Putnam, of Eau Claire, Wisconsin, with the assistance, in the lower peninsula especially, of Mr. G. W. Hotchkiss. These, as well as the estimates of the timber resources of Wisconsin and Minnesota, were obtained by compiling the results of actual surveys, and have been further verified by a large number of persons familiar with the forests in the different regions of these states. It must not, however, be forgotten that the figures given represent estimates, and not facts. Statistics of the volume of any growing crop are difficult to obtain and always liable to considerable error, and the forest, from its very nature and the extent over which it is spread, presents greater difficulties to the collector of statistics of productive capacity than the more compact and more easily studied crops of the field. The estimates of pine include all trees 12 inches in diameter 24 feet from the ground. Since they were prepared the scarcity of white pine has changed the methods of the lumberman, and trees are now generally estimated and cut as small as 8 inches in diameter 24 feet from the ground. If the amount of standing pine had been estimated upon the 8-inch basis it would have added (roughly) 10 per cent. to Mr. Putnam's figures. Small bodies of pine remote from streams no doubt exist in different parts of Michigan, Wisconsin, and Minnesota, in the aggregate of some commercial importance, which are not included in these estimates. The following figures, however, are believed to represent with as great accuracy as is attainable the productive capacity of the northwestern pineries. They cover the entire region, and these pine forests now contain no great body of unexplored timber, an unknown factor in the country's lumber supply:

WHITE PINE (*Pinus Strobus*).

Regions.	Feet, board measure.
LOWER PENINSULA.	
Basins of streams flowing into Saginaw bay, including Saginaw river and tributaries.	7,000,000,000
Basins of streams flowing into lake Huron	8,000,000,000
Basins of streams flowing into lake Michigan	14,000,000,000
Total	29,000,000,000
Cut for the census year ending May 31, 1880 (including 2,988,600,000 shingles and 428,445,000 laths, but exclusive of 36,000,000 staves and 3,330,000 sets headings).	4,068,773,000
UPPER PENINSULA.	
Basin of Menominee river and tributaries (Marquette and Menominee counties).	1,600,000,000
Ontonagon, Houghton, Keweenaw, Baraga, Marquette (west and north of Menominee basin), and Menominee (east of Menominee basin) counties.	2,400,000,000
Schoolcraft, Chippewa, Mackinac, and Delta counties	2,000,000,000
Total	6,000,000,000
Cut for the census year ending May 31, 1880 (including 106,482,000 shingles and 34,266,000 laths).	328,438,000

An estimated amount of 575,500,000 cords of hard wood is distributed over some 20,000,000 acres in the lower peninsula. Of this about 20 per cent. is suitable for lumber and cooperage stock. The cut of hard wood for the census year ending May 31, 1880 (exclusive of 163,821,000 staves and 18,567,000 sets headings, and including 6,038,000 feet of spool stock), was 440,944,000 feet. In scattered swamps there are standing some 5,000,000 cords of yellow cedar (*Thuya occidentalis*).

From Menominee and Delta counties the merchantable pine has been almost entirely removed. Baraga county contains little pine, and Keweenaw county a single considerable body some 30,000 acres in extent.

The northern portion of Ontonagon and Marquette counties is chiefly covered with hard wood.

An estimated amount of 124,500,000 cords of hard wood is distributed over some 10,000,000 acres in the upper peninsula. The cut of hard wood for the census year ending May 31, 1880 (exclusive of fuel and railroad ties), was 1,145,000 feet.

The southern counties of the upper peninsula contain large areas of swamp, covered with tamarack and yellow cedar (*Thuya occidentalis*), estimated, in the aggregate, at 62,500,000 cords.

Some 7,000,000,000 feet of hemlock lumber and 7,000,000 cords of bark still remain in the state.

Michigan is first among the states in the volume and value of its lumber product. Its principal centers of lumber manufacture are Muskegon, on the shores of lake Michigan, the shores of Saginaw bay, in Bay county, the Saginaw river, in Saginaw county, Manistee, and Menominee, in the upper peninsula. The valley of the Saginaw was long the seat of the most important lumber-manufacturing operations in the United States. Its supremacy, however, has departed with the destruction of the splendid pine forest which covered its water-shed, and the center of manufacture has moved westward from the shores of lake Huron across the peninsula to the waters flowing into lake Michigan.

Lumber was first manufactured in the Saginaw valley as early as 1832. Three years later, a second mill, with an annual capacity of 3,000,000 feet, was built upon the Saginaw. In 1836 the first shipments of lumber were made from this mill, and from that time forward great attention was given to the manufacture of lumber for shipment. The commercial panic of 1837, however, seriously interfered with the development of this business, and it was not until 1849 that mills began to multiply. In 1844 there were 23 mills upon the Saginaw, with an aggregate capacity of 60,000,000 feet. Ten years later the number of mills had increased to 82, manufacturing 425,000,000 feet of lumber, while in 1873 there were 83 mills, which produced that year 567,000,000 feet. Since 1870 there has been an almost steady decrease in the number of mills operating in the Saginaw valley; the number finishing their "cut out" is fast increasing, and those destroyed by fire are not rebuilt. But, although the number of mills has decreased, their production has increased, their present capacity being estimated at 923,000,000 feet. A large part of the lumber manufactured upon the Saginaw is transported by lake to Ohio and New York ports, and thence to the principal eastern markets, although a considerable amount is shipped by vessel to Chicago and Milwaukee, and thence distributed by rail through the west. The wide market open to this lumber is due to its excellent quality. Twenty years ago logs which would run 25 per cent. "uppers" were considered common; 40 per cent. was the rule, and as high as 75 per cent. "uppers" was sometimes obtained. Logs were then cut from the lower trunk of the tree below the tops, and only the largest trees were selected. Now land which has been cut over three times is gone over again, and lumbermen are satisfied if logs yield 10 per cent. "uppers".

Of late years considerable changes have been introduced into Michigan lumbering operations by railroad logging; by this means mills are able to obtain a constant supply of logs by railroads built into the forest for the purpose, and this supply can be regulated almost entirely by the demand. There are several roads in different parts of the state doing this business, the principal being the Flint and Pere Marquette and the Lake George and Muskegon River railroads. The growth of this business in the Saginaw valley and at Muskegon, Manistee, and on the Flint and Pere Marquette road is shown by the following table extracted from *Bradstreet's* of February 5, 1881:

Years.	Saginaw valley.	Muskegon.	Manistee.	Flint and Pere Marquette railroad.
1865	200,000,000	108,505,700	....	....
1866	209,000,000	157,468,300	....	....
1867	429,207,808	288,502,200	....	....
1868	446,960,583	213,692,600	....	....
1869	321,350,663	267,789,900	....	....
1870	623,397,353	108,802,600	121,221,395	....
1871	521,706,027	250,000,000	142,369,817	....
1872	645,285,278	315,000,000	155,556,720	....
1873	680,979,461	376,035,037	179,820,243	....
1874	589,225,404	224,571,527	182,218,383	....
1875	584,843,701	309,638,418	108,926,197	....
1876	572,220,472	299,525,919	147,724,241	....
1877	651,567,948	312,285,951	152,221,548	....
1878	558,070,674	340,990,055	178,542,869	....
1879	780,182,286	432,431,670	211,722,030	14,357,670
1880	948,174,274	380,000,000	211,971,000	87,485,547

The following extracts are made from Mr. Putnam's report upon the forests of Michigan:

"The southern boundary of the pine forest in Michigan may be represented by a line drawn from Sarnia westward across the state nearly to the mouth of the Kalamazoo river. Originally the pine forest covered the northern two-thirds of the state, and estimates made in 1835 gave the amount of pine then standing as 150,000,000,000 feet. This estimate included the northern peninsula. The present estimate of the pine standing in the whole state, the northern peninsula also included, is 35,000,000,000 feet. There are now remaining no large bodies of standing pine in the state which have not been more or less cut into, and the timber adjacent to streams has all been cut. The pine now remaining is scattered generally through the northern half of the state, lying back at a distance of from 2 to 10 miles from streams large enough to float the logs. The best pine in the state has been cut. The belt of pine which ran through the center of the state, extending north from the southern boundary of the original pine forest for some 75 miles, contained the best pine in the northwest. This pine was what was called by lumbermen 'cork pine', a soft white pine, large and sound, with a thick bark. The quality of the pine of the Saginaw valley was particularly fine, too; that on the west shore was of smaller size.

"The standing pine on the lower peninsula of Michigan is estimated at 29,000,000,000 feet, of which there are in the Saginaw valley about 7,000,000,000 feet, including the pine upon the Saginaw, Au Sable, and Cheboygan rivers and their tributaries; on the streams flowing directly into lake Huron there are some 8,000,000,000 feet more; making 15,000,000,000 feet upon the streams of the east shore. On the western shore of the state there are 14,000,000,000 feet, including the pine upon the Kalamazoo, Black, Grand, Muskegon, White, Pentwater, Aux Bec Scies, Boardman, and Pine rivers. As before stated, the quality of the timber in the eastern portion of the state is better than that upon the west shore; this is smaller and partakes more of the sapling nature, while that on the east shore is largely cork pine. The pine of the east shore and Saginaw valley is largely used for finishing lumber, and should be transported to the east; indeed all the pine in the lower peninsula of Michigan is wanted at the east, and none should be sent west. The pine of the western shore is suited for fencing, flooring, and dimension stuff, being smaller and containing more knots and sap.

"The largest bodies of pine left in the lower peninsula are in the counties of Presque Isle, Montmorenci, Alpena, Alcona, Ogemaw, Roscommon, Crawford, Missaukee, Wexford, Manistee, Grand Traverse, Lake, Osceola, Clare, Gladwin, and Charlevoix. There are bodies of pine also in other counties from 15,000 to 20,000 acres in extent which have not yet been cut. The pine left in the lower peninsula is generally scattered through hard-wood timber, into which the settlers are now entering, clearing the hard-wood forests and exposing the pine to destruction by fire and windfall. This destruction has largely increased with the settlement of the country, and will increase still more unless stringent measures can be taken to protect the pine forests from waste.

"The southern part of the state outside the pine belt was originally covered with a dense forest of hard-wood timber; this region is now largely settled and is the farming region of Michigan. There is a large amount of hard-wood timber of commercial value still scattered through this farming country, particularly in its middle and northern parts. Along the west shore as far north as the straits of Mackinaw the pine has been cut in large quantities, but there is still a large amount of hard-wood timber left upon this area.

"The pine of the northern peninsula of Michigan is estimated at 6,000,000,000 feet. This includes the pine from the Saint Mary's river westward to the Wisconsin line and the mouth of the Montreal river, and upon the south shore of lake Superior. It is divided as follows:

"1. On the Menominee river and tributaries, 1,600,000,000 feet.

"2. In the western portion of the peninsula, not including the Menominee and tributaries, but including all west of the line of the Chicago and Northwestern railway between Escanaba and Marquette, 2,400,000,000 feet.

"3. East of the line of the Chicago and Northwestern railway, 2,000,000,000 feet.

"The largest bodies of pine in the northern peninsula are in the counties of Chippewa, Mackinac, Schoolcraft, Marquette, Houghton, and Ontonagon. There is also quite a large body in Keweenaw county, covering perhaps 30,000 acres. Ontonagon county, which extends along the south shore of lake Superior for nearly 100 miles, for 35 miles back from the lake is mostly covered with hard-wood timber, with a little pine along the streams, but not in sufficient quantities to estimate. This is also true of the northern part of Baraga and Marquette counties, extending along the southern shore of lake Superior, a distance of 125 miles from L'Anse to Onota, in Schoolcraft county. There are here a few small bodies of pine scattered through the hard wood, but it is needed by the settlers, and has no export value. The quality of the timber upon the Ontonagon and Presque Isle rivers and the upper Menominee, growing among the hard woods along the south slope of the Penokee iron range, is similar to that on the western shore of the lower peninsula. This timber is, however, somewhat difficult of access. The streams over which it must be driven (the Ontonagon and Presque Isle) are rough, broken, and require considerable improvement. The pine east of the line of the Chicago and Northwestern railway between Marquette and Escanaba, on the east half of the northern peninsula, is of poor quality, and may be classed as 'sapling pine', with occasional groves of what is called 'big sapling' scattered through the hard woods.

"In the upper peninsula of Michigan, according to the Lake Superior Canal Company's reports of examination and estimates of cord-wood, there is an average of about eighteen cords of wood per acre over the whole area of the peninsula, of which two-thirds is hard wood and one-third soft wood.

"In Menominee and Delta counties, the southern part of Schoolcraft county, and the extreme southern part of Marquette county are quite large quantities of tamarack and yellow cedar. From most of these lands the merchantable pine has been removed, and where the fires have not destroyed the cedar and tamarack the railroad companies are cutting the timber and shipping it to the prairies for telegraph poles, ties, and posts. It is stated by the owners of the lands, who long since cut the pine from them, that the cedar and tamarack trees left upon the land have netted them more than the original pine harvested. What makes this timber so valuable is its close proximity to the railroads and the ease with which it can be shipped by rail or over the waters of Green bay. This shows the necessity of preserving this kind of timber for future use, and of not abandoning it for taxes, as has heretofore been done, or allowing it to be destroyed by fires and windfalls.

"There are on the Menominee river some 9,000,000,000 feet of standing pine, one of the largest bodies left in the northwest. More than half of this, however, lies in the state of Wisconsin. About 200,000,000 feet of lumber are manufactured annually upon the Menominee. All the mills upon the river are located at its mouth, in the towns of Marinette and Menomonee, in Wisconsin, and it is considered next to impossible to build more mills at that point. The river is here narrow, and the facilities for holding logs, shipping lumber, dockage, etc., are quite limited in proportion to the amount of timber left in the region tributary to this stream; and this body of pine may therefore be considered to a certain extent in reserve, and likely to outlast many larger ones. There is little danger from fire on this river; the pine which is left grows upon the hard-wood ridges, interspersed with broad areas of swamp."

WISCONSIN.

The great prairies of the central Atlantic region once found their northeastern limits in southern Wisconsin. The forest covering of all the southern part of the state was confined to the bottom lands or open upland groves of stunted oaks of no great extent or of more than local importance. The central part of the state was covered with a dense forest of hard woods, oaks, ash, maple, cherry, birch, and the other trees of the northern forest, through which, upon gravelly or sandy ridges, great bodies of white pine were scattered. These pine forests gradually change in character and decrease in productiveness as they reach northward. Lakes are more common, and swamps of tamarack, cedar, and spruce occupy in the northern part of the state a considerable proportion of the forest area. The pine trees in these northern forests are smaller and more scattered than those farther south, although generally less intermixed with hard woods, and affording lumber of poorer quality.

The forest area has somewhat increased in the prairie region of the state since its first settlement and the consequent decrease of destructive prairie fires. The growth of trees has gradually spread from the bottom lands of the streams to the hills, and the oak forests upon the uplands have gradually encroached upon the prairie, losing their open, park-like character by the appearance of a young growth which has sprung up among the old trees.

The pine has been destroyed along the entire southern borders of the pine belt, along the banks of the principal streams, and from the lines of railroad, while the hard wood has been often greatly injured or destroyed by fire in those parts of the state where pine has been cut. The amount of pine still growing in Wisconsin is nevertheless large, although it should not be forgotten that the best and most easily accessible has already been harvested. What remains is generally remote from actual lines of transportation, and often, especially in the extreme northern part of the state, of comparatively poor quality.

During the census year 406,298 acres of woodland were reported destroyed by fire, with an estimated loss of $725,610. The largest number of these fires was set by farmers in clearing land, or by sparks from locomotives.

The manufacturers of cooperage stock report a general deterioration and scarcity of the best varieties of hard woods, and the substitution of beech, elm, and other woods for oak.

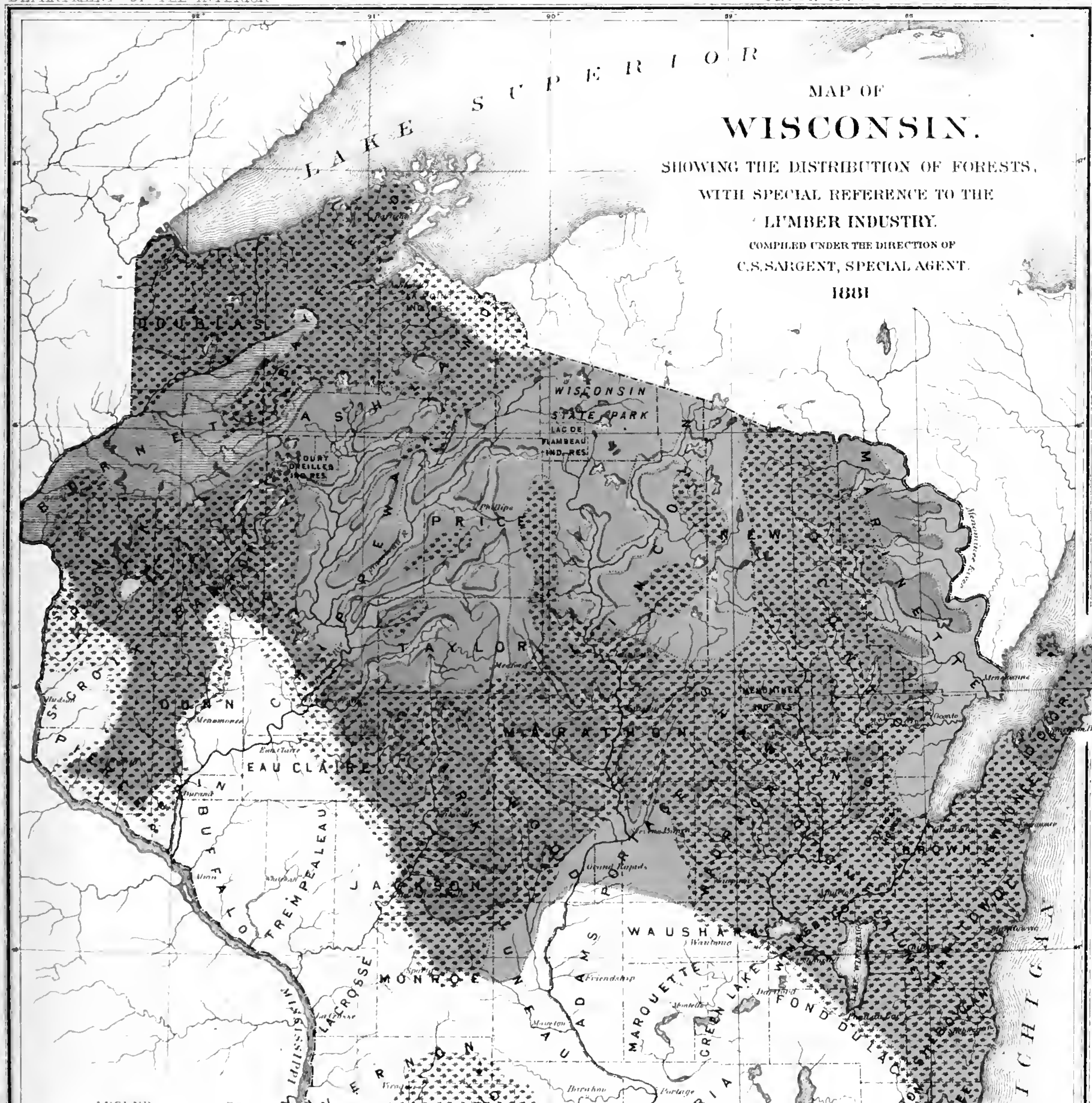
The following estimates of the amount of timber standing in Wisconsin May 31, 1880, were prepared by Mr. H. C. Putnam:

WHITE PINE (*Pinus Strobus*).

Regions.	Feet, board measure.
Basin of Saint Croix river and tributaries	2,500,000,000
Basin of Chippewa river and tributaries	15,000,000,000
Basin of Black river and tributaries	900,000,000
Basin of Wisconsin river and tributaries	10,000,000,000
Basin of Wolf river and tributaries	600,000,000
Basin of Oconto river and tributaries	500,000,000
Basin of Peshtigo river and tributaries	1,500,000,000
Basin of Menomonie river and tributaries (in Wisconsin)	6,400,000,000
Shore of lake Superior	3,600,000,000
Total	41,000,000,000
Cut for census year ending May 31, 1880 (including 1,007,039,000 shingles and 348,301,000 laths).	2,097,299,000

1

554


MAP OF
WISCONSIN.
SHOWING THE DISTRIBUTION OF FORESTS,
WITH SPECIAL REFERENCE TO THE
LUMBER INDUSTRY.
COMPILED UNDER THE DIRECTION OF
C.S. SARGENT, SPECIAL AGENT.
1881
LAKE SUPERIOR
LAKE MICHIGAN
LEGEND
Hard Wood
Standing Pine
Pine, and Hard Wood of commercial value
Cut Pine
Cut Pine, and Hard Wood
Barrens
DOUGLAS
BURNETT
ASHLAND
PRICE
TAYLOR
WISCONSIN STATE PARK
LAC DE FLAMBEAU IND. RES.
COURT OREILLES IND. RES.
MENOMINEE IND. RES.
MARATHON
EAU CLAIRE
DUNN
ST. CROIX
PIERCE
PEPIN
BUFFALO
TREMPEALEAU
JACKSON
MONROE
LA CROSSE
VERNON
CRAWFORD
RICHLAND
SAUK
COLUMBIA
DODGE
ADAMS
WAUSHARA
MARQUETTE
GREEN LAKE
FOND DU LAC
BROWN
WASHINGTON
OZAUKEE
WAUKESHA
MILWAUKEE
JEFFERSON
DANE
IOWA
GRANT
LA FAYETTE
GREEN
ROCK
WALWORTH
RACINE
KENOSHA
MARINETTE
SHEBOYGAN
Scale
Julius Bien & Co. lith.

Of this amount 485,552,000 feet were manufactured along the Mississippi river in Illinois, Iowa, and Missouri as far south as Saint Louis.

The wooded region in Crawford, Richland, Sauk, and Vernon counties is estimated to contain 12,000,000 cords of hard wood in addition to some timber of commercial value. The cut for the census year ending May 31, 1880 (exclusive of 86,545,000 staves and 7,498,000 sets of headings), was 117,041,000 feet.

Valuable oak timber exists in large quantities in Dunn, Pierce, and Saint Croix counties.

The cedar swamps scattered through the pine belt of the state cover an area of some 1,365,000 acres, and are estimated to contain 62,800,000 posts, telegraph poles, and railroad ties, in addition to large quantities of tamarack and spruce.

Wisconsin is the third state in the importance of its lumber-manufacturing interests. The great centers of manufacture are in the neighborhood of Eau Claire upon the Chippewa river, upon the Wisconsin river, and upon the shores of Green bay and lake Superior. Logs cut in the forests of Wisconsin supply also mills located on the Mississippi river in Illinois, Iowa, and Missouri with material equivalent to nearly 500,000,000 feet of lumber.

The following is extracted from Mr. Putnam's report upon the forests of Wisconsin:

"The southern boundary of the forest coincides with a line extending northwesterly from near the city of Milwaukee on lake Michigan, to the falls of Saint Croix on the Saint Croix river, and the western boundary of the state. This includes the heavy hard-wood as well as the pine forest. There is also, or there has been, a large amount of hard-wood timber in the southeastern part of the state, south of this line, but as no large bodies of forest of commercial value are now standing there, it will not be considered here. Large bodies of hard-wood timber exist in Vernon, Crawford, Richland, and Sauk counties, covering in the aggregate fully 400,000 acres and containing at least 12,000,000 cords of wood. This region, however, is already thickly settled, and the forests are being rapidly cleared for agricultural purposes. No estimate has ever been made of the amount of pine timber standing in Wisconsin at the time of its original settlement; at the present time it is estimated that 41,000,000,000 feet of merchantable pine remain in the state, situated as follows, river basins being taken as the natural divisions of these pineries:

"1. North of the Saint Croix river and upon the lands tributary to that stream there are 2,500,000,000 feet, covering 2,000,000 acres.

"2. On the southern shore of lake Superior, including all the waters tributary to the lake in the state of Wisconsin, extending from the Montreal river on the Michigan line westward to the western boundary of the state, and embracing the Wisconsin pine on the Montreal river and upon the Bad, White, Bois-Brulé, Black, and Left-Hand rivers, 3,600,000,000 feet, covering 1,800,000 acres.

"3. On the Chippewa river and its principal tributaries, the Red Cedar, West Branch, East Branch, Flambeau, Jump, Yellow, and Eau Claire, covering an area of some 6,253,000 acres, with an estimated stand of pine of 15,000,000,000 feet.

"4. In the Black River basin, with an area of 1,000,000 acres, containing an estimated stand of 900,000,000 feet.

"5. In the Wisconsin River basin, with an area of 4,500,000 acres, with an estimated stand of 10,000,000 feet.

"The remainder of the state, lying east of the east line of the Wisconsin River division and north of the southern boundary of the original forest, is divided by rivers as follows: (1) Wolf river, with 600,000,000 feet of pine; (2) the Oconto river, with 500,000,000 feet of pine; (3) the Peshtigo river, with 1,500,000,000 feet; (4) the Menomonee in Wisconsin, 6,400,000,000; making a total in the division east of the Wisconsin of some 7,000,000 acres, with an estimated stand of 9,000,000,000 feet of pine. This makes a grand total of pine forest area in the state of nearly 23,000,000 acres, still containing 41,000,000,000 feet of standing pine. This includes about 200,000,000 feet upon the Menomonee Indian reservation, in the county of Shawano, where very little pine has ever been cut; 100,000,000 feet on the Flambeau reservation, and 200,000,000 feet upon the Court Oreilles reservation. There is no merchantable pine standing on any of the other Indian reservations in the state.

"The quality of the pine in the state of Wisconsin varies largely with the differences in soil. The quality of the pine growing mixed with hard woods upon the southern boundary of the forest and bordering on the prairies was similar to that of the best Michigan pine. This is especially true of timber cut on the Wolf, Oconto, and Peshtigo rivers. The timber originally on the Wolf and Oconto rivers was especially fine. This has been largely cut, although there are still some very fine bodies of the best pine left on the Oconto and the western branch of the Peshtigo and northern branch of the Wolf rivers. The Black River district contained also a large amount of the best upper quality of pine, of which, however, more than half has been cut. The Eau de Galle River basin, in the counties of Pierce, Dunn, and Saint Croix, also contained at one time a large amount of the upper grade of pine, now, however, all removed. This grew among hard-wood timber, on good soil, which, when the timber is cut off, is valuable for farming purposes. The pine in this part of the state did not grow in extensive tracts. It was scattered through the hard-wood timber, from 1 to 10 large pine trees growing on an acre—trees which would scale from 1,000 to 3,500 feet of lumber each. There are still small bodies of this large pine left, but the great bulk of it is gone.

"As we go north from the southern boundary of the forest we enter a lighter soil, where cedar and tamarack swamps are interspersed between the hard-wood ridges. Many of these swamps are natural peat-bogs, covered with cedar, tamarack, and spruce. The tree growth upon them is heaviest near the outer edges, the centers often being covered with grass or cranberry plants. These swamps, originally the beds of lakes, are now filling up and becoming gradually covered with timber. On the Wolf river the timber was very heavy. Instances are known of 10,000,000 or 12,000,000 feet of pine lumber having been cut from one section of 640 acres in the Lower Wolf River region.

"In the pine forest, away from the large bodies of mixed hard wood and pine previously described, the general character of the timber is about the same, varying somewhat in different localities, but still possessing the same general characteristics and qualities. Where the pine grows in large solid bodies there are many young trees mixed with the older, and the timber is generally of inferior or lower grade. This is true of pine growing about the head of the Flambeau and Wisconsin rivers, and the Menomonee river in Wisconsin. Large pine cannot grow and mature upon very poor soil, and where the soil is poor the trees, after reaching a certain size or age, decay and are thrown down by wind or destroyed by fire. The white pine in Wisconsin does not mature except upon the rich gravelly loam of the ridges.

"The principal points of lumber manufacture at present in Wisconsin are on lake Winnebago, at the cities of Oshkosh and Menasha, which take largely the product of the Wolf and Fox River pineries; at Green Bay and Oconto, which derive their logs principally from the Oconto river; at Peshtigo, on the Peshtigo river; at Marinette, on the Menomonee river; on the Wisconsin river, at Grand Rapids, Stevens Point, Mosinee, Wausau, and Jenny, the terminus of the Wisconsin Valley railroad, and at Necedah, on the Yellow river. Along the Wisconsin Central railroad, from Junction City to Ashland, are mills of more or less capacity at every station, the most important being at Ogema, Ashland, Medford, and Unity. Upon the Black river the principal manufacturing points are La Crosse and Black River Falls. On the Chicago, Saint Paul, Minneapolis, and Omaha railway, at Fairchild, are the large mills of Foster & Co., who are engaged in manufacturing the timber lying between the Black river and the waters of the Chippewa, included in the Chippewa estimate. On the Chippewa river the largest manufacturing establishment is the Mississippi River Logging Company, composed of fifteen of the heaviest concerns upon the Mississippi river. These firms obtain their stock mostly from the Chippewa river, the logs being driven down to its mouth into what is called the 'Beef Slough boom', where they are separated and formed into rafts and towed to the different mills below. This company cuts on the Chippewa about 400,000,000 feet a year. The principal manufacturing points on the Chippewa deriving their logs from its basin are situated at Waubeck, Dunnville, Menomonee, Meridian, and Eau Claire, where several large and important manufacturing establishments are located. Higher up the river the Badger State Lumber Company and the Grand Island Lumber Company are located, and at Chippewa Falls, the county-seat of Chippewa county, the Chippewa Lumber and Boom Company has a large water-mill, with a capacity of 65,000,000 feet a year, besides several smaller concerns. The railroad extending from Chippewa Falls eastward through Chippewa and Clark counties into Marathon county, and joining the Wisconsin Central railroad at Abbottsford, passes through a hard-wood country. Several firms are already established upon this line and have commenced the manufacture of staves and the production of hard-wood lumber for wagons, etc., and are developing a large business. This road runs through one of the finest bodies of hard wood in the state, containing large amounts of oak and maple growing on a fine soil suitable for farming. The Chippewa River country now contains the largest body of white pine of the best quality left in the states of Michigan, Wisconsin, and Minnesota. It is, however, being very rapidly cut.

"It is found in going north toward the heads of the streams that the timber stands more in large groves, and that there is less hard-wood timber mixed with the pine. When the loggers attack these forests they cut clean as they go, the timber being of more uniform size and age, and there being less undergrowth than farther down the streams. It is found, also, that the pineries on the heads of the streams do not hold out as well or yield as large an amount of timber as those farther south, where the forests border on the prairie lands and where the pines grow on better soil. This is true both of the Wisconsin and of the Michigan pineries. The poorer soils in the northern portion of the state do not grow and mature the large sapling forests of pine found in the southern portions of the pine belt. So that, while there is still a large area which has not been cut and which may appear inexhaustible, yet, owing to the fact that the timber lies more in groves, and that there are here wide extents of tamarack and cedar, swamps and open spaces, the ground will be cut over more rapidly than when the forest was first entered. This is true of the pine standing upon all the streams of northern Wisconsin in the Menomonee district—the Wisconsin, the Chippewa, Saint Croix—and on the southern shores of lake Superior. Commencing at Menomonee, on the Chicago, Saint Paul, Minneapolis, and Omaha railway, and running west through the 30 miles of 'big woods', large mills for the manufacture of hard-wood timber and of what little scattered pine there is left are established at Knapp, Wilson, Hersey, Woodville, and Baldwin stations. The principal manufactories in the Saint Croix district are at Hudson, on the Willow river, and at Stillwater, in Minnesota, which receives its logs from the Saint Croix, in Wisconsin, and which, therefore, should be treated as one of the Wisconsin pinery manufactories. At Somerset, on Apple river, there is one mill; there is one at Osceola, upon the Saint Croix, and upon the Northern Wisconsin railroad, which runs through the Saint Croix division; at Clayton, Granite Lake, and Shell Lake are large mills. There are also other mills along this road on the Lake Superior shore. There are mills of small capacity at Superior City, Bayfield, and Ashland; the latter receive their logs by the Wisconsin Central railroad from the Bad River pinery.

"On the Eau Claire river the timber is small and sound, growing very thick and long; there are frequent instances where 1,200,000 or even 1,500,000 feet of lumber have been cut upon a 40-acre lot. One tree was cut on Jump river some years ago which scaled 7,000 feet of lumber. The general character of this timber, especially upon the main Chippewa or West Branch and a portion of the Flambeau, is called 'big sapling pine'. Of the true cork pine very little is found in the northern part of Wisconsin, probably because the soil is not strong enough to permit its full development. The general character of the timber upon the Wisconsin river is very much the same as that upon the main Chippewa. There are instances of very fine pine having been cut in the hard-wood forest upon the lower part of the river, and some fine groves are found even as far north as the Tomahawk and East Branch. The Flambeau river, or East Branch of the Chippewa, has also, in ranges 2 and 3 east, extending from townships 35 to 41 north, inclusive, some excellent bodies of upper-grade pine.

"On the Jump river are some fine bodies of pine, nearly approaching in quality Michigan cork pine and running largely to 'uppers'. This is true also of the pine upon the Yellow river, where the timber grows largely scattered among hard woods and is of fine quality. One of the finest bodies of pine in Wisconsin is that which belongs to Cornell university, lying in townships 33 to 38, ranges 8 and 9, in the highest part of Chippewa county, on the divide between the Chippewa and Red Cedar rivers. On this body frequent estimates of 1,000,000 feet to 40 acres have been made. On the Saint Croix river are many barren areas timbered with scrub pine, patches of Norway pine, and small black and white oak. These barrens cover about 700,000 acres of the Saint Croix region. The soil is sandy, and fires run over the country every year. South of these barrens, in Poik, Barren, Saint Croix, Dunn, and Pierce counties, is a tract of very valuable hard-wood land, upon which the greatest portion of the timber is now standing, although settlements are already largely scattered through this region. This body of hard wood contains a large amount of valuable white-oak stave timber and much timber suitable for general manufacturing purposes. It is being, however, rapidly destroyed by settlers and by the fires incident to agricultural and logging operations.

"In Clark county, which lies partly in the Chippewa and partly in the Black River region, are large bodies of hard-wood timber as yet uncut and growing upon land valuable for farming purposes. This growth extends as far north as the northern line of the county. The same body of timber extends east through Marathon and Wood counties, and is particularly fine in the western portions. The same body of hard-wood timber continues east toward lake Michigan, including the counties of Portage, Waupaca, Shawano, Outagamie, Winnebago, Brown, Kewaunee, Manitowoc, Calumet, Fond du Lac, Sheboygan, and Ozaukee. Large tracts in these counties are, of course, cleared and settled; still they contain large bodies of unoccupied hard-wood timber, and the opportunities for cheap farms are plenty.

"Of the forest region proper of Wisconsin, fully 5 per cent. is not covered with timber; this includes swamps, lakes, rivers, bottoms, etc. In the extreme southern part of the forest area, over a region from 35 to 50 miles in width, the hard wood predominates, only about one-fifth of the forest growth being pine. North of this hard-wood region proper, perhaps one-half of the forest growth is pine and other soft woods and the rest hard woods. Hemlock is scattered through the pine forest outside of the heavy hard-wood areas. A careful estimate of the hemlock timber now standing gives the following results, the divisions agreeing with those used in estimating the standing pine: On the Chippewa river, upon 3,000,000 acres, 2,500,000,000 feet of hemlock; on the Saint Croix river, upon 1,000,000 acres, 500,000,000 feet of hemlock; on the Black river, upon 350,000 acres, 100,000,000 feet of hemlock; in the country east of the Wisconsin River division, and including the Wolf, Oconto, Peshtigo, and Menomonee rivers and their tributaries, upon 3,000,000 acres, 1,500,000,000 feet.

"The total area in the state on which hemlock timber grows is about 10,500,000 acres, containing, roughly, 5,500,000,000 feet. The quality of the hemlock timber in Wisconsin is not so good as that grown in New York and northern Pennsylvania, although it is valuable for its bark, and the timber when peeled can be driven down with the pine and sawed at the mills into dimension stuff for use where coarse lumber is required.

"Generally, therefore, the forests of Wisconsin may be divided into the hard-wood lands already described, along the southern borders, from which the pine has been mostly cut; north of this, and extending northward somewhat indefinitely, the mixed growth of hard wood and pine, growing upon soil adapted for agricultural purposes. The open meadows in this region are covered either with grass or cranberry marshes, alike valuable to the lumber and farming interests. About the head of the Flambeau river are large open spaces running into groves of heavy pine timber. These open spaces, once lakes or swamps, are drying up and the timber is gradually spreading over them. There are bodies of timber scattered through the southern portions of the state outside of the original forest area, but the amount of this timber is relatively so small that it cannot be considered of commercial importance, and hardly supplies the wants of the population occupying the thickly-settled southern counties.

"Five thousand men are employed in the pineries of the Chippewa river. They are expected to cut during the logging season about 600,000,000 feet of logs, or an average per man of over 100,000 feet. This rule is not applicable to the northwestern pineries generally, for in Michigan, as the timber is now farther from the streams, the average cut per man is not as great, and 80,000 feet per man would perhaps be a fair average, taking the pineries of the whole northwest.

"The annual increase or growth of timber is counterbalanced by the annual waste by windfalls and the natural decay of the old trees. The loss to the forest by fire is an unknown quantity, but it is quite a large amount, probably 5 per cent. of the whole. The lumbermen waste the log which runs into the top of the tree; this is knotty, but usually sound, and would make good merchantable lumber. It is left in the woods, however, because there is a good deal of work in trimming the knots and cutting off the limbs. From an ordinary-sized tree four 16-foot logs are usually taken, the rest being left. Often this top log is 22 inches in diameter at the butt and will scale from 100 to 120 feet. Loggers are paid so much per thousand feet by the lumberman, and the amount they receive is so small that they cannot afford to spend the time to finish up and take out the fifth or last log, which is therefore left in the woods and lost. Nearly one-tenth of the timber, therefore, is left in the woods and lost. The fires about the old choppings, or where lumber operations are going on, are principally caused by the carelessness of woodsmen in hunting up land-lines, or of driving-crews on the river in the spring who leave their fires, or by explorers in the forest during the month of May or June leaving their camp fires burning. In all the old cuttings the dried pine boughs and other timber left on the ground get very dry, and fire once started burns with great rapidity and violence.

"As a matter of fact, more than half the area from which pine forests have been cut in the northwest is sooner or later burned over. The fire destroys the young trees and changes the nature of the surface of the ground, so that the next crop which comes up consists of briers and poplars, and then hard woods. When pine is cut off or burned it does not come in again, and I have never seen any old choppings of pine come up with pine again, even when some trees were left and the ground had not been burned, although where a few large trees only are removed from a pine forest growing on good soil the small trees left standing, if protected from fire, will continue to grow."

MINNESOTA.

The Northern Pine Belt finds in Minnesota its extreme western limit in the United States in longitude 95° 30′, and its southwestern limit near the forty-sixth degree of latitude. Along its southern and western borders a narrow territory covered with an open growth of hard wood separates the forests of pine from the prairie, which occupies all the southern and western portions of the state.

The same general features which characterize the pine belt of Wisconsin extend into Minnesota. The pine in the southern portion, confined to gravelly ridges, is scattered through forests of hard wood. Farther north the forest changes in character, the pine being small and of inferior quality. Broad areas of barren land covered with stunted birch, gray pine, and scrub oak occur, while the whole country is thickly studded with lakes and with tamarack and cedar swamps. North of the Mississippi River divide the country is more open; the forest is stunted and of little value, and pine is only found in small, scattered clumps mixed with spruce, tamarack, and yellow cedar. The forest growth here occupies perhaps two-thirds of the rocky or swampy surface of the ground. Its productive capacity is not large, and the northern part of the state is not adapted to lumbering operations.

The pine has been removed from the principal streams of the state, and that which remains, except in the region tributary to lake Superior and in the vicinity of Red lake, is now inaccessible or of comparatively inferior quality. The best hard-wood forests of the state, as in Michigan and Wisconsin, have suffered seriously by fires started in abandoned pineries, or in clearing land for agriculture.

During the census year 250,805 acres of woodland were reported devastated by fire, with an estimated loss of $1,395,110. The largest number of these fires was set in clearing land or by sparks from locomotives.

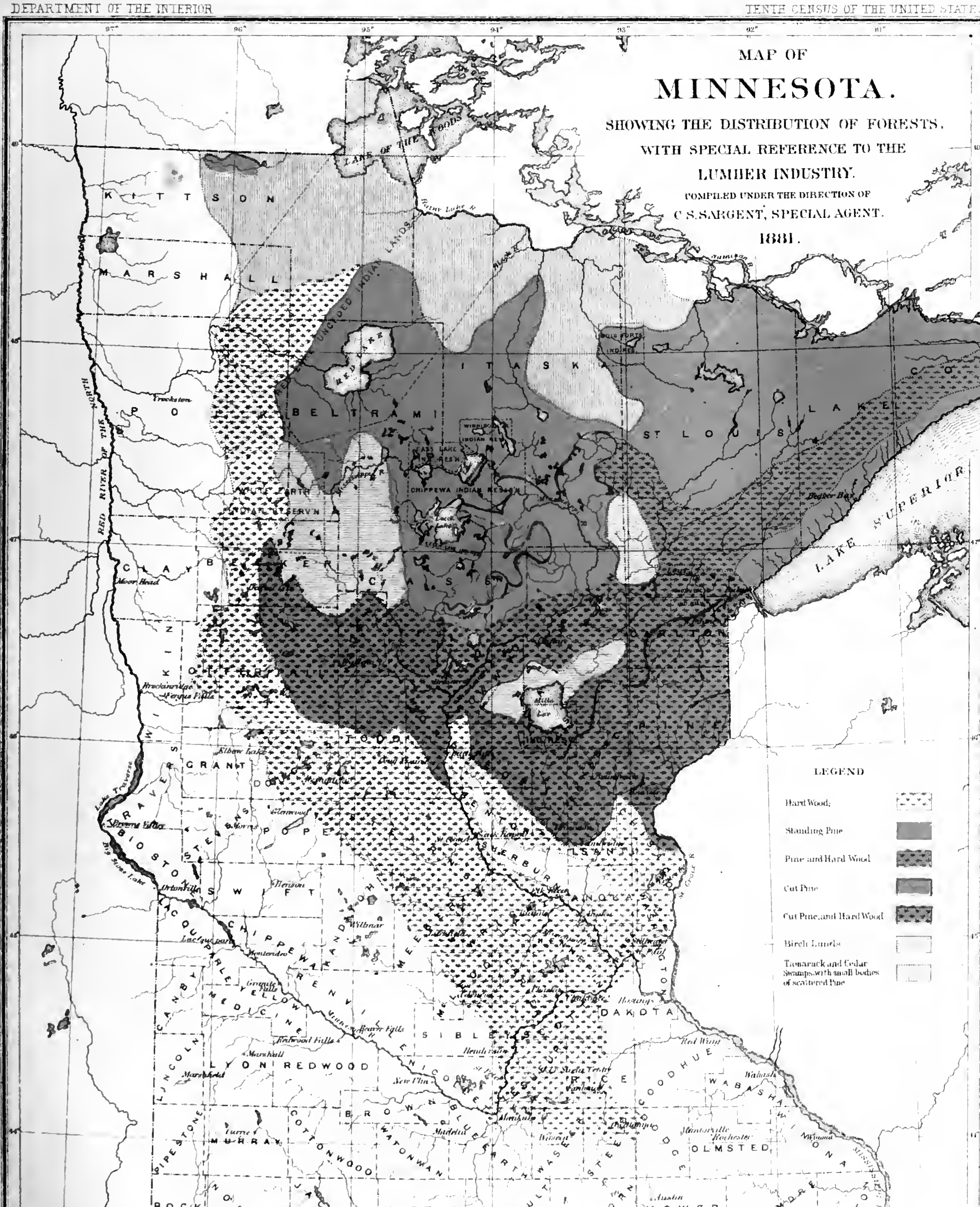
The manufacture of cooperage stock to supply the large flouring-mills of the state is an important industry. Manufacturers report a growing scarcity and general deterioration of material. Basswood, elm, and ash are largely used; oak is inferior in quality to that grown farther east and south.

The following estimates of the amount of pine timber standing in Minnesota May 31, 1880, were prepared by Mr. H. C. Putnam:

WHITE PINE (*Pinus Strobus*).

Regions.	Feet, board measure.
Mississippi river and tributaries	2,900,000,000
Rainy lake and Rainy Lake river	300,000,000
Red Lake river and other tributaries of the Red river	600,000,000
Saint Louis river and tributaries	3,500,000,000
Shore of lake Superior	870,000,000
Total	8,170,000,000
Cut for the census year, ending May 31, 1880 (including 187,836,000 shingles and 88,088,000 laths).	540,997,000

In the belt of hard wood extending west and south of the pine region, and consisting of white, red, and burr oak, sugar-maple, poplar, etc., it is estimated that 3,840,000 acres of forest remain, capable of yielding an average



Scale

50 25 0 50 100 MILES

of 15 cords of wood to the acre, or 57,600,000 cords. The cut for the census year ending May 31, 1880 (exclusive of 7,825,000 staves and 547,000 sets of headings), was 36,884,000 feet.

Minnesota is the eighth state in the importance of its lumber-manufacturing interests. The principal centers of manufacture are Minneapolis, upon the Mississippi river, the Saint Croix river in Washington county, the Mississippi river in Anoka county, and Duluth, near the mouth of the Saint Louis river.

The following is extracted from Mr. Putnam's report upon the forests of Minnesota:

"The great hard-wood forest of Minnesota lies to the south and west of the pine forest, extending north and northwest from Freeborn and Mower counties on the southeast into Marshall county, and to within 50 or 60 miles of the boundary-line between Canada and the United States. This body of hard wood, which is some 300 miles long by about 20 miles wide, borders upon the prairie, and is the extreme western body of timber of any commercial value east of the Rocky mountains. This forest covers about 3,840,000 acres of land generally valuable for agricultural purposes, besides its timber, which will average about 15 cords to the acre. The surface of the land is level or gently undulating, well watered, particularly the so-called 'park region' which lies in Becker, Otter Tail, Douglas, Stearns, and Todd counties, and in fact extends through Wright, Hennepin, Carver, Le Sueur, Rice, and Steele counties.

"North and east of this belt of hard wood the pine forests commence at a point where the southern line of the Wisconsin forest crosses the Saint Croix river, near Taylor's Falls. They extend northwesterly through the counties of Chisago, Isanti, Mille Lacs, Benton, Morrison, Todd, Otter Tail, Becker, Polk, and Beltrami, nearly parallel to the line of the hard-wood forest, and, crossing Red Lake river, extend round to the north of Red lake, and thence easterly, reaching the shore of lake Superior at the Grand Portage.

"The general character of the pine in Minnesota is similar to that of northern Wisconsin, although it contains more sapling pine and a smaller percentage of 'uppers.' It is generally somewhat scattering and in smaller groves. Large areas of barren land within the forest proper are covered with birch, through which are scattered patches of small pine, while large areas of swamp bear only tamarack and cedar. The pine of Minnesota is estimated as follows:

"1. On the portion tributary to the Rainy lake and Rainy Lake river, including the Big Fork, the Little Fork, and the Vermillion rivers, 300,000,000 feet. This stands upon streams which flow northward. This pine will naturally be sent to Manitoba.

"2. On the northern shore of lake Superior, east of Duluth, and covering the waters tributary to lake Superior, of which very little is surveyed and no area is given, 870,000,000 feet.

"3. On the waters of the Saint Louis, including the Cloquet, White Face, and other small streams, 3,500,000,000 feet.

"4. On Red Lake river and its tributaries. The great body of pine in this division is principally upon Red lake and Red Lake river. It is estimated to contain 600,000,000 feet, although it is nearly all unsurveyed.

"5. On the Mississippi river and tributaries above Minneapolis, 2,900,000,000 feet.

"About one-half of the pine has been cut in Carlton county; it has all been cut in Pine county with the exception of that growing in a few townships. It has nearly all been cut in Chisago, Kanabec, Morrison, and Crow Wing counties. A great deal of pine, too, has been cut in Cass county, while Todd, Otter Tail, and Wadena have all been cut over. The principal bodies of pine now remaining are located in Cook, Lake, Saint Louis, Cass, Itasca, and Beltrami counties. There were a few thousand acres growing on the Roseau river, where it runs into northwestern Minnesota, but this has all been cut by the Canadians. There is no hemlock or spruce in Minnesota. There are occasional ridges of hard wood within the pine forest, as in Wisconsin and Michigan.

"A large portion of the northern part of the state is as yet unsurveyed and but little known, except that, in the region extending from 30 to 100 miles south from the international line, there is little pine of commercial value. It is an open country, full of bogs, swamps, rocks, and wide areas of worthless land; this region extends from the Arrow river clear through to the international line, south and west of the Lake of the Woods, and to the Vermillion lake.

"Along the line of the Northern Pacific railroad and north and east of the Mille Lacs country are large swamps covered with tamarack timber of commercial value. Through this country are many marshy lakes containing floating islands, lands in process of formation by the accumulation of vegetation. The timber in this district is growing and increasing, and if fires can be kept out of the tamarack and cedar timber the small pine will grow rapidly.

"The timber which grew on the Saint Croix river in Minnesota was tributary to Stillwater, and has all been cut and manufactured there.

"The principal manufactories of pine on the Mississippi river are at Minneapolis.

"FORESTS ON INDIAN RESERVATIONS.

"Referring to the Red Lake Indian reservation in Minnesota, and other Indian reservations on which the pine remains uncut, amounting in the aggregate to 1,000,000,000 feet, it may be said that they are nearly all unsurveyed, and are generally covered with a heavy pine forest, and that the lands are unfit for agricultural purposes and only valuable for the pine timber which grows upon them. These reservations should be held as long as possible by the government as a timber reserve. They should not be surveyed and subdivided except so far as may be necessary for their protection, and they should not be offered for sale until some necessity, now unforeseen, arises for their disposal. The 1,000,000,000 feet of pine should be held until the amount for which it can be sold is needed by the Indians, or until a price near its value can be obtained for it. By selling the land now the value of the timber cannot be realized, while the interest of the settlers who may hereafter enter upon the prairies would seem to demand that some reservation of pine should be made for them, if possible. The proposition to bring these lands into market, subject to pre-emption and homestead entry, is against the interest of every one except the few worthless tramps and irresponsible persons who may seek to enter and procure a title to these lands; and even if the land was so open to homestead and pre-emption entry, the aim and purpose of these laws could not be carried out, for no farms will be made nor homesteads improved in this Indian country.

"The White Earth Indian reservation is largely covered with hard wood, there being no pine upon more than a quarter of its area. The land is desirable for agricultural purposes, and may be utilized for the settlement of Indians, or under the homestead and pre-emption laws by whites, but the pine lands are unfit for cultivation, and the homesteading or pre-empting of them should not be allowed."

IOWA.

Iowa lies within the prairie region. The broad bottom lands along the river of the eastern part of the state once bore heavy forests of broad-leaved trees. Farther west the tree growth was less heavy in the narrower bottoms. All over the state, however, forests lined the streams and often spread, especially in the southwestern counties, over the uplands. Since the first settlement of the state the forest area has increased by the natural spread of trees over ground protected from fire, and by considerable plantations of cottonwood, maple, and other trees of rapid growth made by farmers to supply fuel and shelter.

The natural forests have been everywhere largely culled of their most valuable timber, and in spite of their increased acreage are, in their commercial aspect, in danger of speedy extermination. Manufacturers of cooperage stock and others using Iowa timber report great scarcity and general deterioration of stock.

During the census year 11,017 acres of woodland were reported destroyed by fire, with an estimated loss of $45,470. These fires were largely the result of carelessness in clearing land.

Iowa is the ninth state in the importance of its lumber-manufacturing interests. It owes its position to numerous large mills situated along the Mississippi river entirely supplied with logs from the pineries of Wisconsin. The amount of Iowa-grown lumber manufactured is insignificant.

MISSOURI.

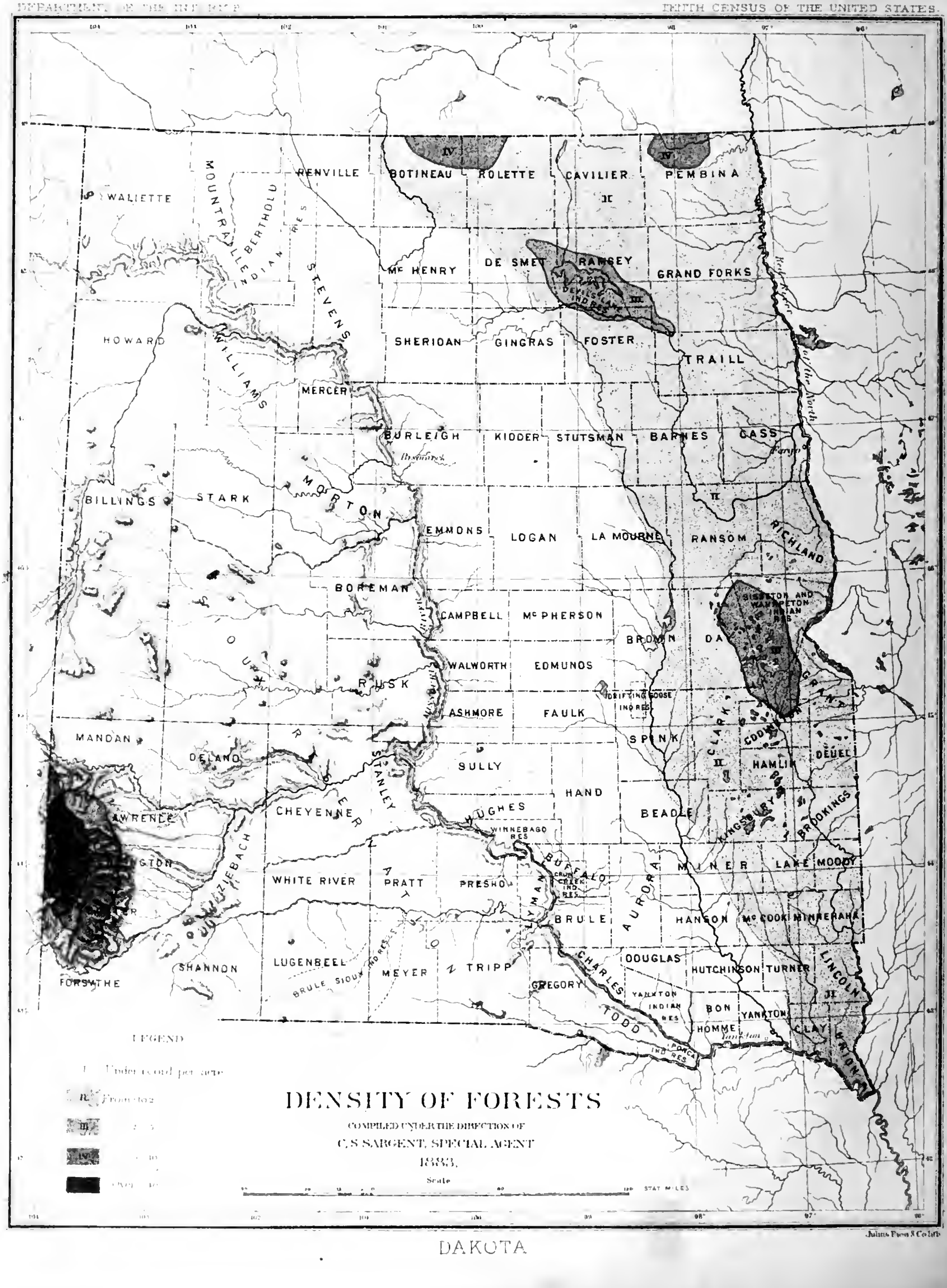
Southern and southwestern Missouri was originally covered with a dense forest of hard woods, through which in the southern counties extensive areas of the short-leaved pine (*Pinus mitis*), covering gravelly ridges and the low Ozark hills, were common. The northern and western limits of the true forest region may be defined by a line entering the state from the southwest, in the southern part of Jasper county, and passing northeasterly through Dade, Cedar, Saint Clair, Henry, Benton, Morgan, and Cooper counties, and then northward to the borders of the state. West of this line the timber is largely confined to the broad bottom lands, in belts often 2 or 3 miles in width. Farther west these become narrower and less heavily timbered. The extreme northwestern counties, Atchison and Nodaway, are almost destitute of timber.

The forests of southeastern Missouri still contain great stores of valuable timber, although the best trees have been cut in the neighborhood of all settlements, and for a distance varying from 5 to 20 miles back from all lines of railroad. This is especially true of the best white oak and of black walnut, once common, but now almost exterminated in all parts of the state.

Manufacturers of cooperage stock report a growing scarcity of material everywhere, and are now forced to obtain oak from Arkansas and elm and basswood from the rivers of southern Illinois and Indiana. The further development, however, of the railroad system of southern Missouri will make available for manufacturing purposes a large amount of valuable timber now remote from transportation.

During the census year 783,646 acres of woodland were reported destroyed by fire, with an estimated loss of $294,865. These fires were traced to careless hunters, to fires set in clearing farming land, to sparks from locomotives, etc.

A gratifying improvement in the condition of the forest in the parts of the state first settled has followed the enactment of a fence law preventing the general ranging of stock through the timber-land. A young growth has sprung up among the older trees and along the borders of woodlands protected from browsing animals, and these young forests are valuable in their prospective yield and as an indication of the methods which must be adopted to preserve and perpetuate the forests of the whole Atlantic region.


RENVILLE
BOTINEAU
ROLETTE
CAVILIER
PEMBINA
WALIETTE
MOUNTRAILLE
BERTHOLD INDIAN RES
STEVENS
Mc HENRY
DE SMET
RAMSEY
GRAND FORKS
DEVILS LAKE IND RES
HOWARD
WILLIAMS
SHERIDAN
GINGRAS
FOSTER
TRAILL
MERCER
BURLEIGH
KIDDER
STUTSMAN
BARNES
CASS
Bismarck
Fargo
Red River of the North
BILLINGS
STARK
MORTON
EMMONS
LOGAN
LA MOURE
RANSOM
RICHLAND
BOREMAN
CAMPBELL
Mc PHERSON
BROWN
DAY
SISSETON AND WAHPETON INDIAN RES
SIOUX
WALWORTH
EDMUNDS
RUSK
DRIFTING GOOSE IND RES
ASHMORE
FAULK
MANDAN
SPINK
CLARK
CODINGTON
GRANT
DEUEL
HAMLIN
DELANO
SULLY
STANLEY
HAND
LAWRENCE
CHEYENNE
HUGHES
BEADLE
KINGSBURY
BROOKINGS
WINNEBAGO RES
ZIEBACH
BUFFALO
CROW CREEK IND RES
AURORA
MINER
LAKE
MOODY
WHITE RIVER
PRATT
PRESHO
LYMAN
BRULE
HANSON
Mc COOK
MINNEHAHA
SHANNON
LUGENBEEL
MEYER
TRIPP
BRULE SIOUX IND RES
DOUGLAS
HUTCHINSON
TURNER
LINCOLN
FORSYTHE
GREGORY
CHARLES MIX
YANKTON INDIAN RES
BON HOMME
YANKTON
CLAY
UNION
TODD
PONCA IND RES
Yankton
LEGEND
I. Under 1 cord per acre
II. From 1 to 2
III.
IV.
Over
DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
Scale
STAT. MILES
Julius Bien & Co. lith

DAKOTA

Missouri is the tenth state in the importance of its lumber-manufacturing interests. It owes its position in part to large mills located upon the Mississippi river manufacturing logs cut in the forests of Wisconsin. A much larger amount of lumber, however, in the aggregate, both pine and hard wood, is produced in numerous small railroad mills located along the line of the Iron Mountain and other railroads running through the southern part of the state.

Saint Louis is an important center of lumber distribution. It receives a large portion of the Wisconsin pine crop by raft, Michigan pine by rail, and southern pine and hard woods by rail and river.

DAKOTA.

Dakota, with the exception of its river lands and the small territory between the north and south forks of the Cheyenne river, is practically destitute of timber. The bottoms of the principal streams contain extensive groves of hard wood. As far west as the James river timber exists about the shores of the larger lakes, and upon the Low Turtle and Pembina mountains of the northern boundary, occasionally ascending the *côtes* or sides of low tables rising from the prairie. The Black hills, an extreme outpost of the Rocky Mountain system, were once heavily timbered. The yellow pine of the Pacific region is here mingled with the white spruce, the canoe birch, the burr oak, and the elm of the eastern forests, while poplars of the Atlantic and Pacific regions grow side by side.

Much timber has already been cut along the eastern rivers to supply the wants of a rapidly-increasing agricultural population, and the isolated pine forests of the Black hills, separated by hundreds of miles from any equally large or valuable body of building timber, have already suffered serious inroads. The best and most accessible pine has been cut and manufactured into lumber or consumed as fuel in the silver mines and stamping mills to which this region owes its population, and much timber has been allowed to perish in the fires which of late years have often swept through these forests.

The principal center of lumber manufacture is Deadwood, in the Black hills, where a comparatively large amount of pine is sawed. In the eastern counties a little oak and elm is manufactured, for the most part in small portable mills.

The following extracts are made from Mr. H. C. Putnam's report upon the eastern portions of the territory:

"Along the whole length of the Missouri river in Dakota there is a belt of hard-wood timber in the bottoms in bodies of from 100 to 500 acres in extent. This timber sometimes grows continuously, but more often there are open spaces between the groves. About three-fourths of the trees are burr oak, the remainder sycamore, cottonwood, green ash, box-elder, poplar, willow, etc. A similar forest growth lines the banks of the Red river north of Fort Abercrombie as far as Fort Pembina, near the international line. This strip of timber averages perhaps forty rods in width, and consists of the same varieties of trees that grow upon the Missouri river.

"In the Pembina mountains and west of Fort Pembina, on the Tongue and Pembina rivers, there are bodies of timber, generally of stunted growth, lying mostly along the streams or about the Pembina mountains in groves of from 160 to 3,000 acres in extent. This timber is situated principally in the two northern tiers of townships of Pembina county. It has no value except as fuel. The next body of timber in Dakota is in the neighborhood of Devil lake; it aggregates some 25,000 acres, distributed as follows: At Wood lake, some 20 miles north of Devil lake, there are 1,000 acres; on Graham's island, a promontory on the north shore of Devil lake, near the northwest end, are 2,500 acres of timber; east of this, on the north shore of the lake, are two groves of about 500 acres; at Rock island, which is really a promontory running into the lake, are 3,800 acres of timber; around the east and north shores, and around the whole southern shore of the lake, past Fort Totten to the extreme west end, are some 15,000 acres of forest adjacent to Devil lake; at Stump lake, a lake some 15 miles in diameter on the north side of Devil lake, there are 1,400 acres of timber; and commencing some 10 miles south of Fort Totten, and extending down along Cheyenne river into township 146, range 56, in Traill, Foster, and Grand Forks counties, are about 10,000 acres of timber. The valley here is only 1 or 2 miles in width, and the timber is generally distributed through it. Probably seven-eighths of all this Devil Lake timber is burr oak; the remainder is sycamore, green ash, etc. This timber in many places grows large, sometimes 30 or 40 feet to the first limb, and is valuable for fuel, for the construction of log houses, and for general use by settlers in the absence of other and better material.

"In the Turtle mountains, in Bottineau and Rolette counties, and extending into the British possessions, is quite a large tract of timber, principally oak of short, scrubby growth, and only valuable as fire wood. A body of timber from 1 mile to 5 miles in width extends for 150 miles along the Mouse river, in the counties of Bottineau, McHenry, Stevens, and Renville. This timber is composed of burr oak, box-elder, sycamore, green ash, etc., and is suitable for fire-wood, house-building, and rough construction."

Mr. Robert Douglas, of Waukegan, Illinois, contributes the following remarks upon the forests of the Black Hills region, of which he made a critical examination:

"From Fort Meade the stage road runs about 2 miles along the base of the hills, and then follows up through heavy timber, gaining an altitude of over 1,500 feet above the fort when within 2 miles of Deadwood; thence down a steep grade of about a mile until the valley is reached, and then up the valley by an easy grade to Deadwood. Five days' driving through the hills from the base of the foot-hills to one of the highest peaks shows little variation in the species of forest trees. The yellow pine (*Pinus ponderosa*) is the only tree of much value in the hills, and composes nineteen-twentieths of the forest, generally covering the hills from base to summit. The trees are larger and stand closer together than in Colorado, and grow here, too, more rapidly than farther south, as is shown by the width of the annual rings of growth and the shoots upon the standing trees. This is the only tree used for lumber at the saw-mills, and no other is used in the mines. The white spruce (*Picea alba*) grows principally near the water-courses, and here the largest trees of that species are to be found. It is scattered, however, through the pines even within 50 feet of the summit of Terry's peak. It is condemned by both saw-mill proprietors and miners as lacking strength and being very knotty, which cannot be doubted, as it retains its lower branches with wonderful tenacity, even when growing closely and in dense shade. These two species comprise all the *Coniferæ* in the Black hills, with the exception of a prostrate juniper and rare specimens of the red cedar. The burr oak is found in the valleys extending into the foot-hills and along the creeks for 40 or 50 miles into the plains. It is short, gnarly, and apparently of little value, although exceptional trees in the valley are of fair size. In the narrow valleys and along water-courses are found the common cottonwood, black willow, narrow-leaved cottonwood, green ash, white elm, box-elder, ironwood, canoe birch, and quaking aspen; in the hills canoe birch, mountain ash, hazel, choke cherry, and juneberry are found growing side by side with the snowberry and mahonia of the Pacific region. The little aspen and the canoe birch perform the same service the aspen does in Colorado, and cover the ground after the timber is burned off, thus making a shade in which the pine seedlings find protection from sun and wind, and finally repossess the hills. On the banks of the numerous creeks intersecting the 'bad lands' and plains from the Missouri river to the Black hills, box-elder, white elm, green ash, black willow, cottonwood, choke cherry, wild plum, and buffalo-berry occur, but the canoe birch is not found below the foot-hills, where it grows along the creeks 6 or 8 inches in diameter, or as a low shrub upon the hillsides.

"The region occupied by the Black Hills forests is 80 miles in length north and south, and about 30 miles wide from east to west. Forest fires are not so frequent nor so disastrous as in Colorado, although the 'big burning' of 1865, near Custer's peak, is estimated to have extended over 400 square miles. The yellow pine is largely reproducing itself over the whole of this area, the trees being now 3 or 4 feet high. As far as my observation went, this reproduction of the yellow pine over the old 'deadenings' is almost universal through the hills, although rarely or never seen in Colorado, and even in northern Wisconsin and the Michigan peninsula scarcely a single young pine has appeared in the whole burned district of 1871.

"The timber is disappearing rapidly in the vicinity of Deadwood, Lead City, Terryville, and Central."

NEBRASKA.

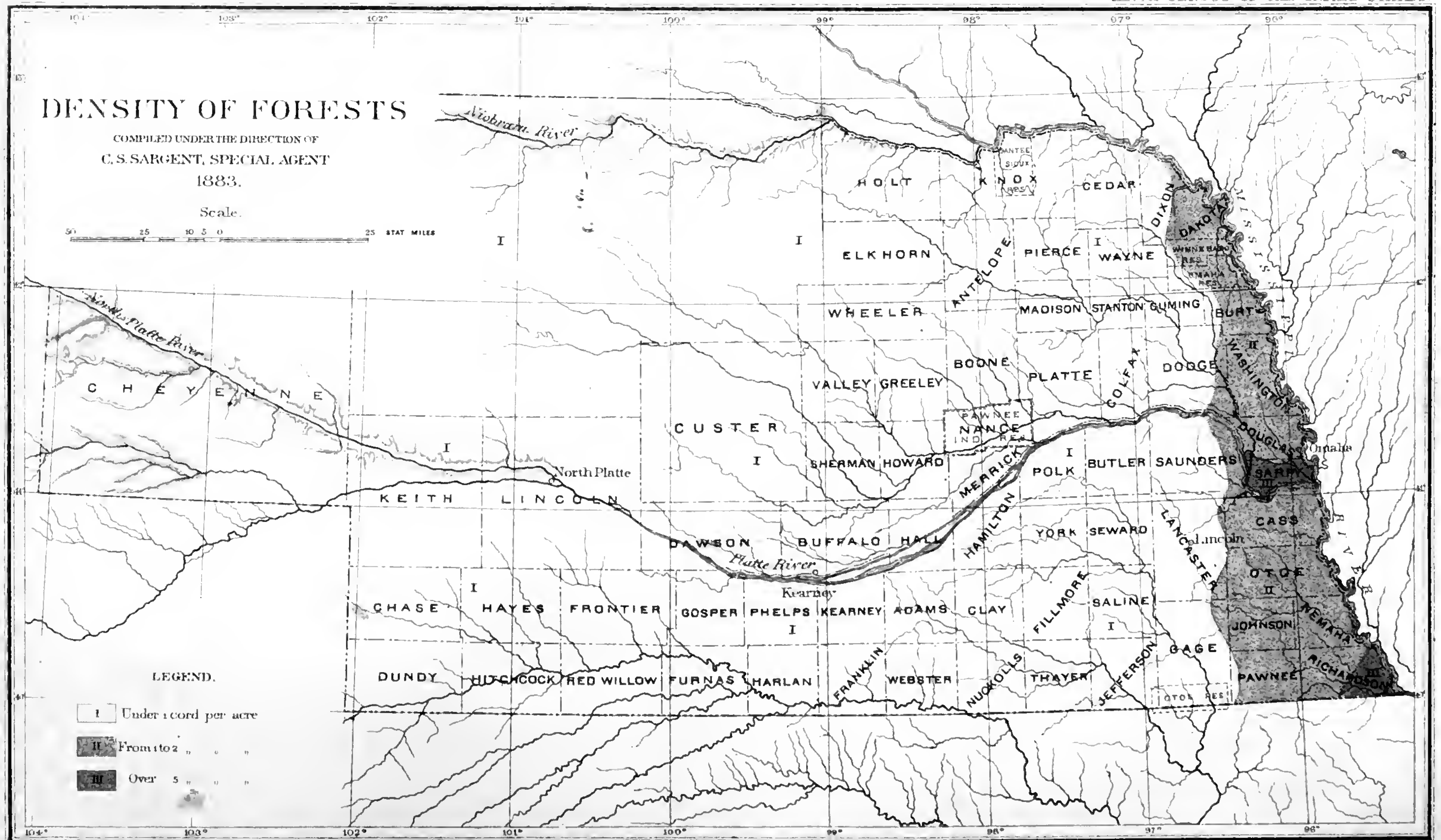
The forest growth of Nebraska was once confined to the eastern part of the state; the broad bottom lands of the Missouri and the lower Platte rivers contained groves of large oak, walnut, ash, and box-elder of considerable extent. These, under favorable conditions, spread to the bluffs and uplands. Westward the tree growth gradually became more scanty and stunted, until, west of the one hundredth meridian, only the large streams were lined with a few small cottonwoods and willows.

The best trees have already been culled from the scanty forest growth of the state, and if the area of natural woodland has somewhat increased along its eastern borders since the settlement of the country and the diminution of prairie fires, these forests are, in their commercial aspect, of little importance. Many small plantations of cottonwood and other trees of rapid growth have been made in connection with farms in the eastern counties, and these in some cases already furnish much-needed shelter to buildings and crops, and supply domestic fuel.

The lumber-manufacturing interests of Nebraska are not important. Mills at Omaha, the principal manufacturing center, saw cottonwood and a little walnut and oak, hauled to them from the neighborhood of the city, and small portable mills at other points along the Missouri saw a little cottonwood and such logs as the country tributary to them can furnish. The product of all the Nebraska mills is consumed in supplying the local demand.

KANSAS.

The heavy forest of the Mississippi basin just reaches the extreme southeastern corner of Kansas, covering nearly one-third of Cherokee county. North of this, and occupying the remaining eastern border of the state, a prairie region varying in width from 30 to 100 miles is still heavily wooded with valuable timber along the streams, the forest growth occasionally extending and covering areas of upland. West of this region of mixed prairie and woodland the timber is confined to the banks of streams. It is often, east of the ninety-seventh meridian, of considerable size and value, occurring in sufficient quantity to supply the most pressing wants of the agricultural population of this part of the state. West of the ninety-seventh meridian the tree growth gradually diminishes in vigor. Trees are here confined to the immediate banks of the large streams, and are small and of little value. West of the ninety-ninth meridian a few small stunted willows and cottonwoods, scattered at wide intervals along the large streams, represent the only forest growth of this arid region.


DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
Scale.
50 25 10 5 0 25 STAT. MILES
LEGEND.
I Under 1 cord per acre
II From 1 to 2 " " "
III Over 5 " " "
Niobrara River
North Platte River
Platte River
North Platte
Kearney
Lincoln
Omaha
CHEYENNE
KEITH
LINCOLN
CUSTER
HOLT
KNOX
SANTEE SIOUX RES.
CEDAR
DIXON
DAKOTA
ELKHORN
ANTELOPE
PIERCE
WAYNE
WHEELER
MADISON
STANTON
CUMING
BURT
BOONE
PLATTE
COLFAX
DODGE
WASHINGTON
VALLEY
GREELEY
PAWNEE IND. RES.
NANCE
DOUGLAS
SHERMAN
HOWARD
MERRICK
POLK
BUTLER
SAUNDERS
SARPY
DAWSON
BUFFALO
HALL
HAMILTON
YORK
SEWARD
LANCASTER
CASS
OTOE
CHASE
HAYES
FRONTIER
GOSPER
PHELPS
KEARNEY
ADAMS
CLAY
FILLMORE
SALINE
JOHNSON
NEMAHA
GAGE
DUNDY
HITCHCOCK
RED WILLOW
FURNAS
HARLAN
FRANKLIN
WEBSTER
NUCKOLLS
THAYER
JEFFERSON
OTOE RES.
PAWNEE
RICHARDSON
MISSISSIPPI RIVER
104° 103° 102° 101° 100° 99° 98° 97° 96°
Julius Bien & Co. lith.

NEBRASKA

A large amount of lumber is manufactured in the eastern counties in proportion to the extent of their forest area; but much of the best timber of the state has been cut, and Kansas must soon depend, even more than at present, upon the forests of Arkansas and Louisiana for its lumber supply.

Considerable plantations made in the eastern and southeastern counties by railroads and in connection with farms promise abundant success. All attempts, however, to raise trees in the arid central and western parts of the state have resulted in failure.

During the census year 7,080 acres of woodland were reported destroyed by fire, with an estimated loss of $14,700. The largest number of these fires originated upon the prairie.

WESTERN DIVISION.

MONTANA.

The forests of Montana are confined to the high mountain ranges which occupy the western part of the territory They are dense and important upon the slopes of the Cœur d'Alêne and other high ranges. Farther east, along the eastern slopes of the Rocky mountains and their outlying eastern ranges, the Big Belt, the Little Belt, the Crazy, the Snow, and the Bear mountains, and the ranges south of the Yellowstone river, the Yellowstone, Shoshonee, and Big Horn mountains, the forests are more open, stunted, and generally confined to the highest slopes, the borders of streams, or the sides of cañons. A narrow fringe of cottonwood, green ash, and willow lines the bottoms of the Missouri, Yellowstone, Tongue, Rosebud, Milk, and of the other large streams of the territory; and a few stunted pines and cedars are scattered along the river bluffs and the highest ridges of the Powder River, the Wolf, and other ranges in the southeastern part of the territory. The remainder of the territory, the eastern, northern, and southern portions, are destitute of timber.

The heavy forests of northwestern Montana, largely composed of red fir, yellow pine, and tamarack, and containing great bodies of white pine (*Pinus monticola*) and considerable valuable spruce (*Picea Engelmanni* and *P. alba*) constitute, with those covering the adjacent mountains of Idaho, one of the most important bodies of timber in the United States. East and west of this forest a treeless country, adapted to grazing and agriculture, and destined to support a large population which must obtain its building material and railroad supplies from it, extends over thousands of square miles. The development, too, of the important mining interests of southern Montana and Idaho is dependent upon these forests, their only valuable source of timber and fuel supply. These forests guard the headwaters of two of the great rivers of the continent, and in regulating their flow make possible through irrigation the devotion to profitable agriculture of a vast territory now an almost arid waste. The forests, largely composed of the lodge-pole pine (*Pinus Murrayana*), which cover the outlying eastern ranges of the Rocky mountains at an elevation of from 5,000 to 10,000 feet above the ocean level with a dense growth of slender trees or on poor soil and in exposed situations with an open, scattered forest, are, as sources of lumber supply, of comparatively little value. These forests, however, contain valuable supplies of fuel and abundant material for railway ties. They guard, too, the flow of numberless small streams, and their importance in this connection should not be overlooked.

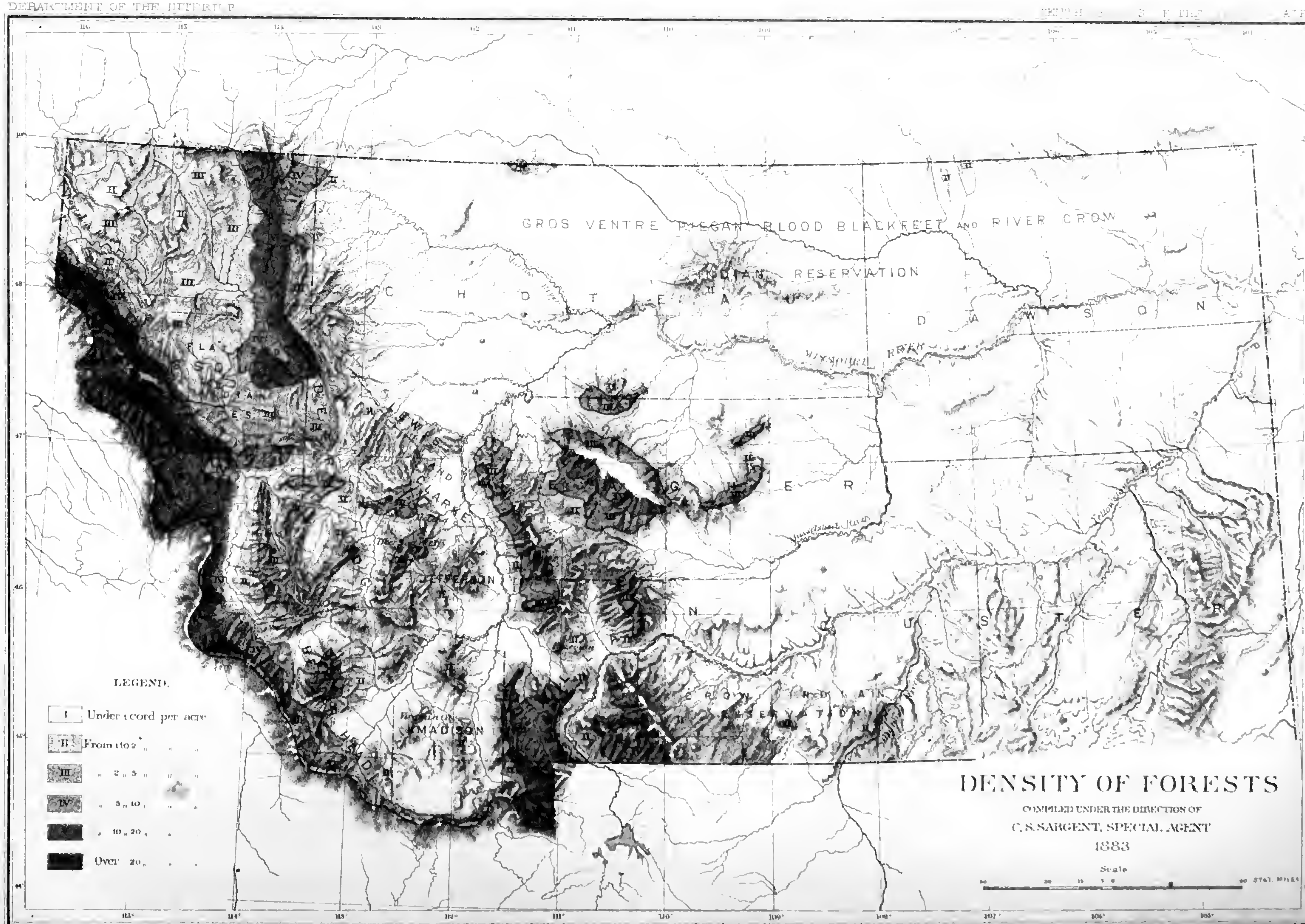
The most important forests, commercially, of the territory are found along the valley of Clarke's Fork of the Columbia river, between the Horse Plains and the Idaho line; here the western white pine reaches its greatest development, becoming an important part of the forest growth. The valleys of the Saint Regis de Borgia and Missoula rivers contain great bodies of valuable fir and pine, which spread also in great luxuriance over the mountains east and south of Flathead lake.

Fires destroy every year large areas of the forest covering the mountains of the western division. The long, dry summers and the character of the forest, composed as it is almost entirely of coniferous resinous trees, favor the spread of forest fires. They increase rapidly in number with the increase of population, and threaten the entire extermination of the forests of the whole interior Pacific region. During the census year 88,020 acres of forest were reported destroyed by fire, with a loss of $1,128,000. These fires, few in number, were traced for the most part to careless hunters, prospectors, and smokers.

Little lumber is manufactured in the territory. Red fir and spruce are sawed at Missoula and in the neighborhood of nearly all the mining centers in the western part of the territory. The product of the Montana mills is entirely used to supply the local demand.

The following report upon the forests of the northern Rocky Mountain region was prepared by Mr. Sereno Watson, of Cambridge, a special agent of the Census Office, in the division of Forestry:

"The territory whose forest resources I attempted under your instructions to examine includes an area of about 150,000 square miles, extending from the one hundred and thirteenth meridian to the summit of the Cascade mountains and from the parallel of 44½° to the British boundary; or, according to political divisions, the western fifth of Montana, the northern two-fifths of Idaho, the eastern three-fifths of Washington territory, and the northeastern portion (or nearly one-half) of Oregon. It comprises a central treeless plateau of some 30,000 square miles in extent, the great 'plain of the Columbia', surrounded by more or less extensively timbered mountain systems. This tract is bounded on the east by the broad mountain range which separates Montana from Idaho, on


DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883
Scale
LEGEND.
I Under 1 cord per acre
II From 1 to 2 " " "
III " 2 " 5 " " "
IV " 5 " 10 " " "
V " 10 " 20 " " "
Over 20 " " "
GROS VENTRE PIEGAN BLOOD BLACKFEET AND RIVER CROW
INDIAN RESERVATION
CHOTEAU
DAWSON
MISSOURI RIVER
CROW INDIAN RESERVATION
CUSTER
LEWIS AND CLARKE
JEFFERSON
MADISON
Julius Bien & Co. lith

MONTANA

the north by the irregularly-broken country which lies north of the Spokane river and of that portion of the Columbia which has a westerly course in the same latitude, and on the west by the Cascade range, while on the south the circuit is less completely closed by the somewhat complicated system known as the Blue and Salmon River mountains.

"With the exception of a single county (Beaver Head) in Montana this entire region is drained by the Columbia river, since the Rocky Mountain divide, or the main central divide between the headwaters of the Columbia and of the Missouri, forms the boundary between Idaho and Montana only as far north as 45° 40′, when it turns abruptly eastward for 75 miles and then again northwestward to the British boundary in continuation of the line of the Wind River mountains of Wyoming.

"As will be seen from the detailed account which is to follow, the general character of the forest growth throughout this region is remarkably uniform, both in the kinds of trees found and in their manner of distribution. The trees of the most constant occurrence and that form the mass of the forests generally are, first, the red fir (*Pseudotsuga Douglasii*) and yellow pine (*Pinus ponderosa*), gradually giving place at higher altitudes to *Picea Engelmanni* and *Abies subalpina* or *Pinus Murrayana;* while of only somewhat less extended range, though sometimes more local in their distribution, are the larch (*Larix occidentalis*), cedar (*Thuya gigantea*), the white pine (*Pinus monticola*), the hemlocks (*Tsuga Mertensiana* and, less frequently, *Tsuga Pattoniana*), *Abies grandis*, and the balsam poplars. *Abies amabilis* only is confined to the Cascade mountains. No other species occur of sufficient size to be of importance as timber trees.

"In order to indicate more particularly the extent and distribution of the tree growth, the territories will be taken up in order by counties, and an estimate given of the area covered in each, though necessarily of the actual density of growth and amount of available timber (varying from square mile to square mile, and much of it never seen) no estimate can be given of such probably approximate accuracy as to be of any value whatever:

"MONTANA.

"BEAVER HEAD COUNTY (4,230 square miles).—This county, nearly equally divided by the one hundred and thirteenth meridian, is surrounded on three sides, north, south, and west, by the Rocky mountains, and is divided into two portions by a lofty spur which sets off in a northeasterly direction from the middle of the western side. The valleys of Beaver Head river and Red Rock creek to the east and south of this spur are treeless, except that the latter stream is bordered with a considerable growth of *Populus angustifolia*, often 60 feet high and a foot or two in diameter. The region to the east is scantily supplied with timber of any kind, while the northern flanks of the Rocky Mountain range as far as the head of Horse Plains creek are only sparingly timbered on the ridges and in some of the cañons, the trees small and mainly red fir, with some *Pinus albicaulis*, the summits and exposed ridges wholly bare.

"The broad dividing spur, which includes Bald mountain and several other peaks from 10,000 to 11,000 feet high, is about 30 miles in length by 20 in breadth. The peaks are bare above 9,000 feet, and the western slopes have some timber in the upper ravines alone. The trees at 7,000 feet are mainly red fir, giving place above to a small growth of *Pinus Murrayana* and *P. albicaulis*. On the eastern side of the spur there are deep, densely-wooded valleys, the timber said to be chiefly red fir, *Picea Engelmanni* and *Pinus Murrayana*. On Rattlesnake creek in this region there is a single saw-mill, 12 miles from Bannock City, which supplies the town and neighboring mining camps with lumber. When a better quality is needed it is brought across the mountains from the Lemhi River district in Idaho by a road crossing the range at the head of Horse Plains creek. The fuel used in Bannock City is hauled some 12 or 15 miles, chiefly from the Rocky mountains. Beyond the head of Horse Plains creek (where the Bald Mountain spur commences) the range for about 40 miles changes in character greatly, becoming higher, broader, and more rocky, with rugged, snow-clad peaks from 10,000 to 12,000 feet high, and with high, rocky spurs to the east, separating densely-wooded valleys difficult of access and rarely visited. The forests here come down to the western edge of Big Hole valley, and are continuous. The trees are said to be largely *Pinus Murrayana*, but there is probably a considerable proportion of red fir, *Picea Engelmanni* and *Abies subalpina*. The range now takes its turn to the east, forming the northern line of the county, and rises again into some high, snowy peaks, but is much less densely wooded. Where the pass crosses the range from the Big Hole valley to the Bitter Root, the prevalent tree is found to be *Pinus Murrayana*, mixed toward the summit of the divide (at 7,000 feet altitude) with some red fir and a small proportion of *Picea Engelmanni* and *Pinus albicaulis*. The trees are mostly young and small, evidently frequently overrun by fires, a dense new growth immediately in most cases replacing the old. The trunks very rarely reached a diameter of 15 or 20 inches. The timbered area of the county may be estimated at 1,000 square miles. No yellow pine was seen or heard of within its limits.

"DEER LODGE COUNTY (6,500 square miles).—This county, also nearly bisected by the one hundred and thirteenth meridian, is occupied by spurs of the Rocky mountains, which form its southern and eastern border, with the intervening open valleys of Deer Lodge river, Flint creek, and Big Blackfoot river. These spurs are to a large extent wholly bare of trees, only some of the ravines and ridges being covered by a more or less scattered growth of yellow pine and red fir of moderate size, and the higher northern slopes by a denser growth of *Pinus Murrayana*. North of the Big Blackfoot the timber is more dense, coming down into the valley, and consisting principally of yellow pine, with some red fir and larch, and at the higher elevations (above 5,000 feet) of red fir, larch, and scrub pine. In the higher cañons of the main range to the south it is probable that *Abies subalpina* and *Picea Engelmanni* also occur, as I heard of a soft tamarack found at Gwendale, which appeared from the description to be the latter species. Total timbered area of the county is estimated at 2,250 square miles.

"MISSOULA COUNTY (21,000 square miles).—The Bitter Root mountains, which separate this county from Idaho, are a direct continuation of the Rocky mountains north from the point of divergence of that range in latitude 45° 40′. While broadening out until they cover a base of 100 miles or more, they rarely reach a height of 8,000 feet. There is nothing alpine in the character of their higher vegetation, nor do they anywhere rise above the limit of forest growth. The summits are not often very rugged, and though the slopes may be steep they are not generally greatly broken. For the most part they are well wooded upon both sides, with no meadows along the streams and little grass anywhere until the foot-hills are reached. Upon the Montana side it is from 20 to 40 miles from the base to the summit of the divides, and the Bitter Root valley, which skirts their feet for 60 miles, separates them from the low and comparatively bare spurs of the Rocky mountains on the east.

"Upon crossing the main divide upon the southern border, between the Big Hole and the Bitter Root valleys, at an altitude of 7,000 feet, the yellow pine immediately appears, of large size, and with its usual massive habit, and is henceforth the most conspicuous forest tree along the usual routes of travel, coming farther down into the valleys than any other tree, and more frequently attaining a large size, probably from its less liability to serious injury from fires. The descent from this southern divide to the Bitter Root valley is well wooded with large trees of the yellow pine and red fir (with at first some small *Pinus Murrayana*), which continue to be the only trees seen bordering the valley. These mountains were crossed by me on the Lolo trail up the Lolo creek, and by the Mullan road, which follows the Saint Regis de Borgia river. In the lower cañons only yellow pine and red fir are found, of the usual scattered growth—the trees rarely much over 2 feet in diameter—with larch and *Abies subalpina* coming down the side gulches, and white pine in the middle cañon. The yellow pine gradually gives place to *Picea Engelmanni*, *Abies subalpina*, and *A. grandis*, though none of these reach the size which they attain on the Idaho side of the range. The large timber is mostly confined to the neighborhood of the streams, where the larch and white pine sometimes reach a diameter of 3 or 4 feet, but it becomes much smaller upon the ridges, and in the upper cañons rarely is more than a foot or 18 inches through, while the mountain slopes are usually much burned over and covered with fallen timber, largely of *Pinus Murrayana*. The largest and most abundant tree in the upper cañons is probably the *Picea Engelmanni*. Small trees of the *Thuya gigantea* are also occasional, but nowhere in northern Montana does it become large enough to be of importance. The *Thuya* and *Abies grandis* extend as far south as the Nez Percé creek. I think that no hemlocks were seen on the Montana side of the range, but they may occur.

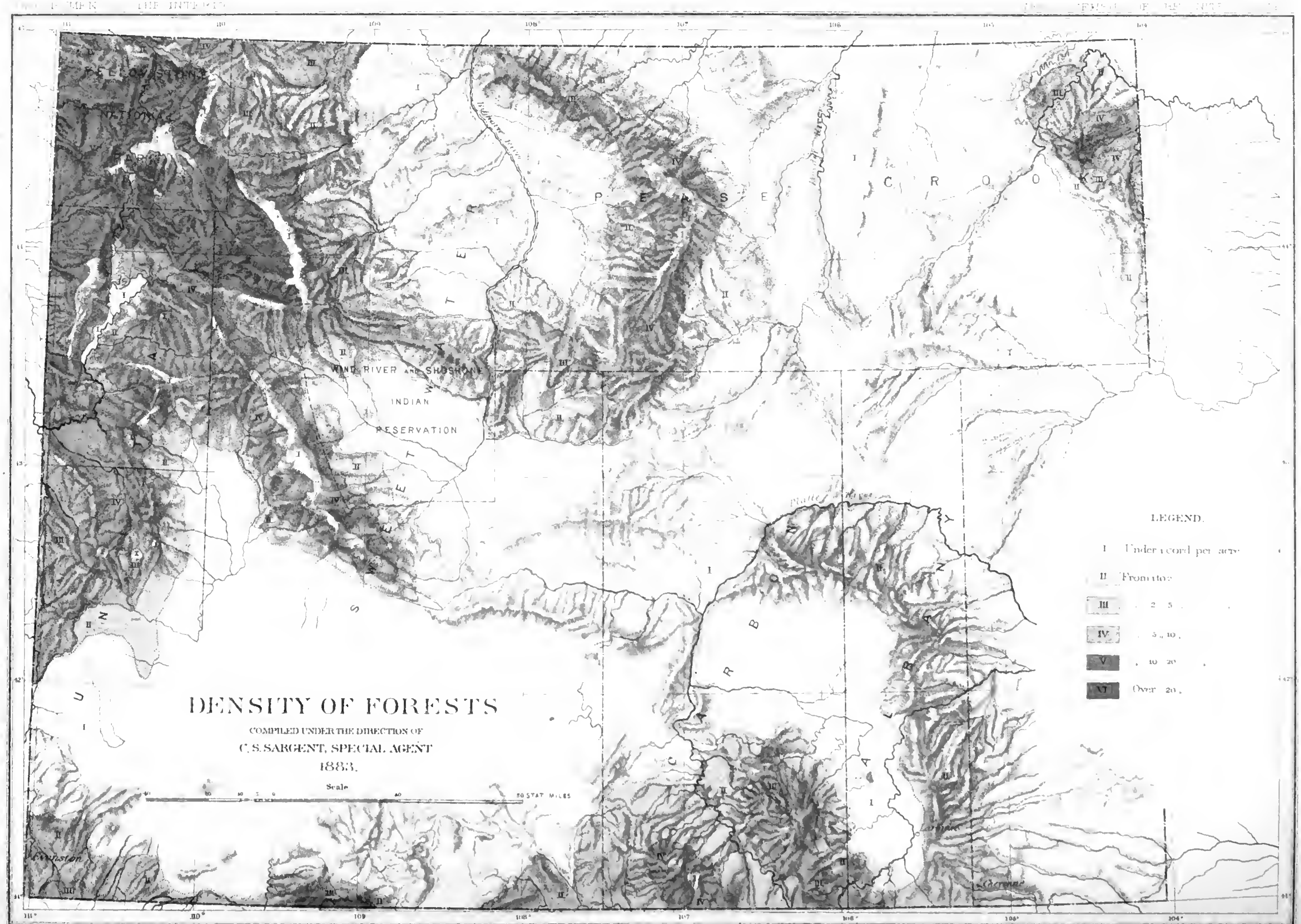
"North of the Mullan road to Clarke's Fork the eastern slopes of the range continue well wooded. On the eastern side of the county the low spur of the Rocky mountains lying to the east of Bitter Root valley is to a large extent bare, but has some young yellow pine (known as 'scrub pine' or 'black-jack pine') and *Pinus Murrayana*. Approaching Hellgate river the timber becomes more prevalent in the ravines; and in the government timber reservation near Missoula, where there is a saw-mill run for government purposes, the timber was found to be yellow pine and red fir (not large) and considerable larch—fine trees 2 feet in diameter or more and 100 feet high. In Granite cañon, in the mountains north of Missoula, where there is also a saw-mill, the lower cañon was occupied by yellow pine and larch, with some red fir rarely over a foot through, and in the upper cañon *Abies subalpina* and *Picea Engelmanni* a foot in diameter. On the mountain sides above the cañon the timber is, as usual, small and worthless for lumber. In the eastern portion of the Flathead Indian reservation a very high and rugged range of mountains extends nearly as far north as the head of Flathead lake, and parallel with the main Rocky Mountain range, which here enters the county and continues across the northern boundary. Both of these ranges are throughout densely wooded, though on the eastern side of the Rocky mountains the timber wholly ceases a few miles (8 or 10) below the summit, giving place to the open grazing region of the upper Missouri. On crossing over the lower end of the western range, from the Big Blackfoot to the Jocko river, the timber was found to be at first almost entirely yellow pine, with red fir and larch in the gulches, the yellow pine ceasing toward the divide (at 5,000 feet altitude) and *Pinus Murrayana* taking its place, but reappearing on the northern side, with occasional *Picea Engelmanni* and even small *Thuya gigantea*. No white pine was seen. The same trees probably continue northward to the boundary (the larch is reported from about 30 miles south of the boundary).

"The remainder of the county, lying west of the Flathead River valley, is wholly occupied by mountains, of less altitude, but, so far as is known, generally densely wooded, with the exception of some of the spurs toward the Flathead river and Clarke's Fork and some small prairies bordering the streams.

"The total timbered area of the county is estimated at 17,000 square miles."

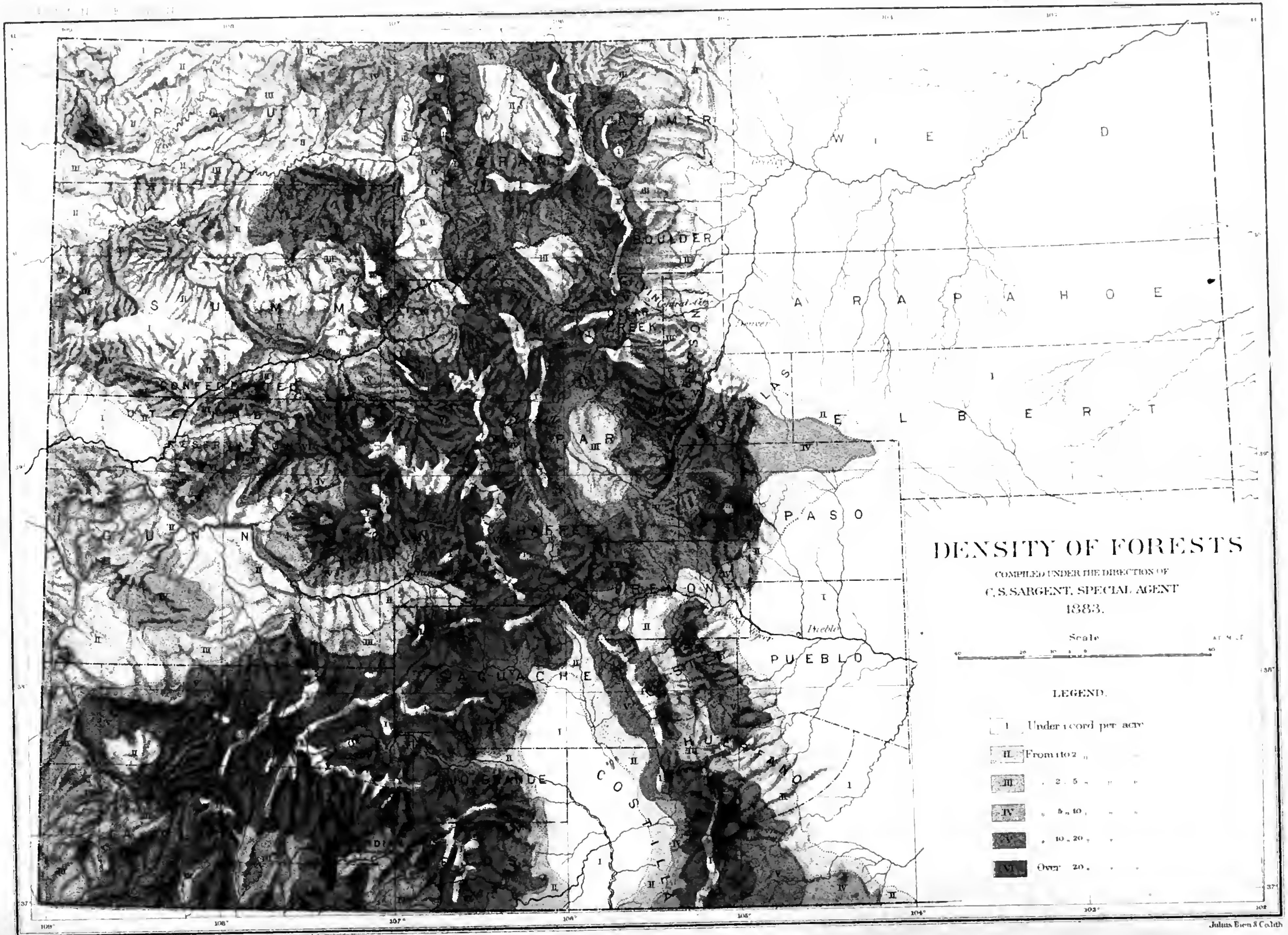
WYOMING.

The highest mountain ranges in Wyoming only are well timbered. The high rolling table-land which occupies the central part of the territory is destitute of all tree growth, while the low ranges which rise from this plateau



WYOMING.

Julius Bien & Co. lith.


DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
Scale
LEGEND.
I Under 1 cord per acre
II From 1 to 2 „
III „ 2 „ 5 „
IV „ 5 „ 10 „
V „ 10 „ 20 „
VI Over 20 „
WELD
ARAPAHOE
ELBERT
PASO
PUEBLO
LARIMER
BOULDER
COSTILLA
HUERFANO
SAGUACHE
RIO GRANDE
Julius Bien & Co. lith.

COLORADO

and border it on the south are either treeless or only support a few stunted yellow pines or firs widely scattered or forming small, isolated patches of open forest upon the highest slopes of the most sheltered ravines. The most important forests of the territory are those in the northeastern corner covering the western extension of the Black hills of Dakota, those upon the foot-hills and slopes of the cañons of the Big Horn mountains, and the dense forests of small lodge-pole pine (*Pinus Murrayana*) which occupy all the northwestern portion of the territory studded by the system of mountains surrounding the Yellowstone park.

The most valuable timber of the Big Horn mountains consists of yellow pine (*Pinus ponderosa*), attaining on the foot-hills sufficient size to furnish saw-logs. Probably one-third of this timber on the east side of the mountains has already been cut to supply mills located upon the streams from Crazy Woman creek to Tongue river. The table-land on both sides of the range between the crests of the foot-hills and the base of the Snow range is covered with a belt, from 8 to 10 miles in width, of small white fir (*Abies subalpina*). The trees are small, rarely exceeding 8 or 10 inches in diameter. They afford, however, useful material for fuel and fence and telegraph poles. This forest has suffered seriously from wind storms and fire. A heavy growth of cottonwood, with which is mingled a little green ash, occupies the banks of all the streams of the Big Horn region, with the exception of No-Wood creek, flowing from the western flank.

The forests of the Yellowstone region, composed for the most part of small lodge-pole pine, are confined to the mountain slopes and high valleys, at an elevation of between 5,000 and 10,000 feet. These forests are capable of supplying great quantities of fuel and fencing material. They contain, however, little timber suitable to manufacture into lumber.

The forests of all this arid central region suffer seriously from fire. These increase with the settlement of the country and inflict great damage upon the forest. In northwestern Wyoming, however, the forests of lodge-pole pine (*Pinus Murrayana*) destroyed by fire reproduce themselves, and the area occupied by this species in all the Rocky Mountain region is increasing. This is due no doubt to the fact that fire does not destroy the seeds of this species, protected in the cones, which remain closed upon the trees for years. The heat of the fire causes the cones to open and shed their seeds upon the burned surface of the soil, where they germinate quickly and freely.

During the census year 83,780 acres of woodland were reported destroyed by fire, with an estimated loss of $3,255,000. These fires were set by Indians, trappers, and prospectors.

A little lumber, in addition to that manufactured in the Big Horn region, of which no returns have been received, is sawed in the Medicine Bow and other ranges in the southern part of the territory. A large amount of fire-wood and many railroad ties are cut in the southern mountains and delivered by chutes along the line of the Union Pacific railroad.

COLORADO.

The forests of Colorado are confined to the mountain ranges and high valleys which cover the western half of the state; the elevated, rolling plateau which extends from the eastern base of the mountains to the eastern boundary of the state is entirely destitute of tree growth, with the exception of an occasional stunted willow or cottonwood found in the bottom lands of the large streams. The important forests of the state cover the mountain slopes between 10,000 and 12,500 feet elevation, and are almost exclusively composed of spruce (*Picea Engelmanni*), with which are mingled different alpine pines of little economic value. Below the spruce belt a more open forest of red fir and yellow pine, occupying ravines or scattered over the ridges, extends down to the foot-hills. These are covered with an open growth in which the nut pine and the western juniper are the prevailing trees, while the borders of streams and bottoms of the cañons are occupied by cottonwoods, willows, cherries, oaks, and other deciduous trees and shrubs of little economic importance. Large areas upon the sides of the high Colorado mountains are exclusively covered with a dense growth of the quaking aspen. This tree very generally takes possession here of ground from which the coniferous forest has been removed by fire, and, as the number of forest fires is rapidly increasing in Colorado, it seems destined to become the only widely-distributed forest tree of this region. The high valleys, or "parks" as they are here locally called, when timbered at all, are covered with a dense forest growth in which the lodge-pole pine (*Pinus Murrayana*), also common at high elevations in the spruce forests, is the prevailing and often the only species, disputing with the aspen the possession of the burned soil. The high plateau of southwestern Colorado is either treeless or is thinly covered with an open growth of small, stunted junipers.

The increase in the number of forest fires raging in the mountains of Colorado is alarming in a region where the forest once destroyed cannot easily reproduce itself, and upon mountains where forest covering is necessary to preserve the integrity of the channels and the constant flow of numerous important streams essential to the irrigation of wide areas of arid territory.

During the census year 113,820 acres of forest were reported destroyed by fire, with an estimated loss of $935,500. These fires were set by careless hunters, miners, and prospectors, and by Indians or whites through malice.

The forests of the Colorado foot-hills afford abundant fuel and fencing material to supply the wants of the present population of this part of the state. Coarse lumber, suitable for the timbering of mines and railroad construction, is manufactured from the fir and pines of the lower mountain slopes, which have also furnished immense quantities of fuel and railway ties. The timber, however, of this forest most accessible to mining centers and the lines of railroads has already been destroyed, while its productive capacity is everywhere impaired by wasteful methods of lumbering and destructive conflagrations. The elevated spruce forests, which contain the only great bodies of heavy timber found in the central Rocky Mountain region, have thus far, on account of the difficulties of operating in them, escaped all serious inroads from the ax of the lumberman. Small portable mills, however, have been established in these forests to supply the wants of some of the most elevated mining centers, and fires every year reduce their extent and value.

Colorado is principally supplied with lumber from Chicago; a small amount is manufactured, however, in the state, mostly upon the waters of the South Fork of the Platte river, in Jefferson county, and in the extensive pineries which cover the divide between the waters of the South Platte and the Arkansas rivers. A little lumber is also manufactured in small portable mills in nearly every county.

NEW MEXICO.

The forests of New Mexico are confined to the slopes and cañons of the high mountain ranges. The elevated plateau which occupies the whole of the eastern part of the territory is treeless, with the exception of occasional willows and cottonwoods bordering the large streams, while the high *mesas* of the southwest and west are sometimes dotted with an open growth of dwarf junipers and nut pines of considerable local importance as a source of fuel and fencing supply. The high mountain ranges extending southward into the northern part of the territory are covered with forests very similar in composition, density, and distribution to those covering the mountains of Colorado. Engelmann's spruce is here the important timber tree at high elevations; lower, open forests of red fir and yellow pine occupy the sides of cañons and the lower mountain slopes, and the nut pine and juniper cover the foot hills with an open, scattered growth. The detached mountain ranges which spring from the central plateau of the territory are less heavily timbered than the higher mountains north and south. The yellow pine is here the most common and important tree, mingled in sheltered cañons and at highest elevations with occasional red firs.

The most important forests of the territory cover the high group of mountain ranges west of the Rio Grande and south of the thirty-fourth degree of latitude—the San Francisco, the Tulerosa, Sierra Blanca, Sierra Diablo, Mogollon, Pinos Altos, and Mimbres. The foot-hills and lower slopes of these mountains, between 5,000 and 7,000 feet elevation, are covered with a heavy growth of junipers, nut pines, and different evergreen oaks. The banks of streams are here lined with immense cottonwoods, sycamores, cherries, ashes, and hackberries, while the *arroyos* or depressions in the *mesas* contain fine groves of mesquit. Above an elevation of 7,000 feet the yellow pine appears, and mingled with it on north slopes the red fir and white pine (*Pinus reflexa*); the elevated valleys contain fine groves of cottonwood, box-elder, alder, and small oaks, while the most inaccessible slopes of some of the highest ranges are covered with forests of cypress (*Cupressus Guadalupensis*).

The coniferous forests of these mountains are dense and valuable, and, although not yet accessible for lumbering operations except at a few points, they seem destined to become an important factor in the future development of the whole region. They can, if properly protected, supply with lumber indefinitely a larger population than will probably occupy this part of the United States.

The deciduous trees of this entire southwestern region, often of considerable size, are generally hollow, especially the oaks; they are of little value for any mechanical purpose, although affording abundant and excellent fuel.

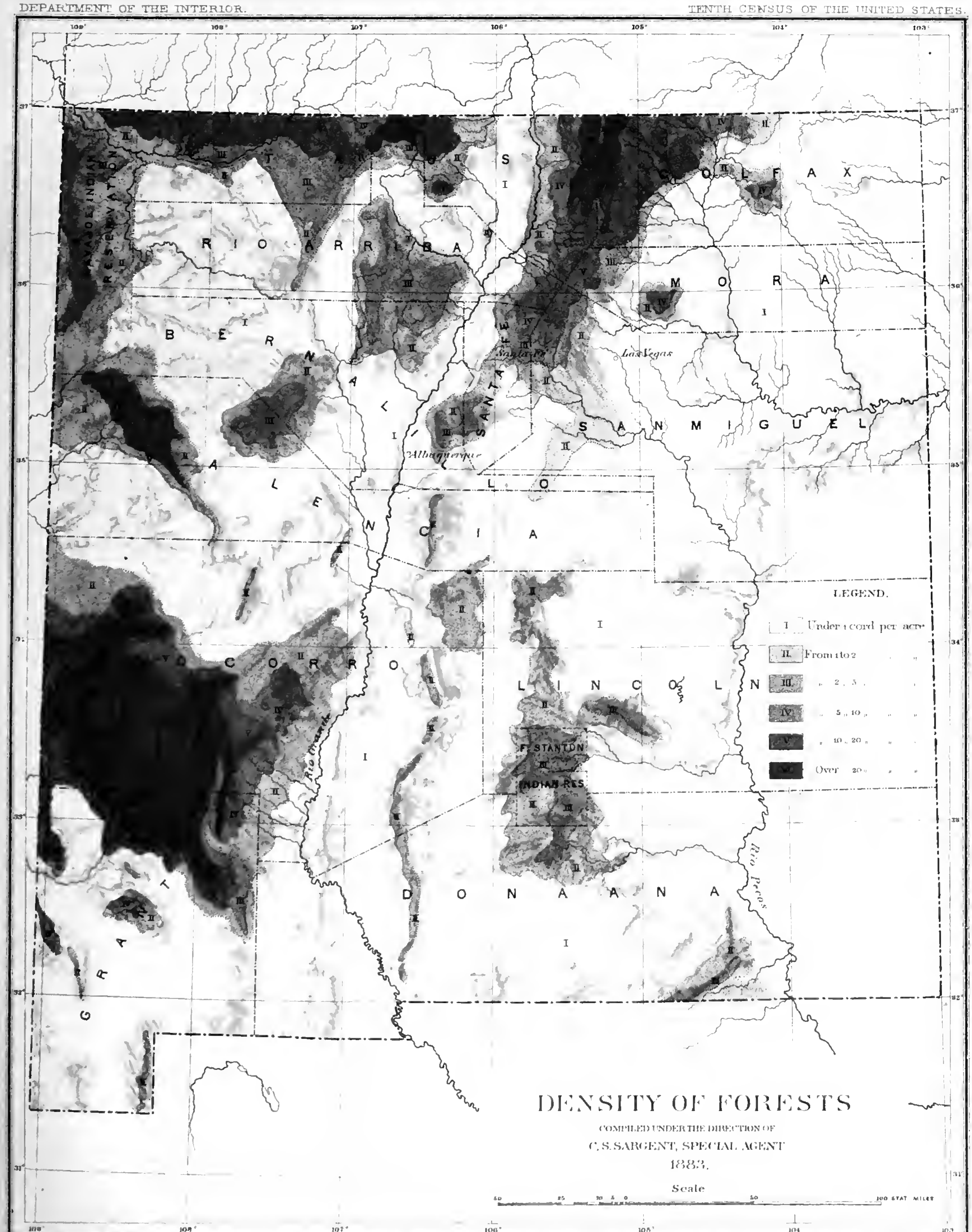
During the census year 64,034 acres of woodland only were reported destroyed by fire, with an estimated loss of $142,075.

A small amount of coarse lumber, principally yellow pine, is manufactured in the territory, mostly in the counties of San Miguel and Santa Fé. New Mexico, however, like Colorado, obtains most of its lumber by rail from Chicago.

ARIZONA.

Northern, western, and southwestern Arizona are destitute of true forests. Ravines in the *mesas* of the high Colorado plateau of northern Arizona are occasionally covered, however, with stunted junipers. Cottonwoods and willows line the banks of the Colorado river, and the ironwood, the palo verde, the mesquit, the suwarrow, and other Mexican forms of arborescent vegetation are found in the valley of the Gila and the deserts of the southern part of the territory; individual trees are, however, widely scattered, nowhere forming forests in the true meaning of the word. The low lava ridges and arid lake beds with which the southwestern part of the territory is covered are entirely destitute of tree growth.

The mountain system culminating south of the Colorado plateau in the San Francisco mountains, and extending southeasterly through the middle of the territory into New Mexico, is well timbered. The high ranges which spring from this central elevated plateau bear heavy forests of yellow pine and red fir, the plateau itself


DENSITY OF FORESTS
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Scale
100 STAT. MILES
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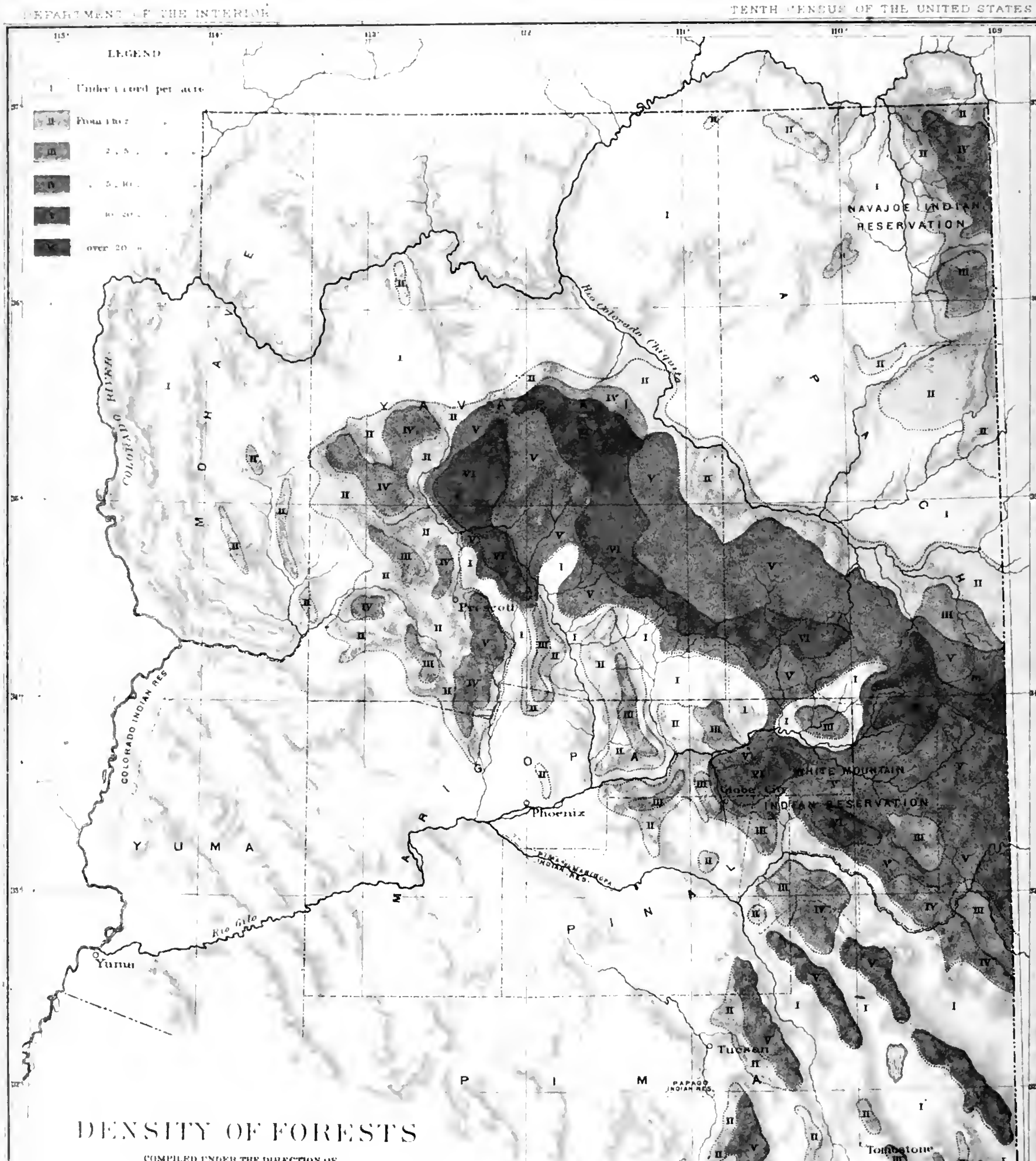
I Under 1 cord per acre
II From 1 to 2
III 2, 3
IV 5, 10
V 10, 20
Over 20
COLFAX
MORA
RIO ARRIBA
TAOS
BERNALILLO
SANTA FE
SAN MIGUEL
VALENCIA
SOCORRO
LINCOLN
DONA ANA
GRANT
NAVAJOE INDIAN RESERVATION
Ft. STANTON
INDIAN RES.
Santa Fe
Las Vegas
Albuquerque
Rio Grande
Rio Pecos
Julius Bien & Co. lith

NEW MEXICO



Julius Bien & Co. lith

ARIZONA

being covered, over thousands of square miles, with an open growth of yellow pine of considerable size. The streams and bottoms of the high mountains are lined with deciduous trees, of which the cottonwood, the cherry, the ash, the alder, and the walnut are the largest and most important. The group of short, detached mountain ranges which occupies with a general north and south trend the southeastern part of the territory is covered with a rich and varied forest growth. The highest slopes are covered with forests of pine, in which, in the Santa Catalina range at least, great bodies of splendid cypress (*Cupressus Guadalupensis*) are found; a little lower the red fir and white pine (*Pinus reflexa*), different oaks and junipers with a madroña, are scattered over the dry, gravelly slopes and ridges between 5,000 and 7,000 feet elevation. These in turn are replaced below 5,000 feet with an open growth of small evergreen oaks. The bottoms of the cañons and the borders of the streams between 4,000 and 8,000 feet elevation are lined in these mountains with hackberry, sycamore, cottonwood, willows, cherries, and ashes. The *arroyos* in the *mesas* are often covered, as in southern New Mexico, with noble groves of mesquit, or in drier situations support a stunted growth of acacias, yuccas, cacti, and other desert plants.

The yellow pine is the only tree of Arizona of great importance as a source of lumber supply. Oaks and other hard-wood trees are invariably defective and of little value except for fuel. The red fir, white pine, and cypress occur only at high elevations, and are generally too scattered and too difficult of access to make their manufacture into lumber practicable for the present at least.

The pine forests of central Arizona and southwestern New Mexico are of great importance to the development of the treeless regions which surround them. No other body of timber of any extent or value exists near the southern boundary of the United States between the pine belt of eastern Texas and the forests of the California mountains. These southern interior forests have nowhere yet greatly suffered. Their inaccessibility has protected them. Railroads, however, now either penetrate this forest region, or will soon do so, and these, with the rapid development of the mining industry now going on in the southwest, threaten these forests with the dangers which are fast exterminating those of Colorado and Utah.

During the census year 10,240 acres of woodland were destroyed by fire, with an estimated loss of $56,000. These fires were set by careless hunters, prospectors, and Indians.

Pine lumber is sawed in Pima and Pinal counties, principally upon the Santa Catalina, Santa Rita, and Huachuca mountains, to supply important mining centers in this part of the territory. It is also manufactured in small quantities in portable mills near Indian reservations and other centers of population throughout the forest region. Returns from 13 mills only, situated in Pima, Pinal, Apache, and Yavapai counties, have been received. Southern Arizona is now, in spite of its fine forests of pine, almost entirely supplied by rail with lumber manufactured in California.

UTAH.

The Uintah range, occupying with an east and west trend the whole of the northeastern part of the territory, the Wahsatch mountains and their southern extension, the San Pitch and the Sanpete ranges, extending north and south nearly through the center of the territory, and the mountains which bound on the east the great Colorado plateau, bear at high elevations fir, spruce, and pine forests of considerable extent. The foot-hills of these mountains and their high valleys are dotted with an open growth of nut pine, juniper, and mountain mahogany (*Cercocarpus*). The high Colorado plateau and the arid deserts of western and southern Utah are treeless, with the exception of a few stunted junipers and nut pines which struggle for existence upon some of the low mountain ranges, and of willows and cottonwoods which line the banks of the infrequent and scanty streams.

The western flank of the Wahsatch mountains north of the fortieth degree of latitude has already been almost denuded of its best timber to supply the wants of the agricultural and mining settlements of the Salt Lake region, and the scanty forests of the territory have everywhere suffered serious loss from fire and wasteful methods of cutting timber and railway ties and of manufacturing charcoal.

During the census year 42,865 acres of woodland were reported destroyed by fire, with an estimated loss of $1,042,800. These fires were set by Indians, wood-cutters, careless hunters, and prospectors.

Small quantities of lumber—pine, cottonwood, and a little spruce—are manufactured through the Wahsatch region, the principal centers of manufacture being Beaver City and Cedar City, in the south, the neighborhood of Salt Lake City, and Cache county in the extreme northern part of the territory. Utah is, however, almost entirely supplied with lumber from the eastern slopes of the California sierras and from Chicago. Small tanneries in Salt Lake City obtain a supply of red fir and spruce bark from the neighboring mountains.

The following notes upon Utah forests, made during the prosecution of a special investigation into the meat-producing capacity of the territory, have been supplied by Mr. E. C. Hall, a special agent of the Census, in the division of "Meat Production in the Grazing States and Territories":

"The timber of the Wahsatch mountains, in Cache, Rich, Morgan, and Weber counties of Utah, hardly suffices for the wants of the settlers. The trees from which lumber is obtained are cedar and a variety of white pine (*Pinus flexilis*). Some fir (*Pseudotsuga Douglasii*) is found, but it is not common north of the latitude of Salt Lake City. This tree likewise furnishes an inferior kind of lumber. In general, in Utah, north of latitude 40°, the west base of the Wahsatch mountains has been stripped of the available timber, so that in the accessible cañons, especially in the neighborhood of settlements, it is laborious and expensive obtaining posts and poles for fencing, to say nothing of smooth planks, etc., for building. Cottonwood and occasionally box-elder are found fringing the river bottoms of the sections described.

"The Oquirrh mountains, on the east of Tooele county, and the Onaqui mountains, 30 miles west, contain cedar and considerable red fir, the latter a tree which I am told is not frequent in the Wahsatch range. The mining camps of Salt Lake and Tooele counties have largely depleted the timber areas of these mountains. More timber is standing on the Onaqui hills than on the Oquirrh range. From the vicinity of the latter to Cottonwood and Bingham Cañon mining districts the dearth of good fencing material is very noticeable throughout Box Elder, Cache, Rich, Weber, Morgan, and Salt Lake counties. Willow withes, stone walls, cottonwood poles, and sod walls flanked by ditches are among the devices for barriers against stock incursion, all pointing to the lack and costliness of lumber.

"LAKE RANGE, WEST OF UTAH LAKE.—This range of low mountains contains scattered black balsam and red fir. In winter this range is visited from the settlements of Utah valley, and the trees felled and sledded across the lake on the ice, to be used by the railroad and by farmers. No piñon pine was found in the Oquirrh or Onaqui mountains.

"The San Pitch mountains, in latitude 39° 30′, longitude 111° 52′, contain sparse timber—a so-called white pine (*Pinus flexilis*), scrubby cedar, and some other evergreen trees—at a high elevation and unavailable as lumber. No good clear planking suitable for building is obtained from these cuts.

"The low ranges west of Juab valley and flanking Dog valley, Dry valley, and Ferner valley, in latitude 39° 30′, longitude 112°, contain straggling cedar and some red fir difficult of access. The timber of the whole region north of latitude 39° and west of the main Wahsatch mountains is meager and inadequate for the purposes of the Mormon settlers.

"Fencing about Salt Lake City is of poor construction and costs $200 per mile of pine poles and cedar posts. I saw some posts of white balsam (*Abies concolor*) 50 feet long, obtained from the cañons of the San Pitch range, used for fencing. At Springville, in Utah valley, posts of cedar were pointed out which were in good condition after fourteen years standing. Were it not for the existence of the 'no-fence' law, which enables a farmer to cultivate unfenced ground and claim damages from incursions of stock, the Utah farmer would be very badly off, not having means to purchase fencing material in a country so ill supplied with timber. The cedar which abounds here affords a lasting supply of fire-wood and posts, but for poles or plank the region depends largely upon imported lumber, especially for building plank, joists, etc.

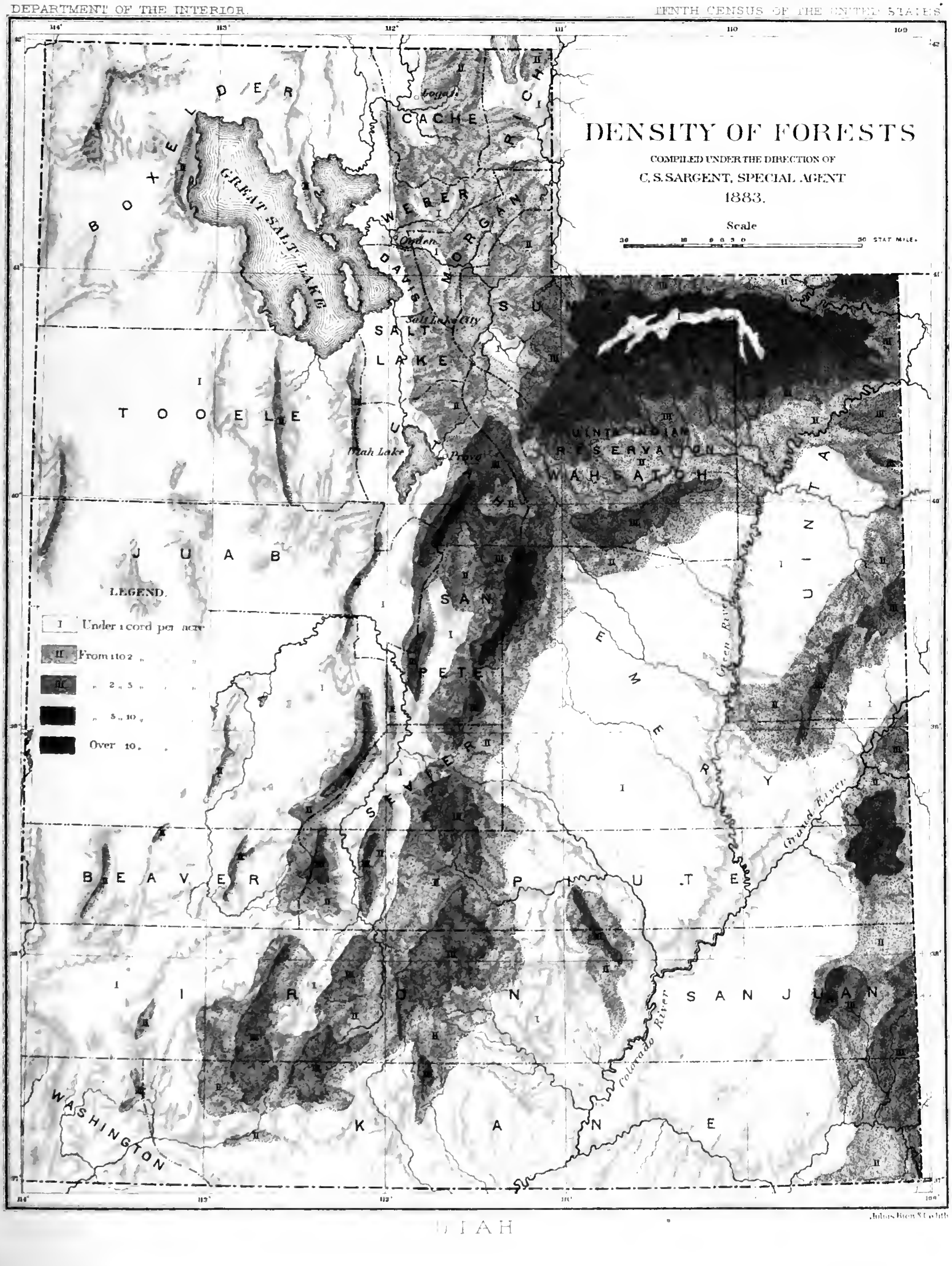
"Upon ranges flanking East and West Tintic valleys, Juab county, in latitude 39° 50′, longitude 112° 30′, the timber is not abundant; it consists of red fir and black and white balsam, from which rough lumber for the mining camps of Mammoth, Tintic, and Silver City has been extensively taken. Cedar of the usual dwarfed kind grows abundantly along the upper slopes of the foot-hills, and is used for braces and posts in shafts of mines.

"SANPETE VALLEY RANGE (longitude 111° 30′, latitude 39° 20′).—The Wahsatch mountains, on the east of Sanpete valley, carry on their spurs and through the deep cañons facing the valley some of the best timber found in Utah. It is largely used by the Sanpete settlers. Yellow pine, black and white balsam, red fir, cedar, and poplar constitute the varieties of trees found. The yellow pine, less abundant now in accessible cañons, furnishes, it is claimed, a clear and firm lumber, fit for building, and not surpassed by any variety in Utah. The range west of the Sanpete mountains—*i. e.*, the San Pitch mountains before spoken of—carries on its eastern slopes and cañons considerable balsam of both varieties and some red fir and poplar about the headwaters of creeks. Little yellow pine is found on the San Pitch range; at least, none is taken out at present, although I was told considerable had already been lumbered from such cañons as were penetrable. Fencing of cedar posts and poplar and balsam poles is largely used in the valley; cedar posts and pine plank are also used in fencing meadows and fields. In no other valley of Utah are the Mormons so well supplied, apparently, with fair lumber of native growth. Except for furniture and house trimmings, no imported wood is used here.

"SEVIER RIVER MOUNTAINS (latitude 38° 30′ to 39° 10′, longitude 112°).—The Tushar mountains and the Valley range, on the west of the Sevier valley, are supplied with meager timber, especially the Valley range. In no part of Utah have I noticed so few and so limited areas inclosed. Timber is said to exist in inaccessible places only on the Wahsatch range to the east of the valley. This is true in regard to the ranges west of the Sevier valley, where the character of the tree growth is inferior to even the average poor quality of Utah forests. Black balsam, white balsam and red fir grow in both ranges, but are approached with great difficulty. The indigenous scrub cedar prevails often in thick groves along the foot-hills, especially on the Valley and Tushar ranges to the west of the valley. Several saw-mills at the mouths of cañon streams on the East Wahsatch range have for several years worked up all the available lumber, but the prices asked for lumber—from $35 to $45 per 1,000 feet—place fencing material beyond the reach of the Sevier farmer.

"All the way up the Sevier valley, and along its south and east forks, fencing is limited and lumber high, a sure proof of the inadequate supply of trees on accessible mountains.

"Fish Lake plateau and mountains (latitude 38° 33′, longitude 111° 50′) contain a considerable quantity of the prevailing timber of Utah, as do also Thousand Springs mountains.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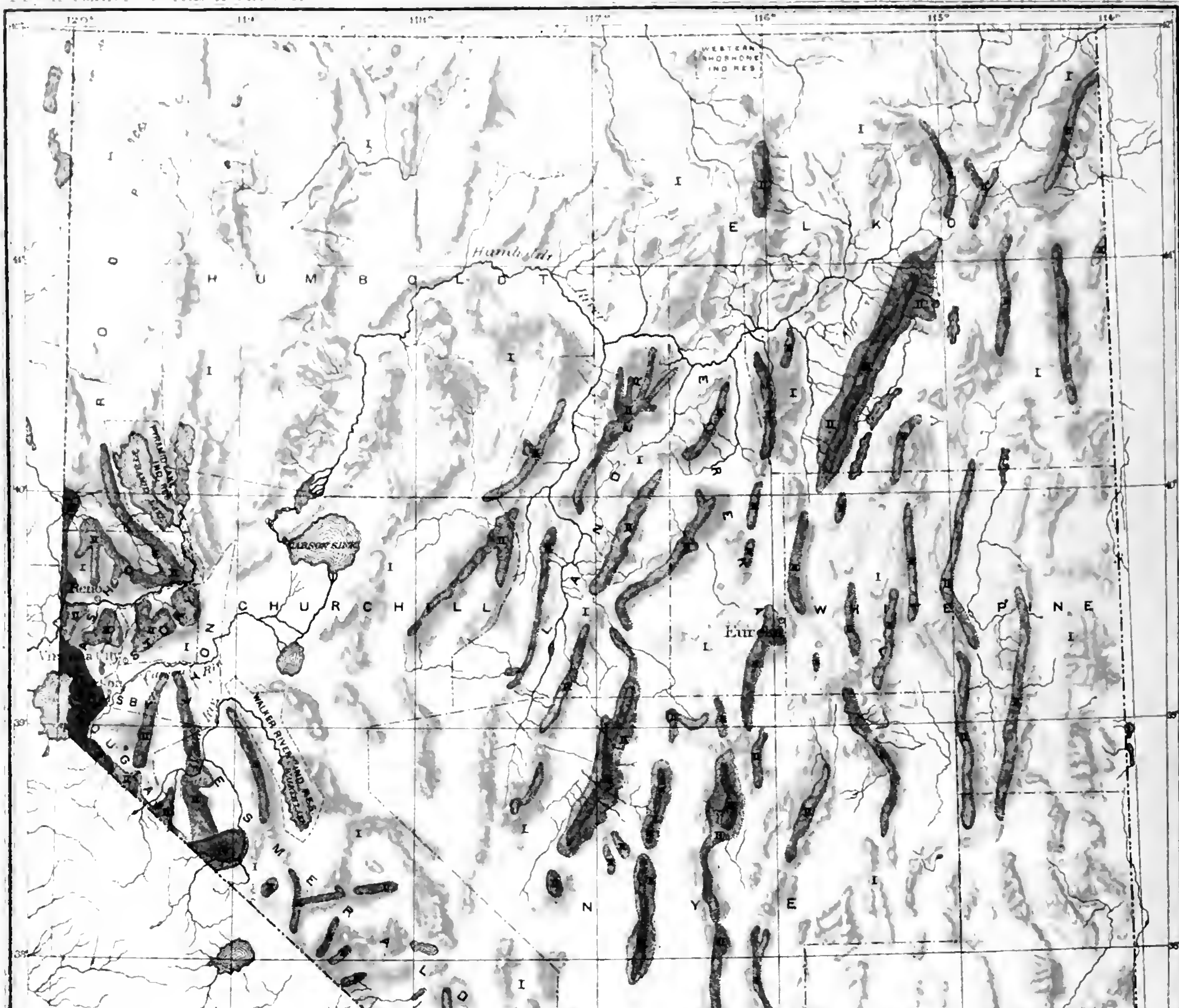
BOX ELDER
CACHE
RICH
WEBER
MORGAN
DAVIS
SUMMIT
SALT LAKE
TOOELE
UTAH
JUAB
SAN PETE
SEVIER
BEAVER
PIUTE
IRON
WASHINGTON
KANE
SAN JUAN
EMERY
UINTAH
WAHSATCH
UINTA INDIAN RESERVATION
GREAT SALT LAKE
Utah Lake
Logan
Ogden
Salt Lake City
Provo
Green River
Grand River
Colorado River
Julius Bien & Co. lith.

UTAH



Julius Bien & Co. lith.

NEVADA

"The Aquarius plateau is said by Sevier Valley stockmen to be abundantly timbered with pine, balsam, and spruce, but Boulder valley (latitude 37° 55′, longitude 110° 30′) was destitute of standing timber, save cedar and poplar on its foot-hill fringe. The country was visited by fires, the Mormons told me, in 1872–'73, which destroyed large areas of the forests in the region southeast of the Grass Valley country. The whole section of Utah lying east of the Sevier valley to the Rio Colorado is better timbered, but from its rough and impenetrable location the timber is of no avail to most of the settlers, but only to such as penetrate the high valleys of Grass, Boulder, Potato, etc., lying adjacent to the timber. Fencing on Grass and Rabbit valleys, western Pinto county, is cheaper than in Sevier valley, but farmers and stockmen are so poor that they are forced to avail themselves of the no-fence law when breaking ground for crops.

"In the Paria River region fencing is very limited and lumber expensive, as timber is hard to get out of the mountain cañons.

"In the Kanab River region fencing at the settlements of Upper Kanab and Lower Kanab, Kane county, is said to be expensive, as material is difficult to obtain, the cañons leading to the valley affording a meager supply of cedar and black and white balsam, while some red fir and yellow pine is said to grow on the Sevier plateau (latitude 37° 30′); this, however, seldom reaches a market in the settlements, owing to the isolated situation of these forests.

"Considerable scrub oak is found on the slopes of the Oquirrh and Onaqui mountains, above referred to, in Tooele county, and many cedar thickets of considerable extent. In Tooele valley some fencing with cedar and panels of balsam occurs. Rush valley contains some bull fences of trunks of cedar, costing $1 25 per rod, showing the cost of even poor material.

"It will be observed that outside of the Wahsatch mountains no building timber of value has been noted in Utah. The supply in this range has been largely consumed from the easily-approached cañons and slopes.

"In summing up my observations, which were made wholly with a view of investigating the fencing of pasture areas and cost of same, it may be stated that Utah seemed very generally lacking in serviceable material for fencing or building. The country settled for thirty years has drawn upon the near supply of standing timber, so that now lumber is obtained by great exertion and expense in most of the valley settlements. The labor and cost of fencing caused Brigham Young to enact the no-fence law, which enabled the destitute settlers to break ground, irrigate, and raise grain without the provision of any barrier against stock inroads, the cattleman being held responsible for the damages of his herd. This law in itself is a commentary on the scarcity of timber in Utah."

NEVADA.

The tree growth of Nevada, except in a portion of Douglas county, in the extreme western part of the state, which the forests of the California sierras just reach, is confined to the low ridges of the central and southern part of the state. The most important of these—the Humboldt, Toiyabe, Monitor Creek, Timpinte, Hot Creek, Kawich, and probably others—bear near their summits, in sheltered ravines, scattered patches of stunted white pine (*Pinus flexilis*) of sufficient size to furnish saw-logs. The lower slopes of the mountains of this region are often quite thickly covered with small nut-pines and groves of the mountain mahogany (*Cercocarpus*), here attaining its greatest development. Below the nut-pine low, stunted junipers cover the foot-hills, often extending, in the central part of the state, across the narrow elevated valleys which separate the low mountain ranges.

The great development of the mining interests of Nevada has already nearly exterminated its scanty and stunted forests. The white pine has been cut in the neighborhood of mines from all the mountain ranges, and the most accessible nut-pine, juniper, and mountain mahogany have been converted into cord-wood or made into charcoal. The forests of Nevada are nowhere reproducing themselves, and a scarcity of fuel, even for domestic purposes, must soon be felt.

A considerable amount of lumber is manufactured in the neighborhood of lake Tahoe, in Douglas county, and sent in flumes down the eastern slopes of the sierras to supply Carson City and Virginia City. The lumber-manufacturing interests of the remainder of the state are necessarily small and unimportant. Their entire extermination, with the forests which furnish them material, cannot be long delayed.

During the census year 8,710 acres of woodland were devastated by fire, with a loss of $19,000. The fires were traced to hunters and Indians.

IDAHO.

The western slopes of the Bitter Root and Cœur d'Alêne mountains, which form north of latitude 46° the eastern boundary of the territory of Idaho, are covered with dense, extensive, and valuable forests of fir, pine, and larch. The ridges of the Rocky mountains, which below latitude 46° occupy the eastern border of the territory, and the extreme eastern development of the Blue mountains of Oregon, just entering it from the west, are less heavily timbered with a scattered growth, in which yellow pine and red fir are still the prevailing trees. The great central region occupied by the Salmon River mountains is unexplored. These mountains are more or less timbered, but nothing is known of the composition or character of the forests which cover them. Judging, however, from the general elevation and climate of this region, its forests cannot be very important, nor capable of supplying more than the local wants of its mining population. The great plains south and southeast of the Salmon River mountains, comprising fully one-third of the territory, are entirely destitute of tree covering, while the Snake River range and the ranges of the Bear River country contain in their more sheltered cañons only small areas of open, stunted forest.

During the census year 21,000 acres of woodland were reported destroyed by fire, with an estimated loss of $202,000. These fires originated in the carelessness of hunters, prospectors, Indians, etc.

A small amount of pine and fir lumber is manufactured at Boisé City and near other centers of population. The great forests of cedar, fir, and pine, however, in the Cœur d'Alêne region are still almost intact. These forests, with proper care, are capable of furnishing indefinitely the treeless agricultural region of eastern Washington territory and Oregon with an abundant supply of excellent building material.

The following extracts are made from Mr. Sereno Watson's report upon the forests of the territory:

"This territory north of latitude 44½° is occupied by the Rocky and the Bitter Root mountains, forming its eastern boundary, with their broad, timbered, interlacing spurs, which terminate in the high, mostly treeless plateau which extends from near the Spokane river in a southeasterly direction to this parallel of latitude. The southern and southwestern portions were not visited by me, and the statements regarding them are to some extent conjectural.

"LEMHI COUNTY (5,530 square miles).—In the extreme eastern portion of this county, where the mountains are crossed by the Utah and Northern railroad, scattered trees of red fir are first met at an altitude of 6,000 feet. Beaver cañon, up which the railroad passes, is well timbered on both sides nearly to its head at 6,600 feet altitude with red fir only, but the broad plateau at the summit (6,869 feet) is treeless. In the lateral cañons (8 to 10 miles long), coming out near the mouth of Beaver cañon, there are two saw-mills, one of which was visited. The timber was here found to be confined to the south side of the cañon, and consisted almost wholly of red fir (here called 'red pine'), averaging from 20 to 22 inches in diameter. The largest log seen measured 32 inches at the butt. A 'white pine' proved to be *Picea Engelmanni*, and a 'bird's-eye pine' was *Pinus Murrayana*, both small, as was also the balsam (*Abies subalpina*), which was found some 3 or 4 miles up the cañon. The yellow pine did not occur here.

"It is probable that the cañons westward along the range are similarly timbered as far as the Lemhi agency. Here the character of the range changes (as stated under Beaver Head county, Montana), becoming higher and more rugged, and the *Pinus Murrayana* is probably more abundant, at least at the higher altitudes. The yellow pine also appears, but at what point is uncertain; it is certainly found at Gibbonsville, on the North Fork of the Salmon river, and it probably extends still farther southward. The Salmon River mountains, lying between the Lemhi river and Rock creek, are reported to be well timbered. The southwestern portion of the county I presume to be much more open.

"The total timbered area is estimated at from 1,500 to 2,000 square miles.

"IDAHO COUNTY (10,100 square miles).—The high and crowded spurs of the Bitter Root mountains fill the entire northeastern portion of this county, extending to the line of the South Fork of the Clearwater, mostly densely wooded from base to summit. The foot-hills and plateaus between the streams are more or less covered with scattered yellow pine and red fir. The valley of the Salmon river is probably comparatively treeless, and the low mountain range between that river and the Snake is scantily timbered.

"Estimated timber area, 4,000 square miles.

"WASHINGTON COUNTY (3,000 square miles).—I have but little information in regard to this county. The southern portion has been surveyed, and is probably nearly treeless. The rest appears to be more mountainous, and may be scantily timbered.

"Wooded area (say) 300 square miles.

"NEZ PERCÉ COUNTY (3,400 square miles).—Mainly high plateau, at about 3,000 feet altitude, in the southeast more or less covered with scattered yellow pine and red fir of good size, on the western side nearly without timber or with occasional yellow pine. Toward the head of Potluck creek some yellow pine and red fir are found in the valleys, and in the northeast the spurs from the Rocky mountains enter the county, covered in addition with the larch and *Thuya gigantea*. East of the Indian reservation the county extends up into the mountains in the form of a narrow gore, and is heavily timbered. The portion lying south of the reservation in the angle between the Snake and Salmon rivers is occupied by low mountains, mostly bare.

"Total timbered area estimated at 750 square miles.

"SHOSHONE COUNTY (5,950 square miles).—Wholly mountainous and covered with forests, with the exception of some prairies and open country near the Clearwater and lower portion of the Lolo Fork.

"Immediately after crossing the divide by the Lolo trail from Montana, at an altitude of 6,000 feet, the forest consisted of *Abies subalpina* and *Picea Engelmanni*, with young *Abies grandis* and *Tsuga Mertensiana*, and occasional larch and red fir, and upon the creeks some small *Thuya* and *Taxus*. The trail soon ascended the ridges and followed them for about 100 miles at an altitude of from 5,000 to over 7,000 feet, doubtless to avoid the fallen timber which made the cañons impassable, though enough of it was found on the route followed. The timber on these ridges was often small and scattered—*Abies subalpina* and *Picea Engelmanni*, with *Pinus Murrayana* and *P. albicaulis*—or on the damper northern slopes with larch and red fir, balsam, hemlock, and sometimes the mountain

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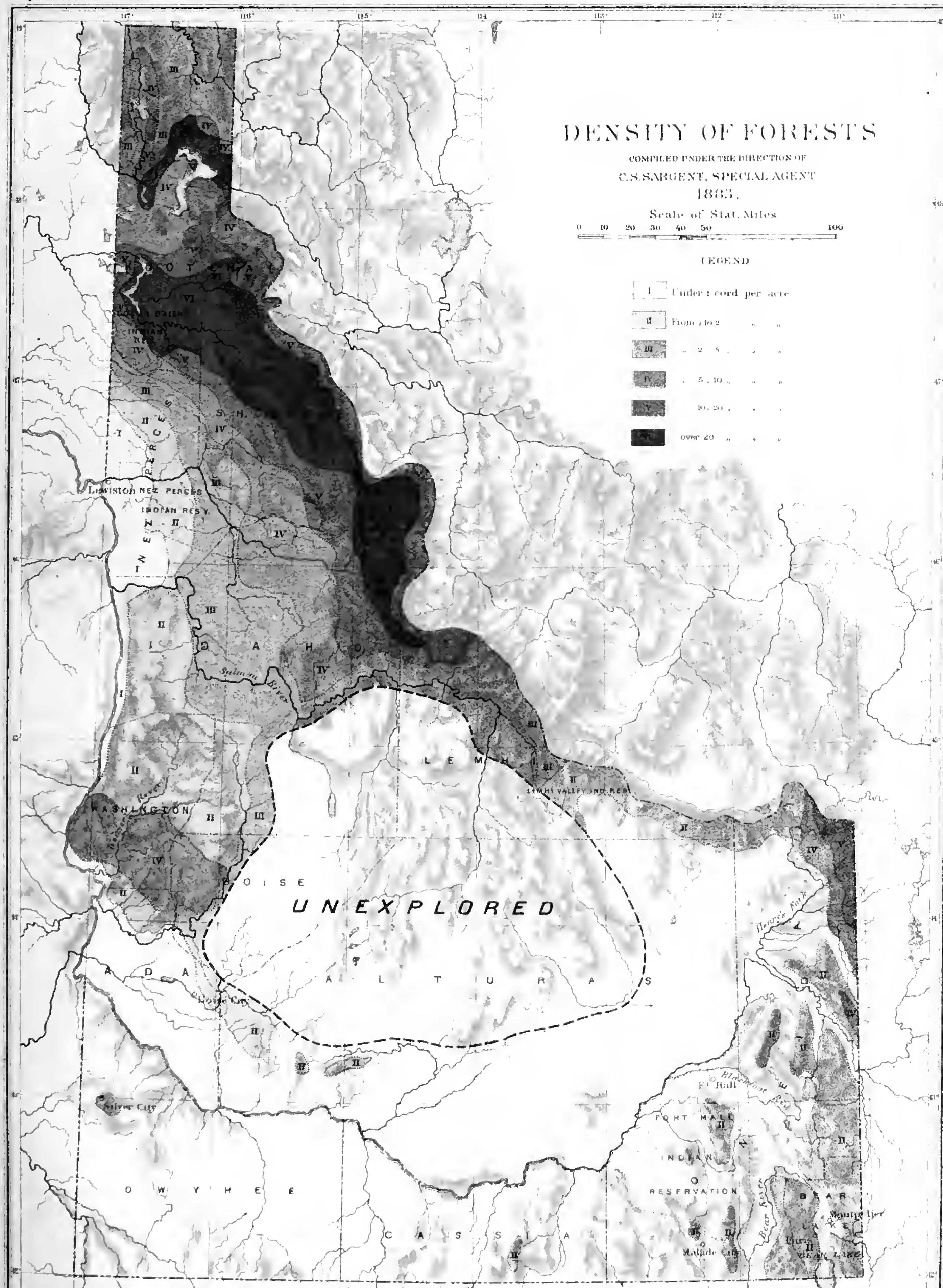

IDAHO

Julius Bien & Co. lith.

hemlock (*Tsuga Pattoniana*), the trees larger (occasionally 2 feet through, the *Abies grandis* being the largest). The white pine (*Pinus monticola*) also frequently occurred. During the last day upon this ridge the trail was through heavy timber, chiefly of hemlock sometimes 3 feet in diameter, with some *Abies* and rarely *Pinus Murrayana* and *P. monticola*, the ridge even at 7,000 feet being covered with the same dense growth. Descending quite abruptly from the drier extremity of the spur, which was covered with *Abies*, *Tsuga*, and *Pinus* (*Murrayana*, *albicaulis*, and *monticola*), we passed through a forest of heavy balsam (*Abies grandis*), with a few larch and some red fir, and at about 4,000 feet came upon cedar (*Thuya gigantea*) to the exclusion of everything else—the trees from 2 to 4 feet in diameter. On the stream banks at the base were found the *Thuya*, *Pinus monticola*, *Abies subalpina* and *A. grandis*, *Picea Engelmanni*, and *Tsuga Mertensiana*, all growing together, with an undergrowth of maple, mountain ash, *Vaccinium*, *Ceanothus*, *Cratægus*, *Pachystima*, *Prunus*, etc. With timber of this character upon the high ridges it is evident that there must be much very heavy timber in the cañons.

"After crossing a low ridge covered with cedar, larch, and red fir, and following a narrow meadow frequently interrupted by clumps of timber, the trail at length came out upon an open *camass* prairie 25 miles northeast of Kamai. From this point the timber covering the plateau is an open growth of yellow pine and red fir, often quite large, with young trees intermixed, and some *Picea Engelmanni* and the two *Abies* in the wetter places. Considerable timber is cut upon the Lolo Fork and Clearwater and floated down to the mills at Lewiston. It is uncertain how far south along the main range the above large variety of trees continues. It is probable, in my opinion, that the *Thuya*, *Abies grandis*, *Tsuga*, *Pinus monticola*, and *Taxus* do not pass beyond the headwaters of the Clearwater, or, at the farthest, that some of them may reach the North Fork of the Salmon river, while the larch may possibly be found in the Salmon River mountains.

"At the northern extremity of the county, along the Mullan road, which from the Cœur d'Alêne mission follows up the cañon of the Cœur d'Alêne river, instead of following the spurs, a distance of 37 miles, the swampy bottoms were found heavily timbered with *Thuya*, red fir, *Abies grandis*, and *Tsuga Mertensiana*, with some larch and *Pinus monticola*. Some of the drier bottoms had been burned over, and were mostly covered with *Pinus Murrayana*. Some *Populus balsamifera* occurs, 3 feet through, or more (as also on the Montana side). The sides of the ridge were also nearly bare. The *Thuya*, which exclusively occupies some of the swamps, attaining a large size, ceases at the base of the dividing ridge, where also the *Picea Engelmanni* and *Abies subalpina* come in. The range above Cœur d'Alêne cañon, and bounding the county on the north, is not heavily timbered, much of its upper slopes being bare.

"Total timbered area estimated at 5,000 square miles.

"KOOTENAI COUNTY (5,530 square miles).—The portion south of the Cœur d'Alêne and Spokane rivers belongs mostly to the Cœur d'Alêne Indian reservation, and is timbered, with the exception of open meadows upon the Cœur d'Alêne and Saint Joseph rivers and upon Hangman creek. The timber is principally yellow pine and red fir, with some *Pinus Murrayana*, and fine bodies of cedar (*Thuya gigantea*) near the western borders of the lake. North of the Cœur d'Alêne river the road from the mission to the fort passes through a cedar (*Thuya*) swamp, with many large trees, from 3 to 5 feet through, traversing cañons filled with a mixed growth of *Abies subalpina* and *A. grandis*, larch, hemlock, *Picea Engelmanni*, and red fir. This latter growth continues for some miles below the fort, where the valley opens out into the broad Spokane plain, which extends northeastward toward Pend d'Oreille lake without trees. The mountains south of the lake are low and not heavily timbered. The portion of the county north of Clarke's Fork and of Pend d'Oreille lake has, so far as I know, never been explored, but is probably mountainous and for the most part well timbered.

"Estimated timber area of the county, 4,500 square miles."

WASHINGTON.

Washington territory west of the summit of the Cascade range is covered with the heaviest continuous belt of forest growth in the United States. This forest extends over the slopes of the Cascade and Coast ranges, and occupies the entire drift plain surrounding the waters of Puget sound. The highest mountain peaks and the sand-dunes of the coast are treeless. The narrow valleys of the Cowlitz and Chehalis rivers are dotted with small oaks and other deciduous trees, and oaks and stunted yellow pines occupy with an open growth the barren Steilacoom plain south of Puget sound; with these exceptions western Washington territory is covered with a magnificent coniferous forest. The most valuable and generally distributed timber tree of this region is the red or yellow fir (*Pseudotsuga Douglasii*), forming about seven-eighths of the forest growth. The valuable red cedar (*Thuya gigantea*) and the hemlock (*Tsuga Mertensiana*), often covering extensive tracts, especially near the base of the Cascade mountains, are common; the noble tide-land spruce adds value and importance to the forests bordering the coast. The forests which cover the upper ridges of the Cascade mountains are principally composed of firs (*Abies amabilis* and *A. nobilis*), spruces (*Picea Engelmanni*), various small pines, hemlocks, etc. These elevated forests, often of great beauty, are of little economic importance.

East of the Cascade mountains the forests are less dense, and are confined to the mountain ranges. The great plains watered by the Columbia and Snake rivers are entirely destitute of tree covering.

Stevens county, which is broken and mountainous, with the exception of the narrow valleys and occasional small prairies, is covered with a heavy, open forest growth. The most valuable trees of the forests of this county are the red fir, the yellow pine (*Pinus ponderosa*), the white pine (*Pinus monticola*), the larch (*Larix occidentalis*), and the red cedar.

The forests of Spokane county are confined to the spurs and ridges of the extreme eastern part of the county, and consist of the yellow pine, red fir, and larch of small size and inferior quality.

The forests of Yakima county cover about one-half of its area, being confined to the eastern slope of the Cascade range. The forests covering the eastern slopes of these mountains are only surpassed in density and value by those extending over their western flanks. The yellow pine occupies the lowest slopes with an open growth of large trees. Above the pine the red fir is the prevailing tree. This at a greater elevation is succeeded by hemlock and larch, with which are mingled fine bodies of spruce (*Picea Engelmanni*) and hemlock, while the forest growth below the timber-line consists of firs, pines, and mountain hemlock.

The western portion of Klikitat county is covered with heavy forest growth, similar in composition and density to that of Yakima.

Walla Walla county is destitute of timber except in the extreme southeastern corner, where the spurs of the mountains are thinly covered with a sparse growth of yellow pine and larch.

Columbia county is without forest except along the ridges and summit of the Blue mountains, which are covered with yellow pine, larch, and, above 5,000 feet elevation, with a continuous growth of lodge-pole pine (*Pinus Murrayana*).

Whitman county is destitute of forest except in the extreme southeastern corner, where there is a scattered growth of small yellow pine.

An estimate of the actual amount of timber standing in the territory is not possible with the existing knowledge of the country, and none has been attempted. The quantity of merchantable timber, however, standing in western Washington territory is enormous; a yield of 200,000 feet of lumber to the acre is not at all exceptional, while over fully 20,000 square miles a yield of 25,000 feet to the acre might be expected; such estimates certainly would not exaggerate the productive capacity of these noble forests.

The forests of Washington territory, especially in the more thickly settled portions west of the Cascade mountains, have long suffered from destructive fires. The injury inflicted by such fires is proportionately less, however, in the humid coast region than east of the mountains, where the dryness of the climate prevents the reproduction of the forest once destroyed. West of the mountains young trees of the species of the original forest, and especially the red fir, soon densely cover the burned surface and grow with astonishing rapidity and vigor. It seems reasonably certain, therefore, that, whatever may be the fate of the forests which now cover western Washington territory and Oregon, they will be succeeded by forests of similar composition, and that this whole region, ill adapted in soil and topography to agriculture, will retain a permanent forest covering long after the other great forests of the continent have disappeared.

During the census year 37,910 acres of woodland were destroyed by fire, with an estimated loss of $713,200. These fires were set by Indians, by whites in clearing land, by hunters, prospectors, etc.

The forests bordering the shores of Puget sound, the strait of Juan de Fuca, and the lower Columbia river have been culled of their best trees for a distance inland of 1 or 2 miles to supply the important lumber-manufacturing interests of this part of the territory. The product of western Washington territory during the census year was 153,986,000 feet of lumber, 6,550,000 laths, 910,000 shingles, and 23,666,000 staves—by far the largest part being manufactured in the mills located on the waters of Puget sound.

The first saw-mill built upon Puget sound was erected in 1851. It was a small water-power mill, with a daily capacity of about 1,000 feet. Two years later a similar mill was erected at Seattle, with a daily capacity of from 8,000 to 10,000 feet.

The centers of manufactures now are Port Gamble, Port Madison, Port Blakely, Port Discovery, Seabeck, Utsaladdy, Tacoma, and Seattle. At the last-named place there is a large establishment manufacturing sugar-barrel staves from cottonwood for the San Francisco market.

The lumber manufactured upon Puget sound is largely shipped to San Francisco and directly to China, Australia, New Zealand, and Mexican and South American Pacific ports.

The population of the southeastern part of the territory is principally supplied with lumber, largely coarse yellow pine of inferior quality, cut on the Blue mountains in small portable mills, and delivered at Dayton, in Walla Walla county, by a flume several miles in length. No statistics, however, have been received of the amount of lumber manufactured in this county.

The methods adopted by the lumbermen of western Washington territory are wasteful in the extreme. Loggers cut only timber growing within a mile or a mile and a half of shores accessible to good booming or shipping points, or which will yield not less than 30,000 feet of lumber to the acre. Only trees are cut which will produce at least three logs 24 feet long, with a minimum diameter of 30 inches. Trees are cut not less than 12 and often 20 feet from the ground, in order that the labor of cutting through the thick bark and enlarged base may be avoided, while 40 or 50 feet of the top of the tree are entirely wasted.

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125°
124°
123°
122°
48°
47°
46°
P A C I F I C
O C E A N
New Dungeness
Townsend
Montesano
IND. RES.
LEGEND
Under 1 cord per acre
From 1 to 2
2 – 5
5 – 10
10 – 20
20 – 50
50 – 100
100 – 200
Over 200

WASHINGTO

ERRITORY

Julius Bien & Co. lith

The following notes upon the forests of eastern Washington territory are extracted from Mr. Watson's report:

"WALLA WALLA COUNTY (1,260 square miles).—This county is wholly without timber, which is supplied from the Blue mountains of Oregon.

"COLUMBIA COUNTY (2,160 square miles).—A spur of the Blue mountains traverses the southern portion of this county, occupying about a fourth of its area, which is partially timbered, chiefly with red fir (*Pseudotsuga*), pine (*Pinus ponderosa*), and some *Picea Engelmanni*, none of it large. Elsewhere the county is nearly destitute of trees, though some of the streams, especially the Touchet, were at the first settling of the county bordered by scattered pines.

"WHITMAN COUNTY (5,000 square miles).—This county is destitute of timber. Some of the townships along the Idaho line were originally sparingly wooded with scattered pines upon the ridges, but these have nearly or wholly disappeared, and the supplies for fencing and fuel are brought from the neighboring mountains of Idaho. There is a saw-mill on the Palouse river, at Palouse, the logs for which are floated down from about 9 miles above.

"SPOKANE COUNTY (8,500 square miles).—The portion of this county to the west of the mouth of the Spokane river is wholly destitute of trees, with the exception of the high point or plateau opposite to the mouth of the Okinakane river. Here there is a small area thinly wooded, probably with yellow pine and red fir. On the eastern side of the county spurs from the mountains bordering Cœur d'Alêne lake enter between Rock creek and Spokane river, and are covered more or less densely with a growth of yellow pine, often small, with some Douglas spruce and tamarack in the ravines. There is a saw-mill at Rock creek supplied from its immediate neighborhood. Crossing Hangman's creek a scattered growth of pine appears upon the ridges between Deep creek and the Spokane river, and as far west as the head of Crab creek. Trees also border the Spokane river below the falls and to within a few miles of its mouth. The region between the Spokane and Little Spokane rivers is mostly a broad, open valley, the hills bordering it upon the north being very thinly wooded. There are two saw-mills at Spokane Falls, but the logs for them are floated down from near Cœur d'Alêne lake.

"The total area more or less covered with trees may be estimated at from 400 to 500 square miles.

"STEVENS COUNTY (14,760 square miles).—This county is broken and mountainous throughout, but with no high ranges east of the Cascade mountains. The portion lying east of the upper Columbia and north of the Spokane river has several small prairies upon Chamokane creek and Colville river, and there is a narrow, open valley along the Columbia for 20 miles below the mouth of the Colville. The mountains are all low, the ridges most frequently thinly wooded or nearly bare, with the timber becoming denser in the ravines, especially northward. The most common tree is the yellow pine, but in the ravines red fir is frequent, with tamarack and lodge-pole pine. Near the Colville river were seen *Picea Engelmanni*, *Abies grandis*, small *Thuyas*, and fine specimens of *Pinus monticola*, as well as *Populus balsamifera*, *Betula papyracea*, and *Alnus* of considerable size. The hills bordering the Columbia above Old Fort Colville are treeless. The drift-wood brought down by the river is said to be chiefly cedar (*Thuya gigantea*).

"The Colville Indian reservation, lying between the Okinakane and the Columbia eastward, is comparatively little known, being crossed by but two trails, one leading directly westward from Old Fort Colville, the other following the Kettle river, and for much of the way not far distant from the British boundary. As seen from the Columbia and from the heights bordering the Okinakane, this portion appears to be more open and grassy than that east of the Columbia, and, especially toward the south, more like the bare plateau of Spokane county. Okinakane valley itself is narrow, with mainly a desert vegetation of sage-brush, *Purshia*, and other like representatives of the Great Basin flora, which seems to find here its only passageway northward to the British boundary. The hills eastward have thinly-scattered pines, which occasionally descend into the valley. The northern trail from Old Fort Colville shows the lower valley of Kettle river to be well wooded, but above, opening out into grassy prairies and bordered by grass-covered hills or with scattered yellow pine, red fir, and larch. Upon the more densely wooded ridges and ravines were also found *Picea Engelmanni*, *Abies subalpina*, *Pinus Murrayana*, and *Thuya*.

"The main ridge separating Kettle river from the Okinakane (about 5,000 feet high and 12 miles from the latter stream) was well grassed upon both sides with large *Picea*, *Pseudotsuga*, *Pinus ponderosa*, and *Larix* along the creeks upon the eastern side, and on the west the *Pinus ponderosa* only. The ridges above the Okinakane to the north appeared treeless, while the northern slopes of the nearer hills to the south were pretty well covered with underbrush. West of the Okinakane, between that river and the Methow, the country is much like that to the east—high and broken, with scattered patches of timber, which becomes more general toward the northern boundary. Upon the Methow and Similkameen creeks there are open, grassy valleys of considerable extent, but for 12 miles from the mouth of the Methow the hills close in upon it and are considerably wooded. The rest of the county, from the Methow to the Wenatchee, is occupied by spurs from the Cascade mountains, which reach the banks of the Columbia; these are exceedingly rugged and almost impassable, being seldom traversed, even by Indians. A foot-trail leads from the headwaters of the Methow over to the Skagit, and a trail which has been passable for horses crosses the ridges between the upper Chelan lake and the Wenatchee, but it is described by the Indians as dangerous and long disused by them. The whole region is probably for the most part well timbered except along the Columbia river, where the mountains for from 10 to 15 miles back are but scantily wooded, the pine (*Pinus ponderosa*) and red fir occasionally reaching to the river. Heavy timber is reported about the head of Chelan lake, commencing at about 15 miles from the foot, mostly yellow pine, but also red fir, some *Larix*, and small *Thuya*. The outlet to this lake is through a deep cañon, and is obstructed by falls and rapids. The Wenatchee flows through a more open valley, and, at least in high water, could be used for floating timber to the Columbia. For 7 miles from its mouth the ridges on each side are only scantily wooded, but from that point the trees (yellow pine and red fir, mostly young) occupy the valley, and at 20 miles the thick timber begins—pine, fir, red fir, larch, white pine (*Pinus monticola*), and cedar, the white pine sometimes 4 feet through, the cedar not large.

"YAKIMA COUNTY (8,900 square miles).—Immediately south of the Wenatchee the highest of the eastern spurs of the Cascade mountains extends in a southeasterly direction to the Columbia, forcing that river to make a bend eastward. This spur has an altitude of about 5,000 feet, and its higher northern slopes, overlooking the mouth of the Wenatchee and eastward, are somewhat densely covered with pine, red fir, and larch. The southern slope, as seen from Ellensburg, appeared nearly bare. I crossed the ridge about 17 miles above the mouth of the Wenatchee and a few miles east of the high, exceedingly rocky, and snow-covered peaks called by McClellan 'Mount Stuart'. It was found mostly well wooded, but the trees not exceeding 1 or 2 feet in diameter, and usually small red fir and yellow pine, with at length some *Abies grandis* and *Pinus monticola*, rarely a small *Thuya*, on the higher rocky ridges small larches, and at the summit some *Pinus Murrayana*. The same trees were found on the southern descent, excepting the *Pinus monticola*. Large cottonwoods (*Populus trichocarpa*) occurred on the creeks. South of this range the spurs recede, leaving a comparatively level sage-brush region, wholly treeless, from 50 to 70 miles broad, between the Columbia and Yakima, and crossing the lower portion of the latter river.

"Below the mouth of the Schwank, which is at the head of what is known as 'Killitas valley', on the Yakima, the foot-hills of the Cascade mountains extend to the Yakima river, a distance of about 50 miles from the summit of the range; but the lower portions of these spurs are bare, or with only scattered pines on their northern slopes, and the chief reliance of the settlers for fencing and fuel is upon the aspens and cottonwoods bordering the streams. Following up the Yakima from the mouth of the Schwank, the valley for 10 or 12 miles is thinly timbered with pine and red fir. For 17 miles more there is some larch on the ridges, and in the bottoms some *Abies grandis*, and rarely a small *Thuya*. Timber and ties had been extensively cut here for the railroad and floated down the river. At this point the yellow pine and tamarack ceased, and a dense, heavy growth began and continued for most of the way to the summit (20 or 25 miles), consisting of red fir, hemlock, *Abies grandis* and *A. amabilis* (all these from 3 to 5 feet through and 200 feet high or more), *Pinus monticola* (18 inches through), and *Thuya* (2 feet in diameter). One spruce, not over $2\frac{1}{2}$ feet through, had a height of 225 feet.

"In like manner, upon the Nachess river, the open sage-brush country extended about 10 or 12 miles from its mouth, with only cottonwood along the stream. Scattered pines then commence, with at length red fir, but it is some 25 or 30 miles more before heavy timber is reached. A small grove of oak (*Quercus Garryana*) is found at the mouth of the Schwank, the only point upon the Yakima where it occurs. It is also frequent along the Nachess for 3 or 4 miles, commencing at about 12 miles from its mouth, but small and rarely over 6 inches in diameter or 15 feet in height. In Satas valley it is abundant. Along the southern border of the county there is again a long spur extending east from mount Adams to within about 40 miles of the mouth of the Yakima. This spur has an altitude of about 1,500 feet, and is mostly covered with a scattered growth of yellow pine, red fir, and *Abies grandis*.

"The entire wooded area of the county may be estimated at about 4,500 square miles.

"KLIKITAT COUNTY (2,300 square miles).—The spur eastward from mount Adams, just spoken of, covers much of the northern portion of this county and affords a good supply of excellent timber. The area may be estimated at 750 square miles. The high ridge overlooking the Columbia from The Dalles eastward is perfectly bare of trees."

OREGON.

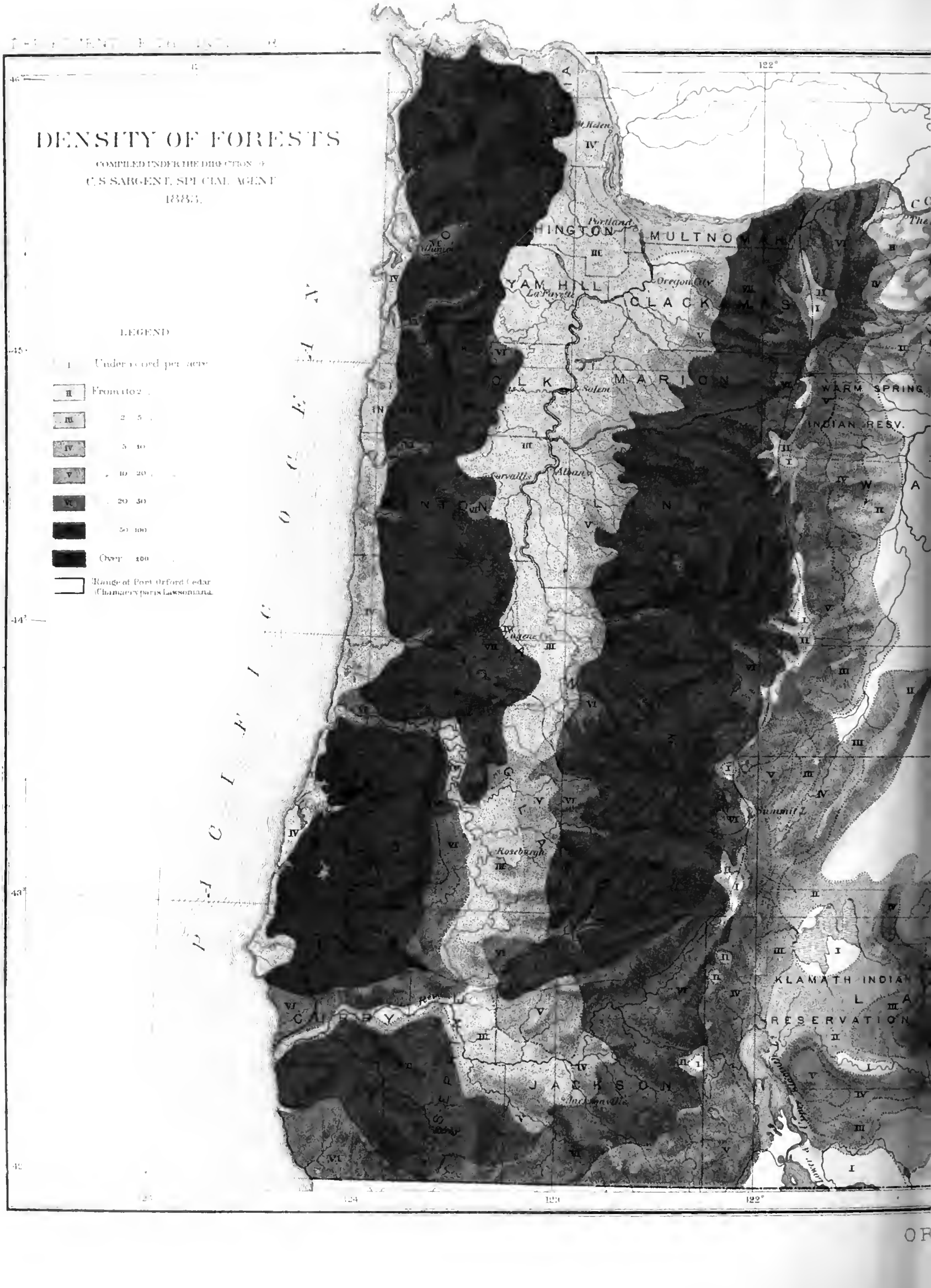
The heavy forest of western Washington territory extends through western Oregon. The most valuable timber tree of the region is the red or yellow fir (*Pseudotsuga Douglasii*), which forms fully seven-eighths of the forest. The tide-land spruce (*Picea Sitchensis*) abounds along the coast, and the red cedar (*Thuya gigantea*) and the hemlock (*Tsuga Mertensiana*) are common and of large size. South of Coos bay an important forest of Port Orford cedar (*Chamæcyparis Lawsoniana*), mixed with the red fir and the tide-land spruce, occurs.

The valleys of the Willamette, Umpqua, and Rogue rivers contain an open, scattered growth of white oak (*Quercus Garryana*), now gradually increasing by the recent growth of young trees protected from the fires which formerly swept every season through these prairie-like valleys. South of the Rogue River valley the sugar pine (*Pinus Lambertiana*), the chestnut oak (*Quercus densiflora*), and other trees of the California forest occur in sufficient numbers to add economic value to the forests of the state.

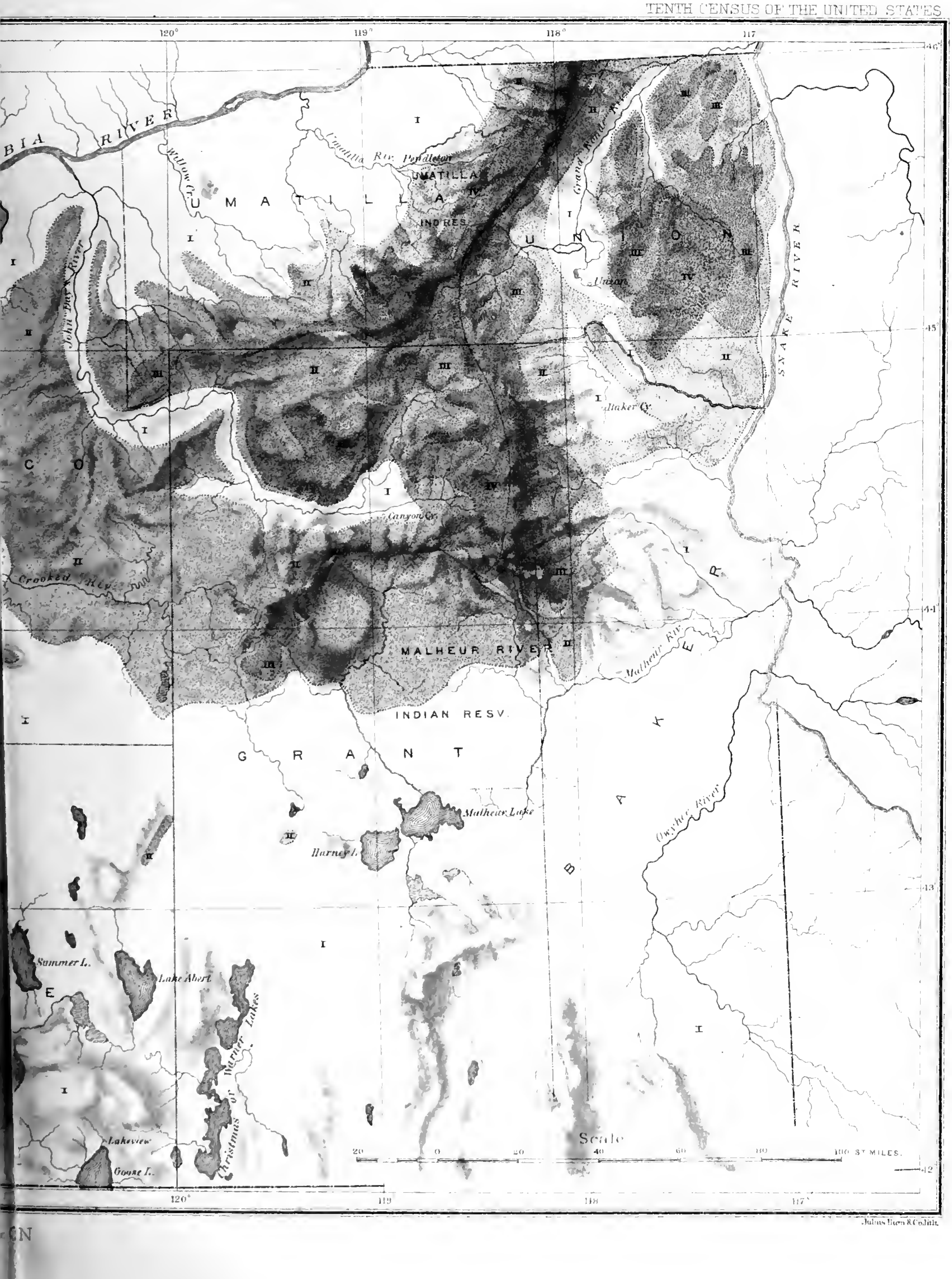
The bottom lands of western Oregon are lined with a continuous growth of cottonwoods of immense size, willows, maples, ashes, and gigantic alders; those in the southwest, near the coast, contain great bodies of splendid hard maple (*Acer macrophyllum*) and laurel (*Umbellularia Californica*).

East of the Cascade mountains the forests are confined to the mountain ranges; they are open, scattered, and generally composed of comparatively small trees.

4 76'


DENSITY OF FORESTS
COMPILED UNDER THE DIRECTION OF
C. S. SARGENT, SPECIAL AGENT
1883.
LEGEND
Range of Port Orford Cedar (Chamaecyparis Lawsoniana)
P A C I F I C   O C E A N
WASHINGTON
MULTNOMAH
YAM HILL
CLACKAMAS
POLK
MARION
WARM SPRING
INDIAN RESV.
JACKSON
KLAMATH INDIAN
RESERVATION
Portland
Oregon City
La Fayette
Salem
Corvallis
Albany
Roseburgh
Jacksonville
Summit L.
122°

OR



BIA RIVER
UMATILLA
UNION
Umatilla Riv.
Pendleton
UMATILLA
INDRES.
Grand Ronde Riv.
Willow Cr.
John Day R. River
Union
SNAKE RIVER
Walker Cr.
CO
Canyon Cr.
Crooked Riv.
MALHEUR RIVER
Malheur Riv.
INDIAN RESV.
GRANT
BAKER
Malheur Lake
Harney L.
Owyhee River
Summer L.
Lake Abert
Christmas or Warner Lakes
Lakeview
Goose L.
Scale
20
0
20
40
60
80
100 ST. MILES.
120°
119°
118°
117°
46°
45°
44°
43°
42°
Julius Bien & Co. lith.

GN

The forests of Wasco county, on the western slope of the Cascade range, when above 3,000 feet elevation are important. The most valuable trees are the red fir, the yellow pine, and the larch. The eastern part of the county is covered with a light growth of pine, principally yellow pine.

The slopes of the Blue mountains in Umatilla and Union counties are covered with an open, stunted forest, consisting of red fir, yellow pine, larch, and, above 4,000 feet elevation, a heavier continuous growth of lodge-pole pine (*Pinus Murrayana*).

Lake county is destitute of timber except on the eastern slope of the Cascade mountains and the southern part of the county, which contain a light forest growth confined to the high ridges of the mountains, and principally composed of yellow pine.

Grant and Baker counties are treeless except in the northern part, where the Blue mountains are covered with a light, open growth composed chiefly of yellow pine, with some larch and scrub pine.

The forests of Oregon have suffered serious losses from forest fires. Along the Coast Range, from the Columbia river to Port Orford and through the entire length of the Cascade mountains, fires have raged nearly every summer since the first settlement of the state, destroying thousands of acres of noble fir, spruce, and cedar. Forests similar in composition to those destroyed soon spring up again and cover the burned surface, but the loss in material which the state has suffered in this way is incalculable.

Forest fires are increasing in frequency, especially west of the summit of the Cascade mountains. During the census year, however, only 132,320 acres of woodland were reported destroyed by fire, with an estimated loss of $593,850. These fires were set by hunters, Indians, and by farmers clearing land.

The abundant spruce, cedar, cottonwood, ash, maple, and alder of western Oregon have developed flourishing industries. At Portland large quantities of ash, maple, and alder are manufactured into furniture, and cottonwood, spruce, and cedar supply numerous establishments engaged in the production of cooperage stock and all kinds of woodenware. The supply of this material is large and of excellent quality.

The principal centers of the lumber-manufacturing interests are at Portland, where fir, spruce, cottonwood, and hard woods are sawed for the local market, and at Empire City and Marshfield upon Coos bay. Port Orford cedar and red-fir lumber are manufactured here, and shipped by schooner to Portland, San Francisco, and Mexican and South American Pacific ports. The first mill was established upon Coos bay, at North Bend, 4 miles above Empire City, in 1853; other mills were soon built, and in 1854 the first shipment of Port Orford cedar was made to San Francisco. Great quantities of this timber have been cut, while fires have destroyed even more than the ax. The fire which raged through the forests of Coos bay for three months in the summer of 1867 destroyed cedar estimated to amount to between 200,000,000 and 300,000,000 feet of lumber. This tree, however, reproduces itself very rapidly, and after the forest has been burned over it is the first arborescent species to reappear, springing up generally in the third year.

The heaviest continuous body of Port Orford cedar now standing is on cape Gregory, extending south to and beyond the mouth of the Coquille river. It is about 20 miles long by an average width of 12 miles, and lies along the western slope of the foot-hills of the Coast Range, extending to within 3 miles of the coast. In this forest two-thirds of the trees are Port Orford cedar, the others tide-land spruce and a few red firs. There is great danger, however, that the Port Orford cedar, one of the most valuable trees of the American forest, will soon be exterminated as a source of lumber supply, so far as this generation is concerned.

The following notes upon the forests of Wasco, Umatilla, Union, Grant, and Baker counties, the only portion of the state visited by Mr. Watson, are extracted from his report:

"WASCO COUNTY (17,760 square miles).—The timber of this county is confined almost wholly to the steep eastern slopes of the Cascade range; the low spurs of the Blue mountains, which enter the county on the east, bordering John Day's river and southward, being only partially supplied with pines, etc. I know nothing about Walker's range and the Paulina mountains in the southwest, but they are probably low, with little or no wood. The trees of the Cascades are doubtless nearly the same as those to the north of the Columbia, the larch reaching to the headwaters of the Deschutes river, the most southern locality for it that I have seen mentioned.

"The total more or less wooded area may be estimated at from 2,500 to 3,000 square miles.

"UMATILLA COUNTY (6,100 square miles).—The Blue mountains occupy the southern and eastern borders of this county, and are the only source of timber. They are for the most part well wooded, especially in the ravines, the trees growing to a fair size, and consisting of yellow and scrub pine, spruce and balsam (*Abies subalpina* and *A. grandis*).

"The wooded area is about 1,500 square miles.

"UNION COUNTY (4,300 square miles).—This county has the main range of the Blue mountains on the west and north and the Cedar mountains on the east, separated by the valleys of the Grande Ronde and Wallowa rivers. A large portion of these mountains is well timbered, the amount decreasing toward the east.

"The wooded area may be estimated at about 2,000 square miles.

"GRANT COUNTY NORTH OF LATITUDE 44° (5,800 square miles).—This portion of the county is traversed by the valley of John Day's river, to the north and east of which lie the main ranges of the Blue mountains, which are to a considerable extent well wooded. The mountains to the south are low and probably scantily timbered.

"Fifteen hundred square miles is probably a liberal estimate for the wooded area.

"BAKER COUNTY NORTH OF LATITUDE 44° (3,800 square miles).—This section is bordered on the west by a high range of the Blue mountains, which is well timbered. The remainder is almost wholly without timber.

"The estimated wooded area of this county is 900 square miles."

CALIFORNIA.

The heavy forests of California are confined to the Coast Range, the eastern and western slopes of the Sierra Nevada, and the group of mountains joining these ranges in the northern part of the state. They extend from the Oregon boundary south to latitude 34° 30′ north. The most important trees of the Coast Range forest are the redwood and the red fir. The tide-land spruce and the hemlock of the Northern Coast Forest extend as far south as cape Mendocino, although less generally multiplied and less valuable than in Oregon and Washington territory. The chestnut oak (*Quercus densiflora*), of which the bark is largely used in tanning, is still common in the coast forests of the northern part of the state. The most valuable forest of the western slope of the Sierra Nevada is confined to a belt between 4,000 and 8,000 feet elevation, consisting of the sugar pine (*Pinus Lambertiana*), the yellow pine, and the red fir. Small scattered groves of the big trees (*Sequoia gigantea*) stretch along the southern portion of this belt. The western slopes of these mountains below 4,000 feet elevation are more or less densely covered with various species of pine of little economic importance, and the broad valleys of the Sacramento and the San Joaquin, lying between the Coast Range and the Sierra Nevada, are covered, except at the south, with an open growth of oaks, often of immense size, although of little value except as fuel. The eastern slopes of the Sierra Nevada are covered with a heavy forest, in which yellow pines (*Pinus ponderosa* and *P. Jeffreyi*) are the prevailing and most important trees.

South of latitude 36° 30′ the forests, both of the Sierra Nevada and of the Coast Range, become gradually less heavy and less valuable than those covering the mountains farther north. Two degrees still farther south they are open and scattered, and have little economic value. The pine and fir forests, however, which cover the upper slopes of the San Bernardino and San Jacinto ranges are important on account of their isolated position in a region destitute of tree covering, and supply a considerable local market with lumber.

The northeastern and nearly all the southern and southeastern portions of the state are almost entirely destitute of forest covering. Oaks and occasional pines and junipers are, however, dotted over the low mountains of southwestern California, and willows and cottonwoods line the banks of streams. Forests of pine crown the highest ridges of the Inyo and other mountain ranges, rising from the desert east of the Sierra Nevada, and arborescent yuccas (*Yucca brevifolia*) form upon the high Mohave plateau an open forest, more remarkable in the strangeness of its growth than in economic value.

The narrow belt of redwood which extends along the western slopes of the Coast Range from the bay of Monterey to the northern boundary of the state is the most important forest of similar extent now standing. Few trees equal the redwood in economic value. No other forest can compare with this in productive capacity, and no other great body of timber in North America is so generally accessible or so easily worked. Single trees capable of producing 75,000 feet of lumber are not uncommon, while a yield of from 1,000,000 to 2,000,000 feet of lumber per acre is by no means rare. The redwood has already been practically destroyed in the neighborhood of San Francisco bay, both north and south, and through the entire extent of this forest the trees most accessible to streams and railroads have been culled. Heavy bodies of redwood are still standing, however, in the Santa Cruz region, and in Humboldt county in the valleys of Eel and Mud rivers and Redwood creek. The largest number of mills engaged in the manufacture of redwood lumber are located upon Humboldt bay, principally at Eureka and Arcata. The logs which supply these mills are generally cut within a distance of 1 or 2 miles from the shores of the bay, to which they are hauled by teams, made into rafts, and towed to the mills. Attempts made to raft logs down the mountain streams watering the redwood forests have not been successful. The rivers flowing west from the California Coast Range are short and rapid. Floods following the winter rains are sudden and severe, breaking up rafts and driving the logs out to sea, or lodging them far from the banks. At periods of low water numerous bars close these rivers to the navigation of the enormous redwood logs. The general destruction of these forests must therefore be accomplished by means of short logging railroads specially constructed to bring logs to the mills. Such a road has been built along Mad river, and there are others either built or projected near Trinidad and at other points along the coast.

Besides the mills upon Humboldt bay, there are others devoted entirely to the manufacture of redwood lumber at Crescent City, in Del Norte county; Trinidad, Rohnerville, and Bridgeville, in Humboldt county; Westport, Kibesillah, Albion, Little River, Caspar, Mendocino, Cuffey's Cove, Punta Arena, and Gualala, in Mendocino county; Duncan's mills, in Sonoma county; and at Santa Cruz.

Redwood lumber is principally shipped by schooner to San Francisco, the great point of lumber distribution upon the Pacific coast, and also direct by water to Wilmington, San Diego, and other ports of southern California, and to Mexico and South America.

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mountain sides down into the valleys below, and burying rich bottom lands in ruin. And this is not the only danger which must follow the destruction of these forests. If the snow which supplies the mountain streams melts slowly, a steady flow of water will be maintained late into the season; if, on the other hand, the snow melts suddenly and rapidly during the first warm days of spring, the unnatural flow of water in the stream must be followed by county; Duncan's mills, in Sonoma county; and at Santa Cruz.

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The following estimates of the amount of accessible redwood standing May 31, 1880, were prepared by Mr. E. L. Allen, secretary of the Redwood Manufacturers' Association of San Francisco. They embrace only such portions of the forest as can be reached by water, or may in the future be penetrated by railroads, and do not include the small, isolated bodies of timber growing in inaccessible cañons:

REDWOOD (*Sequoia sempervirens*).

Regions.	Feet, board measure.
From the Oregon boundary to the mouth of Redwood creek	800,000,000
From the mouth of Redwood creek to the mouth of Mad river	9,000,000,000
From the mouth of Mad river to the mouth of Eel river	2,145,000,000
From the mouth of Eel river to the mouth of Mattoli river	4,450,000,000
From the mouth of Mattoli river to the mouth of Cotonavia creek	200,000,000
From the mouth of Cotonavia creek to the mouth of Russian river	7,680,000,000
In the Santa Cruz region	1,550,000,000
Total	25,825,000,000
Estimated cut for the census year ending May 31, 1880:	
Sawed lumber	125,390,000
Shingles and shakes	25,380,000
Split railroad ties	23,265,000
Posts, etc	12,600,000
Total	186,635,000

No estimate of the amount of pine and fir lumber standing in the state is now possible, and none has been attempted. An enormous amount of pine of excellent quality, both white and yellow, is contained in the sierra forests. These forests have been invaded by the lumberman at only a few points; their inaccessibility and the cost of getting to market the lumber manufactured in these mountains have thus far preserved them, and these sierra forests, if protected from fire, will serve as a reservoir from which the whole Pacific coast can draw its lumber supply long after its more accessible forests have disappeared.

The forests of California suffer seriously by fire; during the census year 356,815 acres of woodland were reported thus destroyed, with an estimated loss of \$440,750. These fires were set by careless hunters, prospectors, and by farmers in clearing land. Great injury, every year becoming greater, is inflicted on the mountain forests by stockmen starting fires to improve the herbage of the alpine pastures. These fires destroy undergrowth and young trees, and often consume great quantities of valuable timber, which does not grow again upon these exposed mountain slopes.

PASTURAGE OF MOUNTAIN FORESTS.

The permanence of the mountain forests of California is severely endangered, moreover, by the immense herds of sheep, cattle, and horses driven into the mountains every year, at the commencement of the dry season, to graze. From the foot-hills to the highest alpine meadows every blade of herbage and every seedling shrub and tree is devoured. Young trees are barked and ruined, and only the most rigid and thorny chaparral shrubs are able to resist the attacks of these ravenous herds. The sharp hoofs of sheep winding around the steep acclivities tread out the roots of grasses and other perennial plants and loosen the surface of the stony soil, which, deprived of the protection of its vegetable covering, is gradually washed into the valleys, choking the bottoms of streams and preparing the way for the disastrous torrents which must follow the destruction of the sierra forests; and the destruction of these forests is certain, if the practice of using them indiscriminately as sheep pastures is continued. The life of any forest in which all young trees are destroyed as soon as they appear above the surface of the soil is limited to the life of the fully grown individuals which compose it. A period of unusual climatic conditions, the demand of an increased population for lumber, or the now unforeseen attacks of some insect enemy may at any time sweep away the old trees of the sierra forests. There are no young trees growing to replace them, and it is doubtful if the forest could ever regain its foothold upon the steep and exposed slopes of these mountains once entirely stripped of the protection of their present covering of trees.

The sheep which threaten the destruction of the sierra forests threaten also the agricultural prosperity of the state; the streams heading in the sierras and watering the great interior valleys of California are protected in their flow by the forests growing about their upper sources. If these forests are destroyed, and the protection to the surface of the ground which they afford removed, the immense accumulation of the winter's snows must melt suddenly in the spring; brooks will become torrents, sweeping with irresistible force gravel and stones from the mountain sides down into the valleys below, and burying rich bottom lands in ruin. And this is not the only danger which must follow the destruction of these forests. If the snow which supplies the mountain streams melts slowly, a steady flow of water will be maintained late into the season; if, on the other hand, the snow melts suddenly and rapidly during the first warm days of spring, the unnatural flow of water in the stream must be followed by its equally sudden disappearance, and the torrent will suddenly diminish to a slender brook or entirely disappear. Irrigation, without which agriculture in a large part of the Pacific region is impossible, is dependent upon the constant and steady flow of streams formed by melting snow, and as the forests which cover the mountain sides are essential to prevent the sudden melting of snow, their preservation is necessary for successful irrigation on any large or comprehensive scale.

The forests of California suffer from wasteful methods of cutting. Only the best and most accessible young trees are cut; often a noble pine capable of producing 25,000 or 30,000 feet of lumber is felled, a few split shingles made from the butt-cut, and the rest of the tree left to rot upon the ground. The preference of the railroad companies of the state for split rather than sawed redwood ties causes an immense and needless waste of this valuable timber. A great amount of material under the most favorable conditions is wasted in splitting out the ties, and when trees after being cut are found to split badly from any defect in the grain they are abandoned and left to waste.

The forests of California, unlike those of the Atlantic states, contain no great store of hard woods. The oaks of the Pacific forests, of little value for general mechanical purposes, are unfit for cooperage stock. No hickory, gum, elm, or ash of large size is found in these forests. California produces no tree from which a good wine cask or wagon wheel can be made. The cooperage business of the state, rapidly increasing with the development of grape culture, is entirely dependent upon the forests of the Atlantic region for its supply of oak. Woodenware and small cooperage stock are manufactured in large quantities, however, from cottonwood, spruce, alder, and red and white fir. Wine-butts and water-tanks are universally made from redwood, which is probably unsurpassed for such purposes.

The large tanning industry of the state consumes, in preference to all other material, large quantities of the bark of the chestnut oak (*Quercus densiflora*), once a common tree in the forests of the northern Coast ranges, but now becoming scarce and in danger of speedy extermination.

The principal centers of lumber manufacture outside of the redwood belt are situated along the line of the Central Pacific railroad, upon both flanks of the Sierra Nevada mountains, in Butte, Tehama, and Mono counties, and in the San Bernardino mountains. Lumber manufactured upon the eastern slope of the Sierra Nevadas is largely shipped eastward by rail to supply Nevada and Utah. The product of the mills situated west of the mountains is largely sent to San Francisco for distribution, or direct by rail to the mining centers of southern Arizona and New Mexico.

ALASKA.

Little is known to me of the present condition or productive capacity of the forests of Alaska. Their distribution, as shown on the forest map of North America, is based upon notes made by Mr. Ivan Petroff, a special agent of the Census Office, who has traced the timber limits of the territory, aided by Mr. C. W. Nelson, of the Smithsonian Institution, by whom the northern limits of the spruce forest are laid down.

The forests of the territory of any commercial value are confined to the islands and Coast ranges east and south of Prince William sound. The most valuable tree of this region is the Sitka cedar (*Chamæcyparis Nutkaensis*). The hemlock, the tide-land spruce, and the red cedar (*Thuya gigantea*) attain here also a considerable size. The importance, however, of these forests, both in extent and in the value of the timber they contain, has generally been greatly exaggerated. The Coast Forest north of the fiftieth degree of latitude rapidly diminishes in density and quality, and there is nothing in the climate or soil of Alaska to produce a forest growth more valuable than that covering the Coast ranges of British Columbia.

A few saw-mills of small capacity are located at different points in southeastern Alaska to supply the local demand for coarse lumber. Alaska is, however, largely supplied with lumber from Puget sound. The treeless Shumagin and Aleutian islands and the southern settlements of the peninsula are supplied with fire-wood brought from other portions of the territory.

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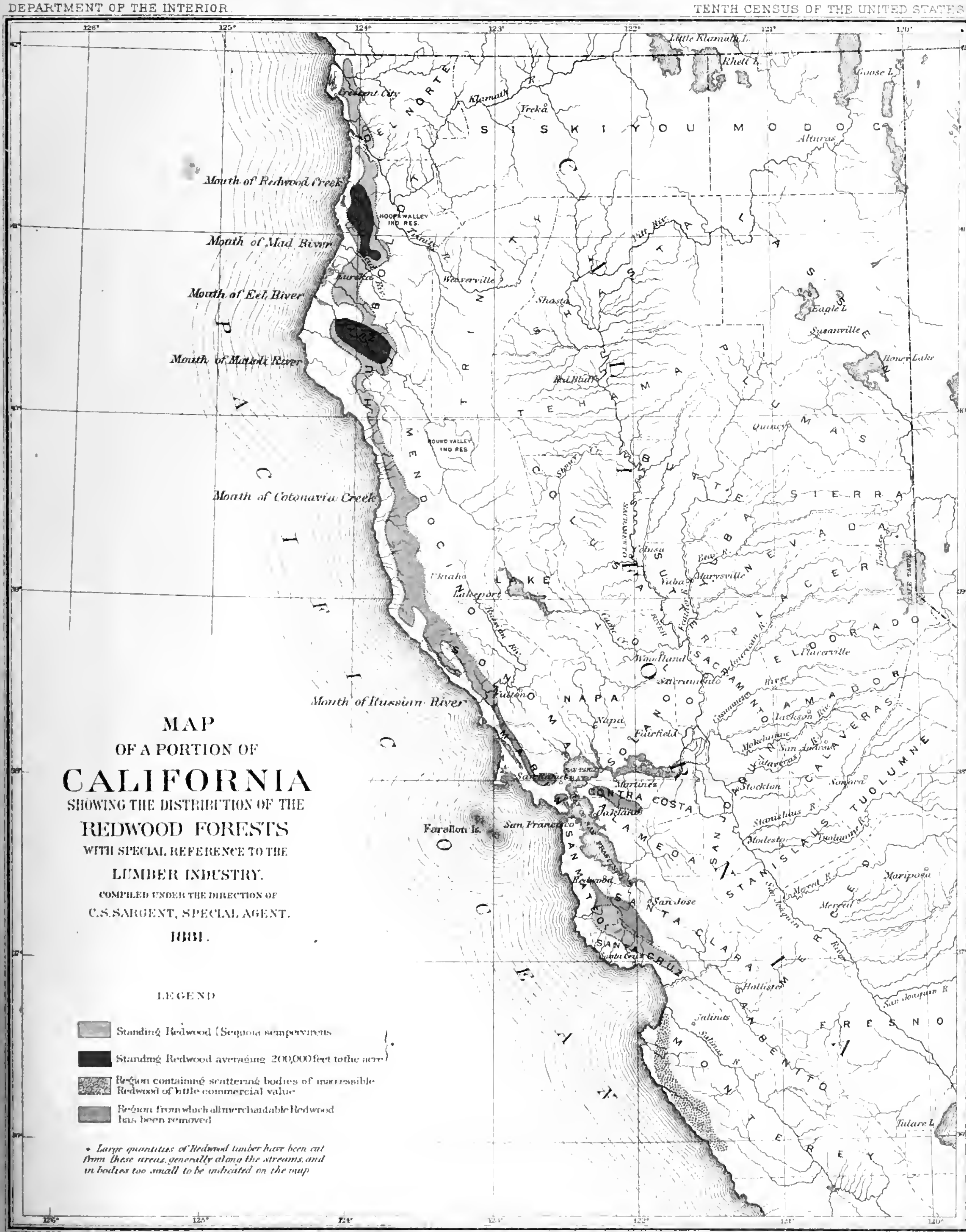

Julius Bien & Co. lith

Scale
20 15 10 5 0 20 40 60 80 100 MILES

GENERAL INDEX.

[NOTE.—In this index the names of families are indicated by "SMALL CAPS", of species by "Roman" type, and of synonyms by "*Italics*".]

A.

D.

E.

G.

H.

X.

Y.