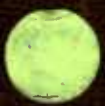
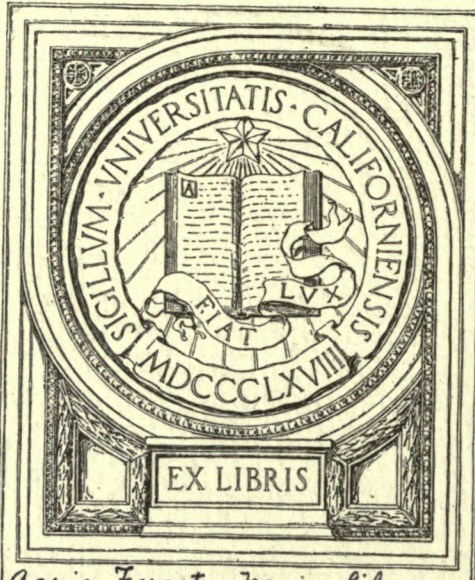


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WOOD-USING INDUSTRIES OF MONTANA INCLUDE A BROAD RANGE OF UTILITY

The study upon which this report is based was undertaken by the Forest Service, United States Department of Agriculture. The statistics were compiled from data collected in the summer of 1911, covering a period of one year from January 1 to December 31, 1910, inclusive.

Preface

Lumbering, mining and agriculture are the principal industries of Montana. Lumbering and mining are confined to the western mountainous section of the state, while the fertile valleys in this region and the plains of Eastern Montana furnish agricultural crops and grazing for sheep, cattle and horses. The towns of Missoula, Kalispell, Hamilton, St. Regis and Libby are the most important lumber distributing centers. Montana produces more copper than any state in the Union. Butte, the principal city, is the largest metal mining camp in the world, and here immense quantities of timber are consumed in developing the mines.

Montana's standing timber approximates 65,600,000,000 feet, board measure; of this, 21,800,000,000 feet are privately owned, the National Forests contain about 39,500,000,000 feet, and the stand on other government lands, including Indian and military reservations approximates 5,800,000,000 feet.

While the cut of lumber in Montana is comparatively small, the state yields a large output in proportion to its population, which in 1910 was 376,053 persons. Montana ranked twenty-eighth in the list of states arranged in the order of their lumber cut.

Table 1 shows the lumber cut of the state for 1908, 1909 and 1910:

TABLE I.

Quantity M ft., B. M.			Per Cent of Increase.		Per Cent Total Cut in United States.		
1910	1909	1908	1909 to 1910	1908 to 1909	1910	1909	1908
319,089	308,582	311,533	3.4	-0.9	0.8	0.7	0.9
-Decrease.							

In 1910, 140 active mills reported the lumber cut; in 1909, 180 mills were operating, and in 1908, 173 mills reported.

The lumber cut of Montana in 1910 was made up of ten species and each contributed the following amounts of sawed lumber:

Species.	Cut M Feet.
Western yellow pine	135,817
Western larch	99,283
Douglas fir	53,070
White fir	13,589
Engelmann spruce	10,273
Western white pine.....	3,090
Lodgepole pine	2,380
Black hemlock	1,201
Black cottonwood	260
Western red cedar	126
Total	319,089

In addition to lumber, the mills of this state produced 40,876,000 shingles and 533,000 shingles.

Statistics on the amount of wood consumed in the form of mine timbers, poles, railway ties, fence posts, fuel and for other purposes not subsequently mentioned in this report, are not available. Large quantities of lodgepole pine, western larch, Douglas fir, western yellow pine, Engelmann spruce, and small quantities of other species were used in working the mines of the state and for poles, railway ties and construction work, firewood and general purposes.

The mines at Butte, Montana, annually consume approximately 70,000,000 feet of lumber, 240,000 stulls, averaging 9 inches in diameter and from 14 to 16 feet long, and 150,000 lagging poles 3 inches in diameter and from 12 to 16 feet long. It is estimated that there are 1,624,000,000 board feet of sawed timber, stulls and lagging underground in the mines of the Butte camp, divided as follows: Sawed lumber, 1,500,000,000 board feet; 2,500,000 stulls containing 100,000,000 board feet, and 2,000,000 lag poles containing 24,000,000 board feet.

Commercial Woods of Montana

Western Yellow Pine

Western yellow pine grows in all states west of the Great Plains. In Montana it reaches its best development in the Bitterroot and St. Regis valleys. The wood is soft, has a straight even grain, and works well under a cutting edge. In color it is light yellow, often almost white. Western yellow pine lumber shrinks and warps comparatively little in seasoning. The wood is resin-

ous, but when properly dried little difficulty is experienced from exuding resin. In 1910 over one-third of the lumber cut of Montana was made up of western yellow pine.

Western Larch

Western larch is the most abundant timber in Montana. The heaviest stands are located in the northwestern part of the state in the vicinity of Kalispell. The texture of the wood renders it less adaptable to general mill work than western yellow pine or western white pine, but on account of its comparative hardness it is preferred locally as a flooring material. The swelled butts common in western larch trees and the frequency of wind shakes cause considerable waste in logging operations, since it is common practice to "butt off" and discard the lower portion of the trunk. On this account the timber cuts a low proportion of uppers.

Douglas Fir

The Douglas fir cut in Montana does not furnish as high a quality of lumber as that grown in Oregon and Washington. The better quality of Montana Douglas Fir is used for flooring and finish, but most of it is used as rough lumber for construction purposes.

White Fir

White fir is found in small quantities in mixture with other species in the mountains of Western Montana. It is cut occasionally in logging other timber and manufactured into common boards and house framing, but contributes only about ten per cent of the total cut of lumber in the state.

The wood is light in weight, soft and generally coarse grained, white or light brown in color and straight grained. It is practically free from pitch, works well with cutting tools and has prospects as a pulp wood.

Engelmann Spruce

Engelmann spruce finds its best development in Northern Montana and Idaho. It forms extensive stands at high elevations, but has been little exploited thus far. In dense stands a straight, slender, clear trunk is formed, which is admirable for lumber manufacture.

The wood is pale reddish yellow in color, light in weight, straight and close grained, but not strong or durable. It is practically odorless and contains no pitch. It furnishes less than 10 per cent of the lumber sawed in the state at the present time, and is manufactured principally into boards.

Western White Pine

The quantity of western white pine manufactured in Montana sawmills is small compared with the amount of this species manufactured in Idaho, where the largest stands of this species are found. The wood is generally manufactured into shop lumber and plain surfaced forms for supplying wood-working plants in Montana and elsewhere throughout the United States. Western white pine is one of the finest soft woods known to this country, and because of its high value it is not employed where the cheaper woods will serve.

The wood is almost free from resin and is fine grained and soft. It can be easily dried and has little tendency to shrink or warp. In color it is white or light yellow. It is neither strong nor stiff as compared with Douglas fir or western yellow pine, and is very light in weight. For purposes where a light, soft, even-grained wood with little tendency to shrink or warp is required, the white pine of Montana and Idaho is the equal of the white pine of the Northeast and the Lake States, which has for so long supplied the demands of Eastern manufacturers.

Lodgepole Pine

While lodgepole pine contributes little to the lumber cut of the state, this wood is probably the most important in its general uses. The species is found in quantities throughout the forested regions of Montana and is extensively employed for posts, poles, firewood and in the many mines. It is sawed into rough building material. This wood has excellent prospects of becoming highly serviceable as a pulp wood for use by the sulphite and mechanical processes of manufacture.

Lodgepole pine is slightly resinous and is not durable without preservative treatment, especially when in contact with the soil. It is fairly heavy in weight, close, straight grained and easily worked. In color it varies from light yellow to pale brown. The taper of the tree and its strength recommend it for poles, provided the butts are given a preservative treatment.

Black Hemlock

Black hemlock is found in small quantities at high elevations in Western Montana and is reported as contributing only 1,201,000 board feet,

or less than one-half of one per cent of the lumber cut in the state in 1910.

It is a very fine grained wood, soft, not strong and pale brown or red in color. It is manufactured principally into common building lumber. It is not greatly dissimilar to the western hemlock of the coast and could readily be substituted for that species in many products.

Black Cottonwood

Black cottonwood is of little importance to the lumbering industry of Montana. However, it serves numerous secondary wood-using industries. Considerable quantities of this species are found within the forests of the state, growing principally along the banks of streams. It is a light, soft, non-odorous wood of light color, and is admirably suited for boxes, butter tubs, slack cooperage, woodenware, excelsior and pulp.

The same species occurs in Western Oregon and Washington, and until the accessible supply was practically exhausted it was extensively used by pulp mills in that region.

Western Red Cedar

Unlike the western red cedar of the coast, this species is of little importance to the lumbering interests of Montana. A small amount is cut into lumber products by local sawmills. Montana wood-working plants depend more largely on the cedar imported from the State of Washington, where the trees grow to much larger size. The small trees of Montana yield excellent pole and post forms, and it is for these purposes that the local cedar serves its best use.

The wood is straight and rather coarse grained, light in weight and dark brown or almost red in color. It is fairly strong and very durable in contact with the soil or in exposed situations.

The western red cedar furnishes the standard pole of the Western United States. The natural taper of the tree and its durability, combined with the reasonable strength of the wood, recommend it for this purpose. Its durability and easy splitting properties are its principal assets for use as posts. While extensively used in the manufacture of shingles in Western Washington, the small size of the trees occurring in Montana and the quality of the wood prevent the development of the shingle industry in that state.

Wood-Using Industries

Only a small quantity of products manufactured wholly or in part from wood are used in the state on account of its comparatively small population. With the exception of planing mills, the industries in the state which manufacture articles from wood are few in number and generally small in size. The higher class of wood products such as furniture, fixtures, vehicles and agricultural implements, are largely imported from other states.

Planing Mill Products

Montana sawmills generally operate planing mills for further manufacturing portions of the cut of rough lumber. These planing mills consume a considerably larger amount of wood than any of the other wood-using industries, but the nature of their products and the mixture of like forms from different species prohibit an accurate compilation of the amount of each species manufactured into the different forms. The planing mill products include flooring, siding, finish, ceiling, rustic, shop and factory lumber, all forms of dressed or matched stock, battens, tank stock, molding and general mill work. Fully 25 per cent of the lumber cut by sawmills is further manufactured into planing mill products.

Boxes

Five woods are used in the manufacture of boxes and crates in Montana. All are soft woods and the entire supply is grown within the state. Box woods should be light and strong, hold nails well, and should be cheap. In general, the woods used combine these requirements. The principal box wood, western yellow pine, supplies 82.79 per cent of all of the wood consumed annually by Montana's box factories. This is an exceptionally good box wood and is serviceable in the manufacture of all forms of boxes.

The boxes produced in the state are employed largely for fruit and packing purposes. Some butter boxes are made from western larch and Engelmann spruce. The heavier packing boxes and crates are generally made from western larch or Douglas fir, while apple boxes are made from all species, but principally from western yellow pine and western white pine. Western white pine and western yellow pine yield superior boxes for the packing of high class articles.

The average price per thousand of all species delivered at box factories was \$11.50. Douglas fir, with an average price of \$17.75, was the most expensive wood used, while western yellow pine, which furnished a preponderance of the demand for box wood, costs less than any of the other species and was delivered at an average price of \$10.67 per thousand feet.

Montana planing mills produce large quantities of lumber which is manufactured into box shooks and shipped outside the state before being assembled. These are not included in this report.

WOOD-USING INDUSTRIES OF MONTANA.

Table II represents only wood used in the actual construction of finished boxes or crates in Montana.

TABLE II—BOXES.

Kinds of Wood.	Quantity Used Annually—Feet, B. M.	Quantity Used Annually—Per Cent.	Average Cost—Per 1,000 Feet.	Total Cost—f.o.b. Factory	Grown in State—Feet, B. M.	Grown Out of State, Feet, B. M.
Western Yellow Pine.....	2,233,000	82.79	\$10.87	\$23,226	2,233,000	.....
Western Larch.....	164,000	6.08	15.66	2,568	164,000	.....
Engelm'n Spruce.....	130,000	4.82	15.00	1,950	130,000	.....
West. W. Pine.....	120,000	4.45	15.00	1,800	120,000	.....
Douglas Fir.....	50,000	1.86	17.75	887	50,000	.....
Total.....	2,697,000	100.00	\$11.50	\$31,031	2,697,000	.....

Sash and Doors

While the woods native to Montana are highly serviceable for supplying the demand for sash and doors, and quantities of these are manufactured in the state, a large proportion of the sash and doors made from Montana woods are made up in other states. Within the state more than one and one-half million feet of wood are used annually in the production of sash and doors. Western yellow pine locally grown furnishes 54.73 per cent of the total quantity of wood employed by this industry. Douglas fir supplies 40.74 per cent, and of the 667,000 feet of this wood used annually 637,000 feet are imported from Western Oregon and Washington, where the timber is superior in quality to the local Douglas fir.

Wood suitable for sash and doors must be fairly strong, straight-grained and clear, and must work easily with machine and hand tools. The wood should retain its form permanently after seasoning without shrinking or warping and in general should show a pleasing grain when finished. Where a natural grain finish is desired by staining, Douglas fir or eastern oak is employed; where the doors are to be painted or varnished western yellow pine or western white pine is used.

Western larch is used for sash and doors in only small amounts, although it is well suited for the purpose. It is considered equal to Douglas fir in beauty of grain when properly finished.

TABLE III—SASH AND DOORS.

Kinds of Wood.	Quantity Used Annually—Feet, B. M.	Quantity Used Annually—Per Cent.	Average Cost—Per 1,000 Feet.	Total Cost—f.o.b. Factory	Grown in State—Feet, B. M.	Grown Out of State, Feet, B. M.
W. Yellow Pine...	896,000	54.73	\$34.29	\$30,720	896,000	.....
Douglas Fir.....	667,000	40.74	30.80	20,543	30,000	637,000
West. White Pine.....	50,000	3.01	15.00	750	50,000	.....
Western Larch.....	20,000	1.22	15.00	300	20,000	.....
Eastern Oak.....	5,000	.30	140.00	700	.....	5,000
Total.....	1,638,000	100.00	\$32.32	\$52,940	996,000	642,000

Fixtures

Eight woods are used for the production of fixtures by factories in Montana. Of these, the only wood grown in the state is western yellow pine. Only two soft woods are used, Douglas fir and western yellow pine. Douglas fir supplies 45.45 per cent of all of the wood used annually for fixtures, and all of it is obtained from Western Washington and Oregon.

Eastern oak is imported at an average cost of \$77.11 per thousand feet, delivered at the factory, and furnishes 29.3 per cent of all of the wood used for fixtures. Cherry and walnut are used sparingly and are the most expensive woods employed. These are purchased, mixed, at a price of \$130 per thousand feet, delivered at the factory. Producers of fixtures in Montana pay \$64,151 per year for their raw material, or an average price of \$47.99 per thousand feet.

Wood used for fixtures is generally more expensive than woods used for other purposes. Beauty of grain and finishing properties enhance the value of fixture woods. Only clear material of high grade is employed for exposed parts.

TABLE IV—FIXTURES.

Kinds of Wood.	Quantity Used Annually—Feet, B. M.	Quantity Used Annually—Per Cent.	Average Cost—Per 1,000 Feet.	Total Cost—f.o.b. Factory	Grown in State—Feet, B. M.	Grown Out of State, Feet, B. M.
Douglas Fir.....	608,000	45.45	\$30.14	\$18,325	.....	608,000
Eastern Oak.....	392,000	29.30	77.11	30,227	.....	392,000
W. Yellow Pine.....	205,000	15.30	35.10	7,195	205,000	.....
Western Birch.....	95,000	7.11	56.15	5,334	.....	95,000
Maple.....	36,000	2.69	80.54	2,900	.....	36,000
Blk. Cottonwood.....	1,500	.12	70.00	105	.....	1,500
Cherry-Walnut.....	500	.03	130.00	65	.....	500
Total.....	1,338,000	100.00	\$47.99	\$64,151	205,000	1,133,000

Coffins and Coffin Boxes

The manufacture of coffins and coffin boxes in Montana ranks fourth among the state's industries

tries in the quantity of wood consumed annually. Only two species contribute to supply this industry and both grow within the state, although quantities of each are imported from other states. Western white pine is employed principally for coffin boxes, while western red cedar is used for coffins. Western white pine furnished 79.8 per cent of the wood used for this purpose, while western red cedar supplied 20.2 per cent. The average cost of woods used for coffins and coffin boxes in Montana was \$18.38 per thousand feet delivered, and the total cost of all wood used for this purpose annually within the state was \$2,003.

Wood for coffin boxes must be light in weight, soft and straight grained and must hold nails well. In fact, any wood suited to the manufacture of packing boxes can be used for coffin boxes. For coffins, however, a higher class wood is generally employed, and western red cedar supplies the demand for low grade coffins only. This is generally covered with cloth after being shaped in the form of a casket. Its principal recommendations for this use are its easy working properties, light weight and durability. This cedar is used in quantities throughout the Northwest for caskets. White pine is also serviceable for caskets when the finished box is to be covered with cloth. High grade caskets made of hardwoods or other materials are not produced locally.

TABLE V—COFFINS AND COFFIN BOXES.

Kinds of Wood.	Quantity Used Annually—Feet, B. M.	Quantity Used Annually—Per Cent.	Average Cost—Per 1,000 Feet.	Total Cost—f.o.b. Factory	Grown in State—Feet, B. M.	Grown Out of State, Feet, B. M.
West. White Pine.....	87,000	79.8	\$18.22	1,585	67,000	20,000
West. Red Cedar.....	22,000	20.2	19.00	418	3,000	19,000
Total.....	109,000	100.0	\$18.38	\$2,003	70,000	39,000

Cabinets

Four woods are used in Montana for cabinet work. Cottonwood, the only broad leaf tree employed, furnishes 62.5 per cent of all of the wood used for this purpose. This wood is all grown within the state. The only wood imported by cabinet makers is Douglas fir, which supplies 2,000 feet, or 5 per cent, of the total consumption. Only high grade material is employed for cabinet work, as is indicated by the average price paid in Montana, which is \$37 per thousand feet for all woods. The industry is not extensive, and it is significant that no Eastern hardwoods, such as oak, walnut, cherry, and imported woods, such as mahogany, are employed. This indicates the somewhat low grade cabinets produced in the state. High class products of this nature are imported from regions affording a better class of wood.

Cabinet woods are generally selected because of the beauty of their grain when stained, or their ability to take a smooth finish. They should work well and retain their form when finished. High grade clear stock is generally demanded.

In addition to the cabinet woods reported in Table VI, large amounts of local woods are used by carpenters and other woodworkers for built-in cabinet work in stores and houses.

Table VI

Kinds of Wood.	Quantity Used Annually—Feet, B. M.	Quantity Used Annually—Per Cent.	Average Cost—Per 1,000 Feet.	Total Cost—f.o.b. Factory	Grown in State—Feet, B. M.	Grown Out of State, Feet, B. M.
Blk. Cottonwood.....	25,000	62.5	\$30.00	750	25,000	.....
W. Yellow Pine.....	10,000	25.0	50.00	500	10,000	.....
West. Red Cedar.....	3,000	7.5	50.00	150	3,000	.....
Douglas Fir.....	2,000	5.0	40.00	80	.....	2,000
Total.....	40,000	100.0	\$37.00	\$1,480	38,000	2,000

Trunks and Cases

While most of the trunks and cases which ultimately reach the consumer in the state of Montana are imported, nevertheless trunk manufacturers in the state consume 27,000 board feet of lumber annually. Of the five species employed by trunk makers in Montana, four are hardwoods. The only softwood used is western white pine, which goes into trunk boxes and trays. Elm and cherry are used for slats, while cottonwood, in the form of three-ply veneer, and bass wood are employed for boxes and trays.

The requirements of a good box wood are essential for trunk boxes and trunk trays. They must be light in weight, straight grained and clear, and must hold nails well. Trunk slats must be hard and strong and resist abrasion.

Trunk boxes and trays made of white pine grown in the state consume 74 per cent of all the wood used by this industry. While all of the cottonwood used for cabinet work in Montana was grown within the state, that used by trunk-makers all came from outside the state.

The average price of woods used for trunks and cases in Montana was \$27.74 per thousand feet. Basswood at \$60 per thousand feet f. o. b. factory

was the most expensive wood used, while white pine at \$22 per thousand feet was the cheapest.

The manufacture of trunks and cases is confined almost entirely to the cities of Missoula, Butte and Great Falls.

TABLE VII—TRUNKS AND CASES.

Kinds of Wood.	Quantity Used Annually—Feet, B. M.	Quantity Used Annually—Per Cent.	Average Cost—Per 1,000 Feet.	Total Cost—f.o.b. Factory	Grown in State—Feet, B. M.	Grown Out of State, Feet, B. M.
West. White Pine.....	20,000	74.	\$22.00	\$440	20,000	.....
Blk. Cottonwood.....	4,000	14.8	45.00	180	.....	4,000
Elm.....	1,500	5.6	32.00	48	.....	1,500
Basswood.....	1,000	3.7	60.00	60	.....	1,000
Hickory.....	500	1.9	42.00	21	.....	500
Total.....	27,000	100.0	\$27.74	\$749	21,000	6,000

Furniture

Only 21,000 feet of wood is used annually in Montana for furniture, and practically all of this goes into furniture repairs rather than the manufacture of new stock. Practically all of the furniture used in the state is manufactured in Eastern markets.

Only two woods are used for furniture repairs, Douglas fir and maple. The Douglas fir is obtained from the west coast of Oregon and Washington, and the maple in Eastern markets. The first of these supplies 71.4 per cent of the wood used at an average price of \$40 per thousand feet. The second supplies 28.8 per cent at an average price of \$125 per thousand feet. The wood is obtained as clear stock, as is indicated by the high price.

TABLE VIII—FURNITURE.

Kinds of Wood.	Quantity Used Annually—Feet, B. M.	Quantity Used Annually—Per Cent.	Average Cost—Per 1,000 Feet.	Total Cost—f.o.b. Factory	Grown in State—Feet, B. M.	Grown Out of State, Feet, B. M.
Douglas Fir.....	15,000	71.4	\$40.00	600	.....	15,000
Maple.....	6,000	28.6	125.00	750	.....	6,000
Total.....	21,000	100.0	\$64.34	\$1,350	.....	21,000

Wagon Stock

Montana wagon makers use only 10,000 feet of lumber annually and this is employed entirely in the production of specific parts for repair work. Five species of hardwoods supply the entire demand for wagon stock and no softwoods are reported by wagon repairers in the state. Eastern oak, which is employed in the running gear, for poles, felloes and single and double trees, supplies 40 per cent of the wood used. For body work on wagons and automobiles yellow poplar and basswood are employed. These furnish, respectively, 18 per cent and 7 per cent of the total consumption.

All woods used for wagon stock in Montana are imported from the East at an average cost of \$94.71 per thousand feet delivered. Hickory and maple are used interchangeably for repairs to the running gear of wagons. Woods used for wagon wheels and axles, single and double trees and poles are selected for their strength, stiffness and toughness, while woods used for wagon beds, boxes and the bodies of automobiles and buggies are generally comparatively soft with good finishing and working qualities and susceptible to bending.

TABLE IX—WAGON STOCK.

Kinds of Wood.	Quantity Used Annually—Feet, B. M.	Quantity Used Annually—Per Cent.	Average Cost—Per 1,000 Feet.	Total Cost—f.o.b. Factory	Grown in State—Feet, B. M.	Grown Out of State, Feet, B. M.
Eastern Oak.....	4,000	40	\$90.00	\$360	.....	4,000
Hickory.....	3,000	30	103.34	325	.....	3,000
Yellow Poplar.....	1,800	18	100.00	180	.....	1,800
Basswood.....	700	7	65.00	45.00	.....	700
Maple.....	500	5	75.00	37.50	.....	500
Total.....	10,000	100	\$94.71	\$947.50	.....	10,000

Miscellaneous

The miscellaneous consumption of wood in the state is chiefly for veneer, patterns and excelsior. One hundred and eighty-five thousand feet, board measure, are manufactured into these three commodities annually. Cottonwood, the only local hardwood used in Montana, supplies practically the entire demand for veneer and excelsior wood, and 180,000 board feet are used annually for these purposes. White pine used for patterns is grown outside the state, and the annual consumption is only 5000 feet. This wood is purchased at an average price of \$40 per thousand feet, delivered to the consumer.

Cottonwood is quite generally employed throughout the Northwest for veneer and excelsior. In fact, for excelsior it is used almost to the exclusion of other species. Cottonwood veneer supplies the berry box and basket trade, and is some-

WOOD-USING INDUSTRIES OF MONTANA.

times used for cores to be covered with veneers of higher grade woods.

Woods for patterns must work easily with hand tools and must retain their form after manufacture. The white pine of Idaho and Montana is a superior wood for this purpose and is employed in quantities throughout the Western United States. Its principal competing species are western red cedar and redwood. Wood for the manufacture of excelsior must be light in weight and tough. Veneers for baskets or berry boxes must be strong, tough, light and odorless. Cottonwood is the best species available in the Northwest for excelsior, berry boxes and baskets.

TABLE X—MISCELLANEOUS.
(Veneer, Patterns and Excelsior.)

Kinds of Wood.	Quantity Used Annually—Feet, B. M.		Average Cost—Per 1,000 Feet.	Total Cost—f.o.b. Factory	Grown in State—Feet, B. M.	Grown Out of State, Feet, B. M.
	Quantity Used Annually—Feet, B. M.	Quantity Used Annually—Per Cent.				
Blk. Cottonwood.	180,000	97.4	\$13.37	\$ 2,406	180,000	.....
West. White Pine.	5,000	2.6	40.00	200	.....	5,000
Total.....	185,000	100.0	\$14.09	\$ 2,606	180,000	5,000

Summary of Woods Used by Manufacturing Plants

Table XI shows the quality and cost of each species employed by Montana wood-using industries exclusive of planing mills; also the proportion grown in the state and the proportion imported. The total quantity, 6,065,000 board feet, indicates the present development of wood-using factories in the state. Of this quantity, 64.45 per cent was grown in the state and 32.55 per cent imported. Eastern hardwoods and Douglas fir from the Pacific Coast comprise practically all the woods imported.

The total cost of all woods used by secondary industries was \$157,257, with an average cost of \$25.93 per thousand feet. Cherry and walnut imported from the East and used for fixtures, are the most expensive woods used in the state, and cost \$130 per thousand feet, delivered at the factory. The cheapest wood employed by the industries of Montana is western larch, with an average cost of \$11.14 per thousand feet delivered. Practically all of the western larch is used for boxes and crates.

Western yellow pine, all of which was grown within the state, furnished 55.1 per cent of all the wood used by secondary industries, while Douglas fir, 94.04 per cent of which was imported, furnished 22.1 per cent of the wood used. Only 5.96 per cent of the Douglas fir reported for the state was locally grown.

Black cottonwood is the only local hardwood employed by Montana industries. This species furnished 3.48 per cent of the wood consumed by the industries.

Sixteen distinct species of wood were reported for Montana and nine of these were supplied entirely from without the state.

The small diversity of wood-working plants and the low grade of articles produced is indicated by the minor consumption of hardwoods, which supply only 5.91 per cent of the total annual consumption of wood as reported in Table XI. While western white pine and western larch are cut in quantities by Montana sawmills, these two important native species yielded only 7.71 per cent of the total consumption by secondary industries. Western red cedar furnished only 0.41 per cent of all of the wood used in the wood manufacturing industries of Montana. Seventy-six per cent of the western red cedar was imported, chiefly from Western Washington and Idaho. The cedar grown locally is employed principally for poles, piling and posts.

TABLE XI—SUMMARY OF WOODS USED BY MANUFACTURING PLANTS IN MONTANA.

Kinds of Wood		Quantity Used Annually		Average Cost per 1000 Feet	Total Cost f. o. b. Factory	Grown in State Per Cent	Grown out of State Per Cent
Common Name	Botanical Name	Feet B. M.	Per Cent				
Western Yellow Pine.....	Pinus ponderosa.....	3,344,000	55.1	\$18.58	\$62,133	100	.....
Douglas Fir.....	Pseudotsuga taxifolia.....	1,342,000	22.1	30.11	40,407	5.96	94.04
Eastern Oak.....	Quercus.....	401,000	6.61	78.03	31,290	.....	100
Western White Pine.....	Pinus monticola.....	282,000	4.67	16.96	1,783	45.6	51.4
Black Cottonwood.....	Populus trichocarpa.....	210,500	3.48	16.34	3,439	98.55	1.45
Western Larch.....	Larix occidentalis.....	184,000	3.04	15.59	2,868	100	.....
Engelmann spruce.....	Picea engelmannii.....	130,000	2.16	15.00	1,950	100	.....
Western Birch.....	Betula lenta.....	95,000	1.56	56.15	5,334	.....	100
Maple.....	Acer rubrum.....	42,500	.72	87.89	3,735	.....	100
Western Red Cedar.....	Thuja plicata.....	25,000	.41	22.72	568	24	76
Hickory.....	Hicoria.....	3,500	.06	98.92	346	.....	100
Yellow Poplar.....	Liriodendron tulipifera.....	1,800	.03	100.00	180	.....	100
Basswood.....	Tilia americana.....	1,700	.03	62.06	106	.....	100
Elm.....	Ulmus americana.....	1,500	.02	32.00	48	.....	100
Cherry.....	Prunus serotina.....	.....	.....	.....	.....	.....	.....
Black Walnut.....	Juglans nigra.....	500	.01	130.00	65	.....	100
Total.....		6,065,000	100.00	\$25.93	\$157,257	67.47	32.53

Consumption by Industries.

The manufacture of boxes in Montana takes 44.5 per cent of all of the wood reported as used by the secondary wood-consuming industries of the state. The box industry is fostered by the supply of excellent box woods, such as western yellow pine and western white pine and the local or nearby demand for boxes. The grade of lumber required by this industry is low and the box woods

used in the state are purchased at an average price of \$11.50 per thousand feet, delivered at the factory.

Eight specific wood-consuming industries are reported within the state, while three industries manufacturing veneer, patterns and excelsior are classified as miscellaneous.

The manufacture of sash and doors is second only in importance to the production of boxes, and sash and door factories take 27 per cent of the wood annually consumed. The excellent quality of locally-grown woods favors the sash and door industry. For high grade softwood sash and doors no wood is superior to western yellow pine and western white pine. The local demand for such doors is extensive because of the natural settlement of the state, and quantities also find distribution throughout the United States.

Table XII shows the apportionment of consumption by the industries of the state and the cost of the lumber delivered for consumption at the factories.

The wood used for wagon stock has the highest average price, which is \$94.71 per thousand feet. This industry is supplied entirely by Eastern hardwoods, which must bear a heavy freight rate before delivery, and are, furthermore, high priced in the region of their production. Woods used for furniture repair rank second in their average price at the factory. The total cost of all wood used annually by the secondary industries of Montana is \$157,257.

TABLE XII—SUMMARY OF WOOD USED BY MONTANA INDUSTRIES.

Industry	Quantity Used Annually		Average Cost Per 1000 Ft. f. o. b. Factory	Total Cost f. o. b. Factory
	Feet B. M.	Per Cent		
Boxes.....	2,697,000	44.50	\$11.50	\$31,031
Sash and Doors.....	1,638,000	27.00	32.32	52,940
Fixtures.....	1,338,000	22.05	47.99	64,151
Miscellaneous.....	185,000	3.05	14.09	2,606
Coffin and Coffin Boxes.....	109,000	1.80	18.38	2,003
Cabinet Work.....	40,000	.66	37.00	1,480
Trunks and Cases.....	27,000	.44	27.74	749
Furniture.....	21,000	.34	64.34	1,350
Wagon Stock.....	10,000	.16	94.71	947
Total.....	6,065,000	100.00	\$25.93	\$157,257

Kinds of Wood Used by Different Industries.

Table XIII shows the percentage apportionment of the kinds of wood used by the various industries of the state. Douglas fir and western white pine each supply five different industries, but are employed in like industries in only two instances,

TABLE XIII—PER CENT OF DIFFERENT WOODS USED BY EACH INDUSTRY.

Species	Box	Cabinet Work	Coffins and Coffin Boxes	Fixtures	Furniture	Sash and Doors	Trunks and Cases	Wagon Stock	Miscellaneous
Western Yellow Pine.....	66.80	.27	.....	6.13	.....	26.80	.....	.....	.....
Douglas Fir.....	3.73	.15	.....	45.30	1.12	49.70	.....	.....	.....
Eastern Oak.....	.....	.....	.....	97.79	.....	1.25	.....	.98	.....
Western White Pine.....	42.53	.....	30.86	.....	.....	17.74	7.09	.....	1.78
Western Larch.....	89.00	.....	.....	.....	.....	11.00	.....	.....	.....
Black Cottonwood.....	.....	11.90	.....	.70	.....	.....	1.90	.....	85.50
Engelmann Spruce.....	100.00	.....	.....	.....	.....	.....	.....	.....	.....
Western Birch.....	.....	.....	.....	100.00	.....	.....	.....	.....	.....
Eastern Maple.....	.....	.....	.....	84.40	14.43	.....	.....	.....	1.17
Western Red Cedar.....	.....	12.00	88.00	.....	.....	.....	.....	.....	.....
Basswood.....	.....	.....	.....	.....	.....	.....	58.80	41.20	.....
Hickory.....	.....	.....	.....	.....	.....	.....	14.20	85.80	.....
Yellow Poplar.....	.....	.....	.....	.....	.....	.....	.....	100.00	.....
Elm.....	.....	.....	.....	.....	.....	.....	100.00	.....	.....
Cherry—Black Walnut.....	.....	.....	.....	100.00	.....	.....	.....	.....	.....
Total.....	44.50	.66	1.80	22.05	34	27.00	.44	.16	3.05

namely, for boxes and for sash and doors. Western yellow pine, which supplies 55.1 per cent of all of the woods used in the state, is employed in four different industries; 66.8 per cent of all of the western yellow pine reported is manufactured into boxes and 26.8 per cent is consumed by sash and door factories. Engelmann spruce, western

trunks. Eighty-five and five-tenths per cent of all of the cottonwood reported is employed for veneers and excelsior, while 11.9 per cent of it is used for cabinet work. A greater variety of woods is used for fixtures than for any other manufactured wooden commodity. None of the industries reported employ less than two species.

Summary of Average Prices

Table XIV gives a summary of the average prices paid for each kind of wood by the various industries of the state. The range in the price of the same wood indicates the varying quality required by the various industries. Native species, such as western yellow pine and western white pine, vary greatly in price according to the use intended. Yellow pine for boxes brought an average delivered price of \$10.67, while cabinet-makers employing this wood paid \$50 per thousand feet for the quality of material they required. Western white pine for boxes cost \$15 per thousand feet, while pattern-makers paid \$40 per thousand feet for the same species.

In general, the box industry paid the minimum price for its raw material, while the material employed in the repair of wagons brought the highest average price. Woods obtained from outside the state were generally the most expensive employed, both on account of freight charges and their relative scarcity.

The National Forests of Montana

The area of the state of Montana is given as 93,806,080 acres, 93,296,640 acres of land and 509,440 acres of water surface. Twenty and five-tenths per cent, or 19,205,100 acres of Montana's gross area, is included in the National Forests. Of this area approximately 3,000,000 acres are in private ownership, leaving a net of 16,192,503 acres of National Forest land. These forests are confined chiefly to the more mountainous western and southwestern sections of the state, and contain little or no agricultural land.

The following species occur in large quantities on the National Forests: Western yellow pine, western white pine, western larch, lodgepole pine, Engelmann spruce and Douglas fir. The estimated stand for all species of timber on the National Forest areas of Montana is approximately 39,500,000,000 feet, board measure.

Timber on the National Forests is for sale where it is mature or dead, and can be cut without injury to streamflow. Contracts for short or long term periods are granted, depending upon the quantity of timber sold and the cost of improvements necessary to get it to market. All timber over \$100 in value is advertised for thirty days

for competitive bids. Smaller amounts than \$100 worth can be sold directly by the forest officers on the ground. Certain restrictions in cutting are required in order to insure protection from fire and to young growth, and to provide for reproduction. These restrictions are established practical methods and have been applied successfully in a large number of cases. Timber is scaled, and paid for on that basis. Advance deposits sufficient to cover approximately three months' cut is the general plan of payments required, although this may be modified to meet special requirements in particular cases. Information concerning the bodies of timber available for cutting may be obtained from the District Forester at Missoula, Montana, or from the local Forest Supervisor.

In 1910, 36,754,000 feet of timber were cut on the National Forests in Montana, while the sawmills of the state reported a cut of 319,089,000 feet. The greater part of the timber cut on the National Forests is sawed into lumber. A large amount, however, is used as mining timbers in the mining regions around Butte, Anaconda, Great Falls and Red Lodge. The following list shows the classes of material cut in 1910:

Saw timber, thousand feet, B. M.....	36,754
Poles, number.....	135,694
Posts, number.....	191,721
Cordwood, cords.....	24,005
Total, including all classes, M ft. B. M.....	54,733

Uses of Different Kinds of Wood as Reported by the Wood-Using Manufacturers of Montana

Basswood—Automobile bodies, trunk boxes, trunk trays, vehicle body sides.

Black Cottonwood—Berry boxes, cabinet work, chip baskets, drawer bottoms, drawer sides, excelsior, fixtures, furniture, interior finish (back-

United States Department of AGRICULTURE

Forest Service

HENRY S. GRAVES, *Forester*



The
WOOD-USING
Industries of
Idaho

By C. W. DUNNING

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Timber Resources and Wood-Using Industries of State of Idaho

The state of Idaho is distinctly a lumbering, mining and agricultural state. The lumbering and mining regions are confined mostly to the northern and central portions of the state, while horticulture and agriculture are the pursuits in the southern part. Idaho has a population of about 325,594 people and is one of the least densely populated states of the country. The natural environment of the state and its small population precludes at this time an extensive development of manufacturing industries. The manufacture of lumber is by far the most important of the industries represented here.

It is estimated that the stand of timber in Idaho approximates 129 billions of board feet. Of this amount 71 billion feet are within the National Forests, 8 billion on other government lands, and 50 billion are privately owned. It is the privately owned timber which furnishes the great bulk of the lumber output of the state, although government timber is coming into the market more and more each year through sales from the National Forests by the Forest Service.

As a rule privately owned timber is immediately accessible to the mills, while the greater quantities of government stumpage lie in more inaccessible mountainous regions.

It is the purpose of this report to present data regarding the industries of the state which further manufacture sawmill and woods products into finished articles of general use, made wholly or in part of wood, and to correlate data concerning like industries to show the present uses of various species of wood and their suitability for different manufactured products. The Bureau of the Census, United States Department of Commerce and Labor, annually compiles statistics of the production and consumption of lumber and other forest products which are not included in this study.

The following table contained previously obtained statistics from the lumber industry of the state:

Lumber Cut of Idaho for Various Years.

Quantity, feet, D. M.			Percent of Increase		Percent of Total Cut in United States		
1910	1909	1908	1909 to 1910	1908 to 1909	1919	1909	1908
745,984,000	645,800,900	518,625,000	15.5	24.5	1.9	1.5	1.6

Idaho ranked twenty-first of all the states in lumber output in 1910. Over 229 active sawmills are represented in the cut reported for that year. In addition to lumber, Idaho mills produced 84,134,000 lath and 60,425,000 shingles during 1910. The state's lumber cut in 1910 is shown below by species:

Species	Feet
Western yellow pine	280,533,000
Western white pine	232,442,000
Western larch	100,512,000
Douglas fir	62,793,000
Western red cedar	38,831,000
White fir	25,266,000
Western hemlock	3,423,000
Lodgepole pine	934,000
Engelmann spruce	842,000
Cottonwood	408,000
Total	745,984,000

In addition to lumber, lath and shingles, Idaho's forests furnish large quantities of poles, piling and posts, mine timbers, hewed ties and other forms of forest products not reported by the census or included in subsequent statistics of this report. Northern Idaho is one of the largest pole producing regions of the country, and Western red cedar poles produced here are distributed throughout the United States. The longest poles of the country are obtainable in this region.

The principal woods of the state, namely, Western yellow pine and Western white pine, are employed in greater quantities than other woods by secondary wood consuming industries operating within the state.

The species of timber on National Forests are practically the same as those on private lands. Western yellow pine, white pine, Douglas fir, larch, spruce and lodgepole form the bulk of the stands of timber. Owing to the absence of hardwoods, no substitutes from the National Forests are available to replace the species already in use. The timber on the National Forests is sold wherever it is old and mature under regular contracts in which the operator removes the timber as he pays for it at a stipulated price per thousand feet, determined upon competitive bidding.

The study upon which this report is based was undertaken by the Forest Service, United States Department of Agriculture, the work being done under the direction of J. B. Knapp, Assistant District Forester, Portland, Oregon. The statistics were compiled from data collected in the summer of 1911, covering a period of one year from January 1 to December 31, 1910, inclusive.

Detailed information can be obtained through any authorized forest officer.

Planing Mill Products.

In Idaho, sawmills generally operate planing mills which are employed in remanufacturing rough lumber into many forms for final use. These planing mill products include surfaced dimension and lumber of all forms; flooring, siding, rustic, finish, ceiling, shop and factory lumber, dressed and matched stock, O. G. stock and battens, tank stock, finish and mouldings. Fully 25 per cent of the lumber cut of the state passes through some form of further manufacture after leaving the sawmill proper.

The nature of the milling operations and the common practice of mixing species makes it impossible to obtain authentic statistics on the amount of the various kinds of wood remanufactured into specific forms at planing mills.

Planing Mill Products by Species.

Western Yellow Pine (Pinus ponderosa).

The texture and general quality of this wood make it highly serviceable for many of the common planing mill products. Thick finish from 1 1/4 to 2 inches, inch finish, siding, flooring, factory plank or shop common, factory selects, thick common lumber, common boards, shiplap, grooved roofing and dressed and matched (D. & M.), dimension, fencing, and lath are the principal products into which western yellow pine is separated when it leaves the yard or planer. Many of these products are shipped in the rough as they come from the sawmill, but the bulk of the material is run through the planer and either surfaced or remanufactured into some of the finished forms. This renders possible a closer grading and at the same time by lightening the weight assists considerably in reducing freight charges. The grades into which western yellow pine as well as western white pine are separated as the lumber comes from the saw are:

- A Select,
- B Select,
- C Select,
- D Select.

Factory or shop lumber:

- No. 1 Common,
- No. 2 Common,
- No. 3 Common,
- No. 4 Common,
- No. 5 Common.

The first five grades called "selects" yield the largest part of the profit in lumber manufacture. Numbers 4 and 5 common scarcely pay for the cost of production, and many mills do not attempt to save them. When putting through the planing mill or sorting for final disposition these grades are redistributed into those classes above named for which they are best suited or for which the demand calls. Shiplap, grooved roofing, dressed and matched material (fencing, drop siding and poorer classes of flooring), dimension timbers and common lumber come from the "common" grades, while the other and higher classes of products usually come from the "select" grades. Other classes and grades are manufactured in smaller quantities and require less amounts of shaping or further mechanical effort.

The wood is well suited for flooring, although considerably softer than its chief competitors, Douglas fir and western larch, or even than the yellow pines of the South. Its even grain and wearing properties commend its use for flooring and it does not shrink or warp greatly after proper seasoning.

The wood is very serviceable for drop siding, and is inferior only to white pine or western red cedar for bevel siding. Its light weight, ease of working, lack of pitch, suitable grain and ability to hold its shape and to hold paint make western yellow pine one of the favorite woods for siding. Douglas fir drop siding, manufactured by coast mills, is the chief competitor in Idaho markets.

As a finishing wood, for window and door casings and baseboards it readily meets a big demand, especially when it is to be painted. Its grain figures do not enhance its value for finish

when it is desired to stain the wood, in which case it gives place to western larch and Douglas fir. Its resistance to warping and checking commend it for paneling and general finish, especially when enamel paints are used.

For shop and factory lumber the western yellow pine is in great demand for sash and door stock, cabinet work, furniture parts and general finishing and manufacturing purposes. Its even grain, smooth finish, easy working properties and resistance to warping and checking enhance its value for uses of the trades. In its general serviceability for secondary manufacturing plants requiring soft woods it is exceeded among its associated species by western white pine (Pinus monticola), for which it is often mistaken and substituted.

Common lumber of western yellow pine is often manufactured in planing mills for use as tank stock, step plank and box lumber. Large quantities of surfaced lumber are consumed for box manufacture within or without the state. Lumber consumed in the actual manufacture of boxes in the state is listed in a subsequent part of this report.

Western White Pine (Pinus monticola).

The western white pine is in many ways the equal of the eastern white pine, the superior soft wood of the United States. It is serviceable for planing mill products, more particularly shop lumber and plain surfaced forms which are later to be remanufactured into finished products by woodworking plants. Sash and door stock of western white pine has no superior in its own region and in this form large amounts of the wood are consumed by factories throughout the United States. The wood is too valuable for general work and as common lumber forms; it is in demand for cabinet work, furniture, drawing boards, patterns and numerous other similar uses.

The wood is almost free from pitch, is white or light yellow in color, fine grained and soft. It does not shrink after thorough seasoning, retains its manufactured form permanently, is very light in weight and is neither strong nor stiff when compared with western yellow pine, Douglas fir or larch, the other common species in the regions of its growth.

Western Larch (Larix occidentalis).

The western larch and Douglas fir occurring in the state of Idaho are rather inferior commercial woods when compared with the highly valuable and widely used white and yellow pines. The two species have many qualities in common and are often utilized for the same purposes, so that they are mixed in manufacture and are not separated when placed on the market. Larch, however, yields a larger percentage of clears and therefore most of the products made from the select grades are of that species and are sold as larch. The most important of these products are flooring and finish. Larch is particularly suited for these uses because of the fineness and beauty of its grain, its hardness and the small amount of pitch it contains. Its even and uniform grain and hardness cause larch flooring to be particularly serviceable. For these uses larch is quite the equal of Coast Douglas fir. Larch is also used for ceiling, beveled and drop siding and some other purposes.

Its qualities recommend it for practically the same uses throughout as those to which Coast Douglas fir is put, although the presence of other better-known woods have hitherto prevented its extensive utilization for high-grade products. The bulk of the species is cut into timbers, dimension and common lumber, for structural purposes, since the stiffness, strength, hardness and other qualities of the wood eminently adapt it for that class of work.

Douglas Fir (Pseudotsuga taxifolia).

Because of its smaller size and absence of clear length the Douglas fir manufactured by Idaho mills is inferior to the same species which forms the principal output of west coast mills, the quantity of high grade material, called "clears" on the Coast and "selects" in the Inland Empire, being a very small percent. A small amount of fir finish and similar products is manufactured along with the larch, but probably 98 per cent of the rough fir lumber from the saw mills is used in the rough or surfaced state in structural forms. Most of it is made into timbers and dimension stuff, although the larger part of the common grades of boards used locally are of this species or of larch. Douglas fir is most highly prized for mining timbers and railway cross ties, for which uses larch is considered as second choice.

Secondary Wood-Using Industries.

The industries of Idaho which consume lumber in the manufacture of their products are small in number and with but few exceptions consume no great quantity. All of the industries combined use only 19,489,800 feet of lumber annually. Of this amount 85.5 per cent is grown within the state, and the balance, 14.5 per cent, is imported from other states to serve the needs of local manufacture.

The following is a summary of the wood used in the state of Idaho, by species, and gives data which indicates the scope of the development of industries in the state which consume wood in the process of manufacture:

Table I—Summary of Kinds of Wood Used in Idaho.

KINDS OF WOOD		Quantity Used Annually		Average Cost Per 1,000 Feet	Total Cost f. o. b. Factory	Grown in Idaho Per Cent.	Grown out of Idaho Per Cent.
Common Name	Botanical Name	Feet B. M.	Per Cent.				
Western yellow pine.....	Pinus ponderosa	14,420,500	73.99	\$ 14.67	\$211,488	99.98	0.02
Western white pine.....	Pinus monticola	3,767,500	19.33	21.02	79,195	56.63	43.37
Douglas fir	Pseudotsuga taxifolia	1,039,000	5.33	30.76	31,955	2.41	97.59
Redwood	Sequoia sempervirens	100,000	.51	70.00	7,000	....	100.00
White oak	Quercus alba	74,000	.38	129.84	9,608	....	100.00
Black cottonwood	Populus trichocarpa	50,000	.26	22.00	1,100	100.00	....
Western larch	Larix occidentalis	25,000	.13	13.60	340	100.00	....
Western red cedar	Thuja plicata	8,000	.04	35.00	280	100.00	....
Philippine mahogany	Dipterocarpaceae	4,000	.02	187.50	750	....	100.00
Sitka spruce	Picea sitchensis	500	*	40.00	20	....	100.00
Black ash	Fraxinus nigra	500	*	174.00	87	....	100.00
Hickory	Hicoria	500	*	140.00	70	....	100.00
Applewood	Malus malus	300	*	26.67	8	100.00	....
Totals.....		19,489,800	100.00	\$17.54	\$341,901	85.48	14.52

* Less than 1/100 of 1%.

The total cost of all woods used by Idaho industries annually as shown by Table 1 is \$341,901, based on delivered prices. The average cost is \$17.54 per thousand feet board measure, which indicates the cheap quality of wood necessary to sustain the wood-using industries of the state. It is significant that the principal timber species of Idaho, western yellow pine, furnishes 73.99 per cent of all wood used by its industries, while western white pine, which ranks second in the importance of the commercial species of the state, furnished 19.33 per cent. No other wood is used in appreciable quantities except Douglas fir, which furnishes 5.33 per cent of the total consumption.

Only thirteen species of wood contribute raw material for the industries of the state, and it is significant that less than 1 per cent of the wood consumed is represented by six species of hardwoods. Two of these hardwoods are produced within the state, namely, black cottonwood and apple wood. Cottonwood itself constitutes about one-third of the hardwoods utilized.

While western white pine is cut in large quantities by Idaho sawmills, 43.37 per cent of the amount reported by the industries was imported from outside the state. The Douglas fir used in the state is obtained principally from the west coast. The local trees of this species yield material unsuited to the needs of such industries. Only two and forty-one one hundredths per cent of the Douglas fir was supplied by local saw mills, while the state itself supplied 97.59 per cent of the western yellow pine to its wood working plants.

Boxes and Crates, Packing.

The manufacture of boxes ranks first in the amount of wood consumed by wood-using industries in Idaho. The manufacture is confined largely to fruit boxes for use in Southern Idaho and for packing boxes, which find a local market. The home woods are eminently suited to this purpose.

Western yellow pine constitutes 98.49 per cent of the wood actually manufactured into boxes and all of the wood used for this purpose grows in Idaho. Western white pine furnishes a little less than 1 per cent and cottonwood and western larch the balance. No wood is imported by box manufacturers. The light weight and strength of western yellow pine make it most desirable for fruit boxes. Its value prohibits its use for rough packing boxes, which demand is met mostly by western larch.

In addition to the boxes manufactured in the state, large quantities of box lumber are produced in planing mills and subsequently manufactured into the finished form outside the state. The large areas of Idaho and contiguous states devoted to horticulture and the suitability of western yellow pine and other native woods for boxes indicate an expansion of this industry.

The requirements of a good box wood are strength, light weight, ability to nail without splitting, and ability to hold nails. Strength rather than light weight is a requisite of boxes used for shipping apples and other fruit, and western yellow pine is better suited than other available species. Lumber for box manufacture is obtained in rough form or surfaced on one or two sides. Widths vary up to 12 inches, and the box lumber is usually one inch thick before surfacing.

The thickness of box boards varies according to the kind of boxes manufactured, but is one inch or less.

Table II—Boxes and Crates, Packing.

Kinds of Wood.	Quantity Used Annually		Average Cost per 1000 Feet	Total Cost f. o. b. Factory	Grown in Idaho Feet, B. M.	Grown out of Idaho Feet, B. M.
	Feet, B. M.	Per Cent				
Western yellow pine	10,090,000	98.49	\$13.31	\$134,297	10,090,000	.....
Western white pine	100,000	.97	18.00	1,800	100,000	.....
Black cottonwood	50,000	.49	22.00	1,100	50,000	.....
Western larch	5,000	.05	10.00	50	5,000	.....
Totals	10,245,000	100.00	\$13.40	\$137,247	10,245,000	.....

Sash and Doors, Blinds and Millwork.
For the manufacture of sash and doors several

uniform and attractive grain. For window and door frames its strength, comparative hardness and working properties commend it.

The grain of Douglas fir commends it especially and the non-warping and shrinking properties of white pine give it preference where enamel paints are to be used.

Western larch is the cheapest wood used for this purpose. It serves as a substitute for coast fir where natural finish and staining is desired. It supplies framing material principally. The lumber is obtained rough, except that it is surfaced one or two sides, and sometimes surfaced two sides and one edge. For framing, thick stock to 2 inches, and 6 inches or wider, is employed. Clear surfaced lumber 1 inch thick is required for window and door casing. This is obtained in various lengths up to 16 feet, and in widths not less than 4 inches.

Fixtures.

The line of distinction between industries using material in the manufacture of planing mill products, such as finish and siding, and industries that use material classed as fixtures, must be drawn more or less arbitrarily. Many planing mills produce forms which are made into fixtures by house builders and carpenters. These are not included in the table for this industry, which represents only the manufacture of fixtures by wood-working plants.

This industry ranks third in the amount of material consumed, and manufacturers report six different woods. The three principal ones, Douglas fir, redwood and eastern oak, are not grown in this state. These constitute 85 per cent of all the wood used for fixtures. Douglas fir is employed in much greater amounts than any other wood. The high price paid for it indicates that the best grades alone are serviceable. The beauty of the grain of Douglas fir, especially when finished by staining; its hardness, and the fact that it works fairly well and takes varnish, paint and stains well, make it a very desirable wood for this purpose. Where a wood cheaper than eastern hardwoods is required for finish or fixtures, Douglas fir finds preference.

California redwood is rapidly coming into favor in the state and ranks second in the amount used for fixtures. Where a dark, rich wood, similar to mahogany, is desired, redwood is utilized and is generally employed for bar and store fixtures. It is soft and works easily and when seasoned before shaping, holds its form permanently.

Eastern oak is used to a large extent where high-class work is wanted. Oak has always been

Table III—Sash, Doors, Blinds and General Millwork.

Kinds of Wood.	Quantity Used Annually		Average Cost per 1000 Feet	Total Cost f. o. b. Factory	Grown in Idaho Feet, B. M.	Grown out of Idaho Feet, B. M.
	Feet, B. M.	Per Cent				
Western yellow pine	4,260,000	85.04	\$17.62	\$ 75,061	4,260,000	.....
Western white pine	511,500	10.81	26.99	14,615	410,000	131,500
Douglas fir	203,000	4.05	22.86	4,640	5,000	198,000
Western larch	5,000	.10	10.00	50	5,000	.....
Totals	5,009,500	100.00	\$18.84	\$94,366	4,680,000	329,500

Sash and door stock is usually received at the factory in rough form of any length, but not less than 6 inches wide. The thickness varies from 1 to 2¼ inches and the stock must be clear in lengths suitable for rails, mullions and stiles. The grade of the stock is judged by the door or sash cuttings it will yield. Shop or factory lumber is some times obtained surfaced on two sides.

For door and window casings and framing, local woods and Douglas fir from the west coast are employed. The use is very similar to planing mill products used for sash and doors. Practically the same species and grades are employed. Western

been considered a superior material for this purpose and where a modest, rich and very attractive grain is desired, it is hard to find a more desirable material.

Western white pine finds service for the cheaper grades of fixtures and in parts that are not easily seen. Western yellow pine is used in lesser quantities, especially where a cheap but attractive wood is wanted.

The state has no native woods which can supply the demand for high-class fixtures and finish, although western larch will undoubtedly meet favor for this purpose when better understood. No

Table IV—Fixtures.

Kinds of Wood.	Quantity Used Annually		Average Cost per 1000 Feet	Total Cost f. o. b. Factory	Grown in Idaho Feet, B. M.	Grown out of Idaho Feet, B. M.
	Feet, B. M.	Per Cent				
Douglas fir	802,000	71.11	\$32.98	\$26,450	.....	802,000
Western white pine	111,000	9.84	46.67	5,180	111,000	.....
Redwood	100,000	8.87	70.00	7,000	.....	100,000
White oak	65,900	5.84	127.09	8,375	.....	65,900
Western yellow pine	48,000	4.25	29.48	1,415	45,000	3,000
Philippine mahogany	1,000	.09	150.00	150	.....	1,000
Totals	1,127,900	100.00	\$43.06	\$48,570	156,000	971,900

hardwoods are available for replacing those now imported from the East.

Rough and surfaced lumber is employed by manufacturers of fixtures. Practically all boards and pieces are surfaced before final placing. Most of the lumber is obtained in the form of boards 1 inch thick, of various lengths. Only high-grade stock is purchased.

Fixture woods are obtained in plank form generally surfaced on two sides. Various widths up to 20 or 24 inches are employed and these are from 3/4 to 2 inches thick. Clear lumber, or lumber yielding large quantities of clear cuttings, is demanded by the industry.

Boats.

In the manufacture and repair of boats in this state as large a variety of woods is used as in more important industries. The center of consumption of wood for boats is at Coeur d'Alene on Lake Coeur d'Alene, which is one of the largest bodies of water in Idaho and carries a large amount of traffic. Farther to the north along the Pend d'Oreille River and on the Priest and Pend d'Oreille Lakes a few small boats are needed for towing logs to the saw mills from logging operations in that vicinity. Douglas fir leads the list in the amount consumed and serves for frames and ribs, planking and for keels and decking where cheap but strong, tough wood is needed.

Larch is used for the same purpose as fir, and compares favorably with it for these purposes.

Table V—Boats.

Kinds of Wood.	Quantity Used Annually		Average Cost per 1000 Feet	Total Cost f. o. b. Factory	Grown in Idaho Feet, B. M.	Grown out of Idaho Feet, B. M.
	Feet, B. M.	Per Cent				
Douglas fir	25,000	39.68	\$21.80	\$ 545	20,000	5,000
Western larch	15,000	23.81	16.00	240	15,000	.....
Western red cedar	8,000	12.70	35.00	280	8,000	.....
Western white pine	5,000	7.94	50.00	250	5,000	.....
White oak	4,000	6.35	161.00	644	.....	4,000
Philippine mahogany	3,000	4.76	200.00	600	.....	3,000
Western yellow pine	2,500	3.97	52.40	131	2,500	.....
Sitka spruce	500	.79	40.00	20	.....	500
Totals	63,000	100.00	\$43.02	\$2,710	50,500	12,500

The western red cedar and Sitka spruce are used for small row boats where light weight is an important factor, and for this reason these woods are employed almost entirely for the lining of such boats. They are likewise employed for interior work and finish on larger boats. Sitka spruce is also used for spars.

Western white pine and western yellow pine are used in small amounts for planking, lining and decking. The higher priced imported woods, such as eastern oak and mahogany, go into finish for the better boats. Some of the oak is used for keels and strakes where a strong, tough, bendable wood serves best.

While the manufacture of boats will never be extensive because of the very local demand, the industry will continue to be an outlet for some part of the local woods.

Rough and surfaced lumber in dimension and plank form, and in large and small sizes, is employed in boat building. Dimension sizes are used in framing, and thin boards for finish.

Furniture.

No factories manufacturing furniture are represented in Idaho and the consumption of wood for furniture is confined mostly to repair work. For this purpose only 20,100 board feet of lumber are consumed annually and of this amount one-half is grown outside the state.

Douglas fir brought from Oregon and Washington is the principal furniture wood, while the native western yellow pine is second in importance. Of the higher priced eastern woods oak is the only species used and this is employed sparingly. Western white pine is approximately equal to the western yellow pine in the amount consumed for furniture.

Due to the lack of suitable woods for high-class furniture, the future of this industry in the state must depend on the manufacture of a cheaper class of goods in which western larch, Douglas fir, western yellow pine and western white pine can be used to advantage.

Only clear lumber, rough or surfaced one or two sides, is employed for furniture repairs. Turning squares of Douglas fir 1 by 1 inch, 2 by 2 inches, and 3 by 3 inches, in short lengths are used in small quantities. Lumber with defects but allowing reasonable amounts of short clear pieces can be used.

Table VI—Furniture.

Kinds of Wood.	Quantity Used Annually		Average Cost per 1000 Feet	Total Cost f. o. b. Factory	Grown in Idaho Feet, B. M.	Grown out of Idaho Feet, B. M.
	Feet, B. M.	Per Cent				
Douglas fir	8,000	39.80	\$33.75	\$ 270	.....	8,000
Western yellow pine	6,000	29.85	36.00	216	6,000	.....
Western white pine	5,000	24.88	30.00	150	5,000	.....
White oak	1,100	5.47	203.64	224	.....	1,100
Totals	20,100	100.00	\$42.79	\$860	11,000	9,100

Wagons.

The use of wood for wagons in Idaho is confined to repair work rather than to actual construction. It is cheaper to ship in the finished product than to import from Eastern states the raw material necessary in wagon construction. Woods suitable for the principal parts of wagons do not grow in the state.

Table VII—Wagons.

Kinds of Wood.	Quantity Used Annually		Average Cost per 1000 Feet	Total Cost f. o. b. Factory	Grown in Idaho Feet, B. M.	Grown out of Idaho Feet, B. M.
	Feet, B. M.	Per Cent				
White oak	3,000	60.00	\$121.67	\$365	.....	3,000
Douglas fir	1,000	20.00	50.00	50	.....	1,000
Black ash	500	10.00	174.00	87	.....	500
Hickory	500	10.00	140.00	70	.....	500
Totals	5,000	100.00	\$114.40	\$572	.....	5,000

In repairing vehicles oak, Douglas fir, ash and hickory are employed and all are imported into the state. The hardwoods are obtained in the Mississippi Valley and the Douglas fir from the west coast of Oregon and Washington. The eastern hardwoods average \$130 per thousand feet delivered to Idaho vehicle repairers, but as they are essential in specific parts, they cannot be replaced by any of the cheaper local woods. The entire amount of wood consumed for wagons in Idaho, 5,000 feet, is not of great importance.

Hickory, ash and oak used for vehicle repair work are received either in the manufactured

material is obtained out of the state, Eastern Washington being the source of supply.

Apportionment of Consumption by Industries.

Table IX gives the quantity of wood used by each industry, and cost data which indicate the quality of material required by each. Boxes consume 52.57 per cent of the wood employed by the industries of Idaho, and the average cost of box

lumber is \$13.40. Wagon repairs require the most expensive woods at an average price of \$114.40, although they use only .03 of one per cent of all.

The average cost of material for industries grouped under miscellaneous is \$19.07 per thousand feet and material for this purpose constitutes 15.49 per cent of the wood consumed by industries in the state.

Apportionment of the Kinds of Wood.

The building of boats in Idaho affords utilization for eight different woods, as shown in Table X. However, the total consumption for boat building is only .32 of one per cent of all the woods used. This industry employs a greater variety of woods than any other. Four species are used for boxes, and western yellow pine supplies 70 per cent of it. Black cottonwood, the only hardwood used for boxes, is not reported used by any other industry. Only 2.6 per cent of the western white pine is employed in the manufacture of boxes. Western red cedar is used only for boat building, ash and hickory for wagons alone, and applewood in small amounts for pipe plugs. Fixtures consume 89.05 per cent of the eastern oak reported, while oak also supplies material for cabinet work, boats, furniture and wagons.

Western white pine serves a larger number of industries than any other wood and is the only wood used for match blocks. Douglas fir furnishes raw material for five industries, and 77.19 per cent of it goes into fixtures. Practically all of the Douglas fir used by Idaho industries is imported from west of the Cascade Mountains in Oregon and Washington. Western larch, the native softwood most closely approximating Douglas fir in its properties, finds a very limited use for boxes, casing and framing, and for boats. The properties of this wood should make it suitable for substitution for imported Douglas fir for fixtures, cabinet work and other purposes.

Summary of Average Prices.

The summary reported in Table XI gives the average f. o. b. cost of the woods apportioned to

Table VIII—Miscellaneous.

Kinds of Wood.	Quantity Used Annually		Average Cost per 1000 Feet	Total Cost f. o. b. Factory	Grown in Idaho Feet, B. M.	Grown out of Idaho Feet, B. M.
	Feet, B. M.	Per Cent				
Western white pine	3,005,000	99.53	\$19.03	\$57,200	1,502,500	1,502,500
Western yellow pine	14,000	.46	26.29	368	14,000	.....
Applewood	300	.01	26.67	8	300	.....
Totals	3,019,300	100.00	\$19.07	\$57,576	1,516,800	1,502,500

In the amount of wood consumed, this group is well to the front, standing fourth on the list. Western white pine and western yellow pine are the two principal species used, white pine furnishing 99.5 per cent and yellow pine the remainder. A negligible amount of applewood is used for novelties.

Table IX—Summary of Woods Used by Idaho Industries.

Industry	Quantity Used Annually		Average Cost per 1000 Feet	Total Cost f. o. b. Factory	Grown in Idaho Per Cent	Grown out of Idaho Per Cent
	Feet, B. M.	Per Cent				
Boxes and crates, packing	10,245,000	52.57	\$13.40	\$137,247	100.00	.....
Sash, doors, blinds and general millwork	5,009,500	25.70	18.84	94,366	93.42	6.58
Miscellaneous	3,019,300	15.49	19.07	57,576	50.24	49.76
Fixtures	1,127,900	5.79	43.06	48,570	13.83	86.17
Boats	63,000	.32	43.02	2,710	80.16	19.84
Furniture	20,100	.10	42.79	860	54.73	45.27
Wagons	5,000	.03	114.40	572	.....	100.00
Totals	19,489,800	100.00	\$17.54	\$341,901	85.48	14.52

The low price per thousand paid for the material used can be accounted for by the fact that the material is purchased in log form and only partially manufactured. About one-half of the

employed only in wagon repair, costs the manufacturer \$140 per thousand feet. The cheapest wood reported by any industry is western larch employed both in boat building and as sash and doors and mill work, which is reported at \$10 per thousand feet. Western yellow pine ranges from \$13.31 for boxes to \$52.40 per thousand feet for boat building. The highest price paid for western white pine by the industries of the state is \$50 per thousand feet by cabinet makers. The black cottonwood employed in box manufacture costs \$22 per thousand feet delivered at the factory. Douglas fir for wagon beds costs \$50 per thousand feet delivered, while for boat building

the delivered price of this wood is \$21.80, and for millwork \$21.34 per thousand feet.

Uses of Wood.

Applewood—Gate ornaments, pipe plugs.
 Black ash—Wagon felloes, wagon tongues.
 Black cottonwood—Crates, packing boxes.
 Douglas fir—Blinds, boat decking, boat frames, boat keels, boat planking, boat ribs, bookcases, cabinet work, cases, cupboards, door casing, door framing, doors, fixtures, general millwork, household fixtures, office fixtures, panels, sash, store fixtures, table legs, table tops, wagon beds, wagon

casing, door framing, doors, fixtures, fruit boxes, general boat finish, general fixtures, incubators, lawn swings, match blocks, sash, shelving, table drawers, window casing, window framing.

Western yellow pine—Boat decking, boat flooring, boat planking, boat moulds, counters, crates, door casing, door framing, doors, fixtures, fruit boxes, incubators, packing boxes, porch posts, sash, shelving, store fixtures, surveyors' stakes, table drawers, window casing, window framing.

White oak—Boat combings, boat finish, boat keels, boat ribs, boat strakes, cabinet work, counters,

Table X—Per Cent of the Different Kinds of Wood Used by Each Industry.

Kinds of Wood	Boats	Boxes and Crates, Packing	Fixtures	Furniture	Miscellaneous	Sash, Doors, Blinds and General Millwork	Wagons
Applewood					100.00		
Black ash							100.00
Black cottonwood		100.00					
Douglas fir	2.40		77.19	.77		19.54	.10
Hickory							100.00
Philippine mahogany	75.00		25.00				
Redwood			100.00				
Sitka spruce	100.00						
Western larch	60.00	20.00				20.00	
Western red cedar	100.00						
Western white pine	.13	2.66	2.95	.13	79.76	14.37	
Western yellow pine	.02	69.97	.33	.04	.10	29.54	
White oak	5.41		89.05	1.49			4.05
	.32	52.57	5.79	.10	15.49	25.70	.08

racks, wagon tongues, window casing, window framing.

Hickory—Wagon running gears.

Philippine mahogany—Bar fixtures, boat finish, boat trim, cabinet work, fixtures, store fixtures.

Redwood—Counters, fixtures.

Sitka spruce—Boat finish, boat lining, row boats, spars.

Western larch—Boat decking, boat frames, boat keels, boat planking, boat ribs, butter boxes, crates, door casing, door framing, fruit boxes, window casing, window framing.

Western red cedar—Boat finish, boat lining, boat planking, row boats.

Western white pine—Boat decking, boat lining, boat planking, cabinet work, cases, crates, door

desks, fixtures, show cases, stands, wagon axles, wagon gears, wagon reaches, wagon trees.

Directory.

The following is a list of wood-using manufacturers in Idaho who contributed data on which this report is based. Manufacturers producing several of the classified products appear in the list, with their addresses, under each industry in which their product is classified.

Boats.

Coeur d'Alene & St. Joe Transportation Company, Coeur d'Alene.

Kremkau Boat Company, Hope.

C. A. Rosenholz, Wardner.

Westlake & Co., Coeur d'Alene.

Table XI—Average Cost of the Different Kinds of Wood Used by Each Industry.

Kinds of Wood	Boats	Boxes and Crates, Packing	Fixtures	Furniture	Miscellaneous	Sash, Doors, Blinds and General Millwork	Wagons
Applewood					\$26.67		
Black ash							\$174.00
Black cottonwood		\$22.00					
Douglas fir	\$21.80		\$32.98	\$33.75		\$22.86	50.00
Hickory							140.00
Philippine mahogany	200.00		150.00				
Redwood			70.00				
Sitka spruce	40.00						
Western larch	16.00	10.00				10.00	
Western red cedar	35.00						
Western white pine	50.00	18.00	46.67	30.00	19.03	26.99	
Western yellow pine	52.40	13.31	29.48	36.00	26.29	17.62	
White oak	161.00		127.09	203.64			121.67

Boxes and Crates, Packing.

Adams-Pilgerrim Lumber Company, Twin Falls.
 Coblentz Lumber Company, Payette.
 Independent Lumber Company, Weiser.
 J. B. Krieger, Keuterville.
 Lapwai Lumber Company, Chesley.
 Lewiston Box Company, Lewiston.
 M. R. Rawson Lumber Company, Kamiah.
 Roseberry Lumber Company, Roseberry.
 M. A. Snyder, Culdesac.
 St. Marles Box & Manufacturing Company, St. Marles.
 Troy Lumber Co., Troy.

Fixtures.

Adams-Pilgerrim Lumber Company, Twin Falls.
 Barnum Lumber Company, Kendrick.
 Bisbee & Taylor, Coeur d'Alene.
 Capital Sash & Door Factory, Boise.
 Coast Lumber Company, Boise.
 Coblentz Lumber Company, Payette.
 Coeur d'Alene Sash & Door Company, Coeur d'Alene.
 Independent Lumber Company, Weiser.
 M. & B. Carpenter Shop, Bonners Ferry.
 Oakley Planing Mill Company, Oakley.
 Renshaw & Berray, Kamiah.
 Roseberry Lumber Company, Roseberry.
 Snake River Valley Planing Mills, Idaho Falls.
 L. Zachara, Sandpoint.

Furniture.

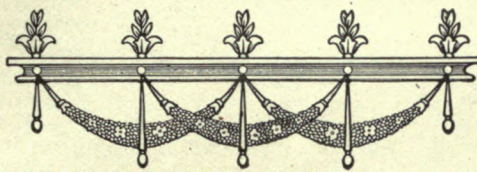
Campbell & Berry, Emmett.
 Coblentz Lumber Company, Payette.
 J. A. Hammock, American Falls.
 H. J. Linke, Jerome.
 H. W. Titus, Emmett.
 L. Zachara, Sandpoint.

Miscellaneous.

Coblentz Lumber Company, Payette.
 Sommers Brothers Match Company, Sandpoint.
 Standard Incubator Company, Boise.
Sash and Doors, Blinds and General Millwork.
 Adams-Pilgerrim Lumber Company, Twin Falls.
 Bisbee & Taylor, Coeur d'Alene.
 Capital Sash & Door Company, Boise.
 Coast Lumber Company, Boise.
 Coblentz Lumber Company, Payette.
 Coeur d'Alene Sash & Door Company, Coeur d'Alene.
 William Gramkow, Boise.
 Ilo Lumber Company, Ilo.
 Independent Lumber Company, Weiser.
 H. J. Linke, Jerome.
 M. & B. Carpenter Shop, Bonners Ferry.
 Robert Price, Paris.
 Rigby Hardware & Lumber Company, Rigby.
 Troy Lumber & Manufacturing Company, Troy.
 Western Cabinet Works, American Falls.
 A. C. White, Laclede.
 L. Zachara, Sandpoint.



The Wood-Using Industries of Tennessee



By **CLARK W. GOULD**
FOREST AGENT

and **HU MAXWELL**
EXPERT

Forest Service

United States Department of Agriculture

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The Wood-Using Industries of Tennessee

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Wood-Using Industries of Tennessee

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Note.

The investigation upon which this report is based was undertaken by the Forest Service, United States Department of Agriculture, in the spring of 1911, the data collected covering a period of one year, from January 1 to December 31, 1911, inclusive. The work was done under the direction of H. S. Sackett, Chief, Office of Wood Utilization, Forest Service; and the statistics were compiled and the report written by Clark W. Gould, Forest Agent, and Hu Maxwell, Expert. Much assistance was also given in the collection of data by John T. Harris, Statistician in Forest Products.

PREFACE.

Tennessee is 432 miles long, 109 miles wide, and has a total area of 42,050 square miles, of which 300 miles are water surface. The streams within the state, or forming part of its boundary, afford 2,000 miles of navigation, but not during all the year. The surface of the state is mountainous in the east, hilly in much of the central portion, and fairly level in the west. The highest mountains are more than 6,000 feet above sea level, while the western border of the state has an elevation of only a few hundred. Nearly all conditions of surface exist: steep, stony, and precipitous mountains; hills of thin soil, fertile slopes, rich valleys. The rain fall is abundant in all parts; the summers generally are pleasant, the winters mild. Altitude alone produces much difference in climate. The high mountains receive abundance of snow, the low valleys little. Drainage from all of the state is toward the Gulf of Mexico, though some of the rivers flow far to reach their destination.

Tennessee was originally one of the heavy forested regions of this country, and it yet has a large amount of timber. The best was cut when the farms were cleared, and the remnants are still being cut, and will continue for a long time to come to supply lumber to its own people and to the distant markets. In its primitive condition, there was little of Tennessee which was not heavily timbered. There were a few canebrakes along the rivers, but with that exception, the region was an unbroken expanse of timber from the Mississippi River to the summits of the eastern mountains. Some of the finest kinds and the largest trees of the Eastern United States were there. More than three hundred and fifty years ago De Soto, with his army that had marched from Florida, cut his way through woods and reached the Mississippi River near Memphis. Nearly two centuries later a company of French adventurers felled a few trees and built cabins where Nashville now stands. Forty years later the real settlement of the region began along the fertile valleys in the northeastern part of the state, and the forest resources were soon recognized. It was a third of a century before Perry launched his fleet on Lake Erie and reported, "We have met the enemy and they are ours;" that Isaac Shelby constructed a fleet of canoes hewed from enormous yellow poplar trees, and launched them in the Holston River, manned by seven hundred and fifty Tennessee backwoodsmen, and captured the British powder magazines at the mouth of Chicamauga Creek, and by that bold stroke destroyed the power of England's Indian allies to fall upon the rear of the Carolina settlements in the most perilous period of the Revolution.* Another remarkable fleet was launched in the same region a year later, and under John Donelson conveyed more than 200 settlers to the site of Nashville. The largest vessel carried 100 people. The forty boats descended the Holston and the Tennessee, ascended the Ohio to the mouth of the Cumberland River, and pushed up that stream to Nashville, a distance, following the meanders of the streams, of about 2,000 miles.

Boat building, therefore, appears to have been the earliest important use of wood in Tennessee, except for fuel, and yellow poplar held chief place. The valuable and beautiful tree is at its best in the fertile valleys of Eastern Tennessee, and the pioneers turned to it when they needed canoes to navigate rivers before roads were opened overland.

Not only is Tennessee rich in soil for agriculture, and bounteously supplied with timber for manufacturing purposes, but its rivers will afford abundant water power to turn the wheels of factories for all time. Most of this power is yet undeveloped, but it is a resource in reserve and can be drawn upon when needed. This makes the future sure. Cheap power and abundance of raw material guarantee business during years to come.

The timber resource is only one of many pos-

*Without boats that remarkable feat would have been impossible, as the army could not have marched the long distance through the woods in time to make a successful attack. In three days Shelby's men rowed down stream three hundred miles, defeated 1,000 Indians, captured the powder, 150 horses, 100 cattle, destroyed 20,000 bushels of corn, and were upon the return, having destroyed their own canoes, which were no longer needed.

CONTENTS.

	Page
Preface	39
Commercial woods of Tennessee.....	40
The Pines	40
Shortleaf pine	40
White pine	40
Table mountain pine	40
Pitch pine	40
Scrub pine	41
The Oaks	41
The white oaks	41
The red oaks	41
The chestnut oaks	41
The hemlocks	41
The cedars	41
Red cedar	41
Cottonwood	41
The ashes	41
The elms	41
The gums	41
Red gum	41
Tupelo	41
Black gum	41
Birch	41
The hackberries	42
The maples	42
The walnuts	42
Other hardwoods	42
Yellow poplar	42
Dogwood	42
Sycamore	42
Persimmon	42
Black cherry	42
Black willow	42
Sassafras	43
Buckeye	43
Mahogany	43
Chestnut	43
Osage orange	43
Basswood	43
Cucumber	43
Beech	43
Planing-mill products	43
Packing boxes and crates	43
Furniture	44
Sash, doors, blinds, and general millwork	44
Vehicles and vehicle parts	44
Car construction	44
Handles	45
Caskets and coffins	45
Chairs	45
Pencil stock	46
Woodenware and novelties	46
Trunks and valises	46
Agricultural implements	46
Sporting and athletic goods.....	47
Shuttles, spools and bobbins.....	47
Boat and ship building.....	47
Fixtures	47
Excelsior	48
Miscellaneous	48
Summary of industries.....	49
Apportionment of woods among industries	49
Cost of species by industries.....	49
Saving waste	50
Appendix	50
Lumber cut in 1910.....	50
Other products	50
Uses of woods.....	51
Directory	52

essed by the state, and, though it is not the greatest, it is of supreme importance. This report is based on statistics collected by the United States Forest Service in 1912, and undertakes to show the condition and scope of the wood-using industries. A year's business is shown; and, in presenting the figures in a series of tables, attempts are frequently made to make clear by discussion the significance of the data. It has not been a part of the plan to give a history of wood utilization in Tennessee. If allusion is occasionally made to isolated instances in past years (as in the above paragraphs regarding the boats built in 1779), the purpose is solely to show that the use of wood in the region is not a new thing, but has a foundation resting on long periods of experience. The real lessons to be taught by studies such as this concern the future rather than the past; for if anything prac-

tical comes from such studies it must bear its fruit in years to come. That which manufacturers are now doing should serve as a guide—a starting place, as it were—for the future. They are the teachers, the experimenters, the pioneers whose successes and failures will inspire or warn those who shall follow the same calling in years to come. Important problems are being worked out, and others will demand solution in the future. We are now trying to master the immediate problems, and thereby throw light, if possible, upon questions which will come later. It is not possible to foretell all that wood utilization in the future will attempt and accomplish, but certain lines are indicated by present tendencies. A hundred years ago nobody thought of it, and twenty-five years ago few considered it seriously; but now it is present in the thought and plans of all successful workers in wood.

Another matter which is now attracting more serious attention than ever before is the study of the best uses for each wood. The properties and qualities of woods are considered—strength, elasticity, hardness, color, odor, grain, figure, seasoning qualities. Much of this may be discovered by scientific methods, but some of it is learned only in the school of experience. The tables and discussions in a report like this are really a record of the experiences of men who are working on the problems. Investigation, backed by necessity, is bringing into use many species of wood not usually listed in reports of sawmill output. They are sometimes known as minor species. Every region has a few, and the workers in wood are experimenting with them and finding out what they are good for. Reliable information on the subject, when it is secured, is given in the reports prepared by the Forest Service. In many instances these minor species are meeting part of the demand and lessening the drain upon well-known woods.

The planting and growing of commercial woods are subjects which do not properly fall within the scope of wood-using studies, and for that reason little space is given to them in this report. It is deemed sufficient to point out tendencies and facts which are now apparent and which must speedily affect the available supply on which wood-using industries depend.

Investigation similar to this in Tennessee have already been made by the Forest Service in a number of states, and the results have been published. The class of manufacturing done and the kinds of woods used vary in different regions; but certain prominent and encouraging features stand out prominently in all of them. Wood is being saved, and cheap woods are taking the places of expensive. The Forest Service adheres to one plan in all of this work and attempts to reach every important user of wood. Lists are compiled, letters are written, and blanks to be filled are mailed to all. To those who fail to respond within a reasonable time a second request for information is sent. There are usually a considerable number of manufacturers in a state who fail to respond to both the first and second requests, and they are visited in person. The data secured by correspondence and by the personal interviews with manufacturers are supplemented by studies of various phases of the business in the region, and with this material in hand the report is compiled for publication. It shows the kinds of wood used, the industries which demand the different woods, the cost at the factories, what commodities are made of each and all of the woods, and various other matters. Some attention is paid to markets, though the compilations are not intended to be market reports. Special consideration is given to supply of raw material on which the various wood-using industries depend. The tables are made up to show how much of each species of wood is produced in the state which uses it, and what part comes from other states and countries. As much relative weight is given to the small manufacturer as to the large. In fact, some of the most interesting and valuable experiments in the uses of woods come from small shops.

The Bureau of Census compiles yearly reports of the sawmill output in all the states. Species are separately shown, except that in some instances several are grouped as one. The annual census report should not be confused with the special reports by the Forest Service. The former deals with sawed lumber and rough mill products; the latter takes rough lumber where the census report leaves it and follows it through other processes of manufacture until it reaches its final form in some finished product. Thus the two reports, while dealing with the same material in part or wholly, do not show the same results, and are not meant to do so. For example, the census report takes a maple log as raw material and car-

ries it through the sawmill, and leaves it as rough lumber. The Forest Service report begins with the rough lumber, carries it through planing machines, and leaves it in the form of flooring, which is a finished product, ready for use. Much lumber goes directly from the mill yard into use without any further manufacture.

Table showing lumber production by state for 1909. Columns include State, No. ft. rough lumber produced for year 1909, and Mfd. prod-ucts. No. of feet 1910-1911.

* Including large quantity which was simply planed.

States with little timber and large manufactures may work much more into finished products than their sawmill cut. What the state can not furnish in the way of rough lumber the factories draw from the outside.

The manufacturers in Tennessee are favorably situated in regard to markets. Railroads are ample, and distances to the best markets are moderate. Some of the largest shippers figure that ten or more states, extending from Texas to Virginia, lie so convenient as to make them peculiarly suited to trade with Tennessee;

The output of sawmills in Tennessee according to the Federal census was:

Small table showing sawmill output in Tennessee for years 1907, 1908, 1909, and 1910.

SUMMARY OF KINDS OF WOOD USED IN TENNESSEE.

Table 1.

Large summary table with columns: Common name, Botanical name, Quantity used annually, Average cost per 1,000 ft, Total cost f. o. b. factory, Grown in Tennessee per cent, and Growr out of Tennessee per cent.

*Less than 1-100 of 1 per cent.

Commercial Woods of Tennessee.

The state's vertical range of more than 6,000 feet from the flood plains of the Mississippi River in the west to the highest mountains of the east is responsible for the extraordinary number of tree species in Tennessee.

The total number of commercial woods indigenous to the region can not be definitely stated for the reason that there is no exact definition or agreement as to what a commercial wood is.

must be. Some woods possess qualities fitting them for many purposes, though they have not yet been much used. The size of a tree is not a sure guide by which to judge its place as a commercial wood.

- Pecan—Hicoria pecan.
Bitternut—Hicoria minima.
Nutmeg hickory—Hicoria myristicaeformis.
Water hickory—Hicoria aquatica.
Shagbark hickory—Hicoria ovata.
Shellbark—Hicoria lasiniosa.
Mockernut—Hicoria alba.
Pignut—Hicoria glabra.
Paleleaf—Hicoria villosa.

The list of oaks native to Tennessee is double that of the hickories. Two or more pines not mentioned in the reported species are doubtless in use. At least a score of minor species—that is, woods not usually considered in sawmill output—grow in Tennessee in amounts sufficient to give them value, and not one is listed in reports by manufacturers,

Tennessee is thus shown to have nearly one-third of all the species of trees in the United States. It would be difficult to find a similar area in this country possessing an equal number, though the total quantity of timber in some other regions of equal size is much greater.

The Pines.

Though six pines are native to Tennessee, only four were reported in use in the States, and one of these, longleaf pine, came wholly from without.

SHORTLEAF PINE—This grows in Central and Western Tennessee, but is rare or totally wanting in the mountains of the east. In the region where it grows it is not equally dispersed, but is found in some localities and is wanting in others.

WHITE PINE—This valuable timber is found in the mountains of Eastern Tennessee and in rather large amounts. In 1910 the sawmills of that region cut more than 39,000,000 feet of it. The white pine is hardly ever mistaken for any other.

TABLE MOUNTAIN PINE—This scarce and little known tree reaches its best development in the mountains of Eastern Tennessee, though its range extends northward in certain restricted localities, through West Virginia, Maryland, and Pennsylvania.

PITCH PINE (PINUS RIGIDA)—No manufacturer in the state reported the use of this pine, though there is no doubt that many have been using it for a number of purposes, but have listed it under some other name, or failed to include it.

A report issued in 1910 by the Tennessee State Geological Survey and compiled by R. Clifford Hall of the United States Forest Service, listed tree species native to Tennessee as follows:

Table listing tree species native to Tennessee with counts. Includes Pines (6), Spruces (2), Hemlocks (2), Fir (1), Cypress (2), Cedars (2), Walnuts (2), Hickories (10), Willows (4), Cottonwoods (3), Birches (3), Oaks (19), Elms (6), Hackberries (4), Ashes (6), Magnolias (5), Maples (10), All others (63), and Total species (150).

by calling one white and the other black. It is fairly abundant in an area of some thousands of square miles in the eastern part of the state. Most of the trees are small and short, but where conditions are favorable saw-logs are cut. The lumber is used more in the rough than in the finished condition, but some goes through wood-working machines and is made into frames and flooring. Box and vehicle makers use some of it. The wood is of rather low grade compared with most other pines. It is 64 per cent as strong and 39 per cent as stiff as longleaf and about three-fourths as heavy. Few other trees withstand forest fires as well as pitch pine, and it can maintain itself on very poor land. The stand is generally thin.

SCRUB PINE. (PINUS VIRGINIANA)—This is another tree not reported by any manufacturer in Tennessee, though some of it is used. It is one of the poorest of the pines, small in size, unpromising in form, with characterless wood. It makes good boxes and crates.

The Oaks.

Users of wood usually separate oaks into two classes, white and red. That classification holds only in a general way, for the rule is subject to many exceptions. The color of the wood determines the class, as understood by actual users. Sometimes the classification includes the chestnut oaks, thus making three classes instead of two. This is not a botanical division, and takes little account of leaves and acorns, but is intended for convenience only among users of wood. In Tennessee the manufacturers reported five oaks by name, and perhaps used a dozen others which they included under one or another of the five names.

THE WHITE OAKS—Speaking in a general way, the oaks used in Tennessee under the name of white oak are post oak (*Quercus minor*), bur oak (*Quercus macrocarpa*), overcup oak (*Quercus lyrata*), and white oak (*Quercus alba*). The last named is the true white oak, the type of the group, the most abundant, and the best of all when all things are considered.

THE RED OAKS—There are more species in the red oak group as classified by users of the wood in Tennessee. The type of the group, and therefore the genuine red oak, if one of the group can be more genuine than another, is the *Quercus rubra*, which is the only tree called red oak in the Forest Service's official check list. It is best developed in regions north of Tennessee, but extends into that state where much good timber is cut. Table 1 credits this species with 50 million feet, as reported by Tennessee manufacturers; but this is partly made up by counting a number of other oaks. Those so included are probably the following: Texan oak (*Quercus texana*), yellow oak (*Quercus velutina*), Spanish oak (*Quercus digitata*), pin oak (*Quercus palustris*), blackjack oak (*Quercus marilandica*), water oak (*Quercus nigra*), shingle oak (*Quercus imbricaria*), and willow oak (*Quercus phellos*).

THE CHESTNUT OAKS—Only half a million feet was reported under this name and it may all have been the true chestnut oak (*Quercus prinus*), but three other species belonging to this group grow in Tennessee and some of each may be included. They are: Chinquapin oak (*Quercus acuminata*), cow oak (*Quercus michauxii*) and swamp white oak (*Quercus platanoides*). These oaks have leaves resembling those of the chestnut, hence the name; but the oaks of the other groups, white and red are so called from the color of the wood and not from the shape of the leaves.

The Hemlocks.

A little more than half a million feet of hemlock was reported in the state, and most of that came from other states. It is not, therefore, of a great deal of importance in Tennessee from the manufacturer's standpoint. In 1910 not a single mill reported hemlock in its output in the state. Nevertheless, some of it was cut. Two species grow among the mountains of Eastern Tennessee. The Northern hemlock follows the mountains that far southward and is found along the water courses and on steep, damp slopes on the upper tributaries of the Tennessee River. The other species, the Carolina hemlock, is scarce.

The Cedars.

Though manufacturers report the use of two species of cedar in Tennessee, the correctness of the reports may be questioned with regard to Northern white cedar (*Thuja occidentalis*), yet it is not impossible that some of it was cut on the high mountains of Eastern Tennessee and made into penholders, as stated. The species there approaches the extreme Southern limit of its range and grows on high and rugged mountains, the trunks being small, crooked, and difficult to procure. More likely the white cedar listed was the white sapwood of red cedar.

RED CEDAR—Tennessee is the home of this fine wood. The state has produced great quantities in past years, and it is generally considered that the species is more highly developed there than anywhere else. It has a wide range, and, if closely related species are included, it is found in all

regions of the United States. Its form is more like a park tree than an uncared-for inhabitant of the forest. Its tall, sharp, conical crown looks as if the gardener's pruning shears might lately have been at work upon it. The trunk is occasionally fluted and not of best form, but the top is almost faultless, unless the tree has met with some accident or is very old. It grows in every part of Tennessee, but is now most conspicuous on thin land and dry ridges. That is because it has been cut from the best land. It is so tenacious of life, and ekes out a living under circumstances so adverse, that in many parts of the state it is nearly the only tree to be seen on rocky bluffs, gravelly flats, and sterile ridges. Other species have starved out and have given up the ground to the red cedar. It has entered into possession and is making good. It is one of the most valuable forest trees of Tennessee. In 1910 the sawmill cut was 31,000,000 feet, and that did not represent half of the output. Millions of posts and poles were cut and were shipped to many parts of the country. The drain has been enormous, and it looks as if the end must be near; but in spite of appearances the red cedars keep on coming, new thickets spread into cut-over land and untold thousands of young trees take the place of those cut for the markets.

It is a tree of slow growth, but it keeps at it. Specimens as large as those in the original forests need not be looked for again, for centuries would be needed to produce them. Early settlers found it the most available farm timber in many localities, and cedar rails fenced the farms, cedar logs built the barns, cabins and mills, and in many cases cedar fuel warmed the houses, and cedar furniture fitted them for occupation. It became the greatest pencil wood because it is soft, light, odorless and handsome. Pencil manufacturers in this country and in Europe have ransacked the state for suitable timbers and have taken most that is fit. The small trees escape that search because they are too knotty for pencils and do not contain enough red heartwood, nor are they of the desired whittling qualities.

Cottonwood.

Two woods are reported in Tennessee belonging in the cottonwood group: the common cottonwood and the large-toothed aspen. Only 100,000 feet of the latter was used and 28,000,000 of the former.

Some peculiarities are found in the reports of the uses of cottonwood in Tennessee. The total quantity is shown above. The total saw mill cut, including the veneer output in the state, according to the latest available statistics, is less than what the manufacturers use of state-grown wood. The discrepancy may be accounted for on the assumption that much of the cottonwood going to the factories was in the log, and was not counted in the census returns of mill output. The country's cut of cottonwood is declining. In 1899 it was 415,000,000 feet, and fell off 36 per cent by 1907, and declined 45,000,000 feet further by 1910. The mill output for Tennessee in 1909 was over 18,000,000 feet, and in 1910 had fallen below 9,000,000. The conclusion is that this wood is approaching practical exhaustion.

The Ashes.

Four or more species are used in Tennessee, but only two are reported. The wood in all is much alike and the user frequently cannot tell the exact species he has in hand, so he gives it the name of the species he knows best, usually the white, but if not that, the black. The species makes little difference to the man who manufactures some commodity, so long as the wood is satisfactory, and most of the ashes give satisfaction. The two species reported are: White ash (*Fraxinus americana*), and black (*Fraxinus nigra*); while the two most plentiful of the unreported species are red ash (*Fraxinus pennsylvanicum*), and green ash (*Fraxinus lanceolata*). It may be noted that these woods are designated by colors—white, black, red and green.

The Elms.

White elm and slippery elm were reported in small quantities. The former is the most common elm in this country and is native in nearly all the states east of the Rocky Mountains. The slippery elm is not so common, but where it exists it is best known on account of its mucilaginous inner bark which was formerly a household remedy for most external injuries. The bark is sold in nearly all drug stores. The wood of this tree is rather deeper in color than that of the white elm, and for that reason is known in some localities as red elm. Two other trees of the elm genus are common in Tennessee and are in general use, but chiefly under the name of white elm, or some other of the multitude of names with which most of the elms are burdened in the regions where they are in commercial use. The cork elm (*Ulmus racemosa*) is so named because of thickenings, ridges and excrescences of the bark, resembling cork. The wood is of good quality and is suitable for many purposes, but like all the other elms it has no grain or figure of a kind to give it attractive appearance. Wing elm (*Ulmus alata*) also owes its name to peculiarities of its bark. Flat keels on the opposite sides of small twigs resemble wings.

They are about as thick as heavy paper, and range from one-fourth to one inch in width, measured from the center of the twig outward. They sometimes occur on larger limbs and on the trunks of small trees. When the branches are bare of leaves, the peculiar appearance of winged branches and trunks seldom fails to arrest attention. Rock elm is a name often applied to trees of this genus. There is no such species. It is simply a name which in different regions is applied to whatever elm happens to grow of best quality there. Sometimes it means the white elm, sometimes slippery elm, and again some one of the others. "Rock oak" is a name applied in much the same way to the oaks, and "rosemary" to some of the Southern yellow pines. The custom of the community must be understood before one can determine what trees these names are meant to designate.

The planertree (*Planera aquatica*) resembles the elms so closely that distinctions are often not made by users of the wood. None was reported in Tennessee, though it is well known that lumbermen cut the planertree when they come to it in course of their logging operations, and the saw mills convert the logs into lumber. In most places it goes into the elm lumber piles and loses its correct name.

The Gums.

Three woods in Tennessee belong to this group and the common name "gum" is frequently applied to each and all, but at other times they are considered separately. They have some characters in common, but they have differences also.

RED GUM—In 1910 Tennessee sawmills cut 62,000,000 feet of this wood, which was about one-tenth of the cut in the United States. The largest output was in Arkansas, next in Mississippi, Missouri was third, and Tennessee stood fourth. A large amount was made into veneer in addition to the sawmill product of lumber. In Tennessee the veneer output of red gum is about one-fourth of the lumber, or 15,000,000 feet. Practically all of the veneer is rotary cut and the quantity given is based on log measurement. Much of the veneer is used by manufacturers of boxes and crates, but a large amount is demanded by furniture makers. Some of it is finished to imitate more costly woods. The seasoning problem is a serious one with red gum intended for fine work. The wood contains an oil which makes gluing difficult, unless the wood is thoroughly dried. It has been mastered by many manufacturers who now produce excellent furniture and finish made wholly or partly of the wood. Its beauty is widely known. In fact, its beauty is known by many who do not know the name of the wood they admire, but who suppose it is black walnut, white oak, sweet birch, cherry or Circassian walnut. Men well acquainted with the lumber industry predict that red gum has not yet reached the position which it is destined to attain in this and other countries.

TUPELO—This wood is not very important in Tennessee, but some of it is cut there, usually associated with cypress in swamps and near water courses. It is often known commercially as bay poplar—a term which it is claimed was originally employed to convey the impression that it was yellow poplar (*Liriodendron tulipifera*). The "bay" referred to the fact that the trees grew close to water, particularly the southern part of Chesapeake Bay. The bark of the tupelo bears rather close resemblance of that of yellow poplar, and the wood of certain trees looks much like the yellow poplar's wood. Botanically, the trees are quite different.

BLACK GUM—Manufacturers in Tennessee used more than a million feet of this wood last year, all of which was grown in the state. The Bureau of the Census, in returns for 1910, included black gum with tupelo and separate figures were not given. It grows in all parts of Tennessee, not in thick stands like some other species, but here and there through the forests. It is one of the most unworkable woods of this country. The fibers cross and interlock that no line of cleavage can be found. For that reason, it has been much used for mauls. They can be beaten into splinters before they will split. The black gum mauls of early times pounded out many millions of fence rails for farm fences. In very cold weather, however, such mauls could not be used, for when frozen they burst under the impact of heavy blows.

Birch.

Several species of birch contribute to the lumber supply of this country, and when the wood reaches the manufacturer who makes furniture, finish and other commodities of it, it is not always possible to determine what species is used. Any one or all of three species may be used in Tennessee. Forty-five mills cut birch in this state in 1910. Sweet birch (*Betula lenta*) grows in the mountains, and with it occurs the yellow birch (*Betula lutea*). Both species contribute to the commercial birch lumber of the markets. It can not be stated what proportion of each was reported by manufacturers in Tennessee who used 1,363,000 feet. Three-fourths of it came from outside the state. That brought from the Lake States was chiefly yellow birch, while Pennsylvania and West Virginia

contributed sweet birch, and most of what was cut in Tennessee was sweet birch. The most abundant birch in the state is neither of these, but the river birch (*Betula nigra*). It is not much sought after because it lacks grain and figure to make it attractive. Moderate success has attended efforts to stain it in imitation of other woods. The tree grows along river banks and is easily recognized by the ragged appearance of its trunk, covered with hanging rolls and tatters of light brown bark, which the tree seems to be always in the act of shedding.

The Hackberries.

Two species of hackberry occur in Tennessee both passing by that name. They are much alike and while botanists recognize both, the lumberman does not. In fact, as often as not, hackberry is classed as ash at the mill yards and is sold as such. Hackberry (*Celtis occidentalis*) and sugarberry (*Celtis mississippiensis*) may grow side by side, but in most regions where both occur the former is most abundant.

The Maples.

Two species of maple are reported by manufacturers in Tennessee, aggregating about three and a quarter million feet. In 1910 there were 229 mills in the state cutting maple, but in small amounts for the total product was little more than the total used by manufacturers. In all parts of the maple region east of the Rocky Mountains it is the custom of users to recognize two kinds of maple generally termed "hard" and "soft." These names do not conform very closely to species, for half a dozen are called by the former name and occasionally more than one by the latter, though usually soft maple means the silver maple (*Acer saccharinum*). Hard maple, or sugar maple, (*Acer saccharum*) is the most abundant of the maples in Tennessee. It is the tree which produces sugar in early spring. Others which are found in the state, and which are commonly classed as hard maple, are mountain maple (*Acer spicatum*) a small tree called low maple in Tennessee because it is apt to grow near mountain water courses; the striped maple (*Acer pennsylvanicum*); black maple (*Acer saccharum-nigrum*); red maple (*Acer rubrum*); and Drummond maple (*Acer drummondii*) in Southwestern Tennessee. This tree is scarce and is generally small. To these should be added the box elder (*Acer negundo*) which in spite of its name belongs with the maples. It is not an important timber tree in the state, nor anywhere else, but is sometimes used. The black maple may be recognized by the dark color of the bark which characteristic is more noticeable in winter than in summer, but the bark alone is not an unerring criterion in determining the species. The red maple is so called from the bright color of its winged seeds which make a fine display in early spring. In Tennessee this tree occupies swamps and in the western part of the state closely resembles the Drummond maple.

The Walnuts.

Black walnut and butternut are both reported by Tennessee manufacturers, the former in larger quantity than the latter, though most of the black walnut came from outside the state, while all of the butternut was home grown. Butternut is known also as white walnut, a name which in early times was often applied to hickory. The heartwood of butternut is lighter in color than the heart of black walnut, but otherwise the woods bear close resemblance. The black walnut is generally regarded as more handsome. Neither of them should be counted on for a large part of the future lumber supply. The butternut never contributed much, but twenty-five years ago and longer ago than that black walnut was in great demand for furniture. It is not now in fashion in this country, and, besides, it has become scarce and high priced. The best wood comes from large trees because they have comparatively more heart than small trees and it is blacker and of finer grain. Black walnut has long been, and still is, the choice wood for gun stocks and pistol grips. Some prefer the softer toned wood from the planted walnut trees of Europe. Tennessee produces good walnut, but the best was long ago cut and not much young growth is coming on. Trees in the open may be worth more for their annual crops of nuts than for lumber. In some of the northern states the butternut pays better if left to bear nuts when other forest trees are cut from around it. It might be more profitable to let the Tennessee butternut stand. The average value of the wood at the factories was only \$13.45.

Other Hardwoods.

A number of other hardwoods went to the factories in Tennessee, some in a small way, others in large amounts. The particular commodities made wholly or in part from each are shown in the various industry tables in this report; but the importance of the several species as a resource in Tennessee is not always apparent in these tables. A wood must be fairly abundant and must be fit for something in particular to make it a commercial resource. The extent of its present use is not a correct measure of its value. Some species are not now in much demand, but they

possess properties which will give them a higher place in the future. On the other hand, some are passing down the scale from their former high position to minor places because of increasing scarcity. Instances of that kind should be carefully considered, and if an increase of supply seems practicable it ought to be encouraged. The extirpation of valuable species is not necessary in this country. The people of Massachusetts cut all their original white pine forests long ago, but they are growing young forests to take the place of the old. Other states can with profit follow the example of Massachusetts, each devoting its care to the forest trees which pay best.

YELLOW POPLAR—This is one of the finest trees of the American forest. It is generally considered the largest hardwood of this country and none exceed it in well-balanced proportion of trunk. The fertile valleys and slopes of Tennessee have furnished some of the largest poplars on record. Reference has already been made to the five-foot poplar trunks, felled in 1779 on the Holston River by Isaac Shelby, to be hewed into canoes to carry his army of 750 men down the river to attack the Indians who were assembling near Chattanooga to march against the Carolina frontiers. This tree has been the greatest canoe wood of America, next to the paper birch. In some regions the name canoe wood has been given it. A list of uses for which it has been found suitable would include almost every commodity of wood from the earliest settlement of this country to the present time. Only where great strength, hardness and toughness are essential is it unfitted.

The maximum annual cut of yellow poplar in this country seems to have been passed, and the future supply must come from a rather small region of which Tennessee, Kentucky and West Virginia are the center. More than half of the country's supply in 1910 came from those states, most from West Virginia, next from Tennessee, and third from Kentucky. Estimates have been made that the remaining yellow poplar on the stump in this country does not much exceed 6,000,000,000 feet, which will be exhausted in nine or ten years at the present rate of cutting. Definite conclusions and great weight should not be given estimates of this kind. While they are based on the best obtainable data, no one knows how much poplar remains in the forests, and most of the general estimates of this kind have proved too low when the time comes to check them by exact information. It is certain that most of this wood in the original forests of this country has been cut, and that no large amount remains. The yearly output must, for that reason, soon decline with no hope that it can ever again reach high figures; but some yellow poplar will reach the markets for a long time to come. It requires many years to grow a good sized tree as poplars are usually rated, though it is a rather fast grower. The long time required will stand in the way of extensive planting. People who set apart wood-lots will choose loblolly pine or some other fast grower. A further fact against planting the poplar is that it wants the richest soil. It had the richest slopes and coves when it had choice of the whole country. Farmers of the future will not give up their best land to any forest tree, but will plant food and provender crops there and put their wood lots on poor or rocky corners. That will give the yellow poplar no chance in competition with other less choice species in the forests of the future. If it is compelled to exist on thin soil it degenerates so quickly that it becomes a "white poplar." That is the name usually applied to a runt yellow poplar—a poor soil specimen. It has little or no heartwood, is hard and tough, and being nearly all sap, which is white, a quite common belief has developed that it is not the same species as yellow poplar. It is the same, however, for there is only one species of this tree in America, and one in China; and, in fact, both might be considered as one, though separated by ten thousand miles.

Though not exactly on the subject of wood uses in Tennessee, the evidence of geology is interesting, because it warrants the belief that the yellow poplar was growing in the Appalachian region covering Eastern Tennessee in the cretaceous age—a time so remote that no geologist will venture to measure it in years. The yellow poplar's peculiar notched leaf is among the fossils in the strata beyond the Mississippi, which rocks, it is believed, were laid down as sands in the sea which then covered the Mississippi Valley; and the sands, and doubtless the poplar leaves also, were carried from the Appalachian highlands to that sea by rivers which then flowed westward, as they still do. If that view is correct, the yellow poplar is one of the very oldest broad-leaf species on earth, having come down to us through almost measureless ages. The character of the rocks in which the fossil leaves are embedded indicates that the tree then grew in soil of great fertility, as it does today, and leads to the conclusion that the mountain regions of Eastern Tennessee had deep, rich soil at a time when the Gulf of Mexico extended at least as far north as Nebraska. A tree so ancient, so splendid and so vigorous does not deserve to perish by the hand of man in the very region where it has held its ground during millions of years. There are

sentimental as well as sound business reasons why steps ought to be taken to perpetuate the yellow poplar in protected woodlots, since it cannot much longer hold its place as a wild tree of the forests.

DOGWOOD—In 1910 Tennessee led in saw mill output of dogwood. That for the whole country was 1,469,000 feet. This quantity is so small as to place dogwood among the minor species; yet in the saw mill reports dogwood is not given justice. The total is certainly too small. Tennessee alone last year manufactured more dogwood into shuttle blocks than the whole reported output of saw mills in the United States. The explanation is that most of the dogwood does not go through saw mills, but is shipped in rough blank form to the shuttle factories. The trees are small and logs one foot in diameter are unusual, and a length of a few feet is the average. Two species grow in Tennessee, flowering dogwood (*Cornus florida*) which is most common, and blue dogwood (*Cornus alternifolia*). It is doubtful if the latter is a commercial commodity in Tennessee.

SYCAMORE—Tennessee is the fourth state in the production of sycamore, it being exceeded by Indiana, Missouri and Arkansas. In 1910 the saw mill cut in Tennessee was 5,000,000 feet and the manufacturers reported less than three-quarters of a million feet. It is apparent that most of the state's output of this wood is taken by manufacturers not operating in Tennessee. Twenty-six states contribute to the saw mill supply, and, contrary to general belief, the total yearly output has not decreased in the past ten years, though it was not the same from year to year. In 1909 the cut of sycamore in the United States was twice as great as in 1899. For the most part it is a waste land tree, and it should be encouraged. It takes possession of gravel bars along rivers, steep banks of ponds and streams and land subject to frequent overflow. The best lumber comes from trees of moderate size, for the very large are usually hollow. Sometimes trunks of great dimensions are mere shells and of no value, though formerly they were made into gums for the barn and granary, and wheat and corn were stored in them in place of barrels. There is only one species of sycamore in the eastern part of the United States, but California and Arizona each has one.

PERSIMMON—The entire reported saw mill output of persimmon in the United States does not exceed one million feet, yet manufacturers in Tennessee alone used 680,000 feet. Many other states produce it, and the total cut must amount to several million feet. The same custom prevails with persimmon as with dogwood, that much is sold in the log or bolt, and the saw mills never handle it.

The wood goes to the shuttle factories or is made into golf heads. Statistics are too meager to determine whether the cut of this wood is increasing or diminishing; but complaint is made by shuttle people that they frequently find the wood hard to procure. They use the sapwood only, which is white, and in appearance somewhat resembles hickory. The persimmon tree is a good fighter in the contest for ground, and it spreads rapidly into open spaces. The seeds are widely dispersed, and a vigorous growth springs up from stoloniferous roots. It is not probable, therefore, that this valuable tree will disappear from Tennessee in the near future, but whether it will produce enough wood to meet demand is doubtful.

BLACK CHERRY—In the annual report of saw mill output by the Bureau of Census, black cherry is classed among the minor species, not because it is of small value, but that it is scarce. The whole reported cut in 1910 was a little over 18,000,000 feet, and Tennessee's part of it is not stated. Manufacturers in the state used less than half a million feet. The species grows slowly, and it is doubtful if much of it will ever be planted for use. A tolerably good imitation of this wood can be produced by staining red gum and tupelo; but the real luster, the characteristic tone, of cherry is due to the bright lining of the wood cells, and this has not yet been successfully imitated by staining any other wood.

BLACK WILLOW—This is one of the most rapid growing of Tennessee's native trees, and it is worth considering in plans of future forestry and conservation. The wood is plain and can never have a wide range of uses, but it is suitable for boxes and is worth growing for that purpose alone. A mud flat, too wet for cultivation, has been known to grow more than two thousand feet of lumber yearly per acre, for forty years. That is doubtless above the average growth of willow, but it shows the possibilities. Willow plants itself and cares for itself when ground is available. Tennessee has much wet land, too much subject to overflow to be profitable for field crops, and in such places willow ought to be encouraged. It protects the land against washing, collects sediment, gradually builds the surface higher and ultimately may convert it into dry land for farming. The wet situation in which willow grows affords protection against fire, and gives the young trees an advantage which is denied to many species on dry land. The willow produces a fence post or a small saw-log in a few years; and old trees two or more feet in diameter

are not unusual, and some attain three or four times that size.

SASSAFRAS—Probably the principal value of sassafras in the future will be for oil and not lumber. The oil is manufactured from the wood and bark, chiefly from the roots, and is used to perfume soap. It has long been so used, but of late years synthetic oils, of which one of the ingredients is camphor, have somewhat lessened the demand for sassafras oil. The whole reported output of sassafras lumber in 1909, according to census returns, was only 24,000 feet, and yet Tennessee alone last year used fourteen times that much in its factories. If the wood were more abundant, it would be a valuable commodity, for it is of good color, attractive grain, and is hard, strong and durable. Its tendency to season without checking was recognized generations ago by early settlers who for that reason selected it for dugout canoes on the Mississippi River and elsewhere. It is of historical interest that sassafras was once (for a brief period) the most valuable wood in the United States, due to a belief that it was a cure-all for diseases. Sassafras is in no danger of becoming extinct. It spreads so rapidly into open ground that in some localities it becomes a nuisance; but large trees, suitable for lumber, are apt to become scarcer than they now are.

BUCKEYE—This wood is of considerable importance in Tennessee and manufacturers last year used nearly 3,000,000 feet of it, which was almost one-fourth of the entire cut of the wood in the United States. Three species of buckeye are cut in Tennessee, Ohio buckeye (*Aesculus glabra*), yellow buckeye (*Aesculus octandra*), and purple buckeye (*Aesculus octandra hybrida*). The yellow buckeye is most abundant and of largest size. The box-makers, trunkmakers and coffin manufacturers used nearly all the buckeye reported in Tennessee, and practically all of it was state grown. It is especially valued by manufacturers of candles and chocolates. The seasoned wood is white, clean and odorless, and when made into boxes imports no taint to articles of food. When green it is one of the softest woods, but it hardens and toughens as it becomes dry. It is among the lightest of the broad leaf trees, lighter even than basswood, which in some respects it closely resembles.

MAHOGANY—This is a foreign wood and comes from Mexico, the West Indies and other parts of tropical America. Other woods commercially known as mahogany are brought from Africa. Next to osage orange, mahogany is the most costly wood reported by manufacturers in Tennessee. Sixty thousand of the 183,000 feet reported was the African species (*Khaya senegalensis*).

CHESTNUT—Tennessee ranked fifth among the chestnut producing states in 1909, with a cut of 58,000,000 feet. That was four times as much as its factories worked into commodities, and it shows that the state is sending most of its chestnut beyond its borders. In fact, nearly two-thirds of what was used in the state was imported. Home-grown chestnut was sold out of the state, while Tennessee factories were sending away from home for what they needed. Chestnut is perhaps the most important wood of this country for coffins and caskets, and it goes to large cities where these commodities are manufactured on an extensive scale. The owners of chestnut timber are concerned lest a blight affecting the species in some of the Northeastern States shall spread into other regions.

OSAGE ORANGE—Only 8,000 feet of the wood was used last year in Tennessee, but it cost more per thousand than any other. It came wholly from Texas and Oklahoma, which is its natural range. It has been planted for hedges and ornament in nearly every state, and is known by many names. In Tennessee some call it osage apple tree, and others yellow wood. The last is the proper name of another Tennessee wood (*Cledrastis lutea*), which is not closely related to the osage orange. Manufacturers of wagons use all the osage reported. It is a very hard wood and shrinks and swells little under climatic changes. The very high price is accounted for by the fact that it was already manufactured into felloes when received at the wagon factories.

BASSWOOD—Tennessee finished 8,500,000 feet of basswood in 1910. That was three million feet under the reported output of the preceding year. There has been a general decline during the past five years in the cut of this wood in the United States. In Tennessee it is occasionally called linn and black limetree. Two or more species are cut in the state, but they are considered one by most lumbermen. The white basswood (*Tilia heterophylla*) is often known in Tennessee as large-leaved limetree, or linn.

CUCUMBER—This wood resembles basswood, but if leaves and fruit are observed, it is not likely to be mistaken for basswood or any other tree. It is scarce and not very important. In early times it was much sought for by pioneers who hewed dough trays and woodenware from solid blocks but that use has passed away and it now goes to mills to be made into doors and other millwork. The tree is conspicuous in the forest after the first severe frost in the autumn, for the leaves

take on strange and mottled colors and all come down within a day or two. As they lie on the ground they resemble, in color, a heap of owl feathers. This may be classed as one of the trees that will disappear with the cutting of the original forests; for no one will plant it except as a curiosity and a relic in parks. It is named for its fruit, two or three inches long. When green, the fruit resembles a stunted, misshapen cucumber, but when ripe it is bright scarlet. It yields abundance of seeds and ought to reproduce vigorously, but it does not appear to do so. Trees are found only here and there scattered through forests of other woods.

BEECH—Tennessee produces three times as much beech as its factories use. Only one species of beech grows in the United States, except in parks where others have been planted. A tree bearing some resemblance to it is known as blue beech (*Carpinus caroliniana*). Though the blue beech was not reported by any manufacturer in Tennessee, it is probably used in a small way for handles and for other purposes. The common beech has been classed as a food tree for centuries; and in some parts of this country the nuts constitute an article of diet, but in Tennessee they are valuable only as mast for hogs.

Planing Mill Products.

This is the largest wood-using industry in Tennessee, and the chief commodities manufactured are flooring, ceiling and siding. These products are made and are offered for sale in the general market, it not being essential that they be of

cypress and sassafras in the table was procured in the state.

Packing Boxes and Crates.

This is the second largest wood-using industry in Tennessee. In some other states it is the largest. Since this product is employed in shipping merchandise and the commodities of truck patch and garden to market, the quantity of such boxes and crates made in a state is a fair index to the state's position as a manufacturing district. Tennessee ranks high, though not as high as some of the states north of it. This business in Kentucky demands 109,000,000 feet of lumber, Wisconsin 119,000,000, Maryland 136,000,000, and Illinois 372,000,000. No satisfactory reason has been found why Tennessee with its abundance of cheap wood should pay a higher average price for box material than is paid by any of the states named. Box-makers in Wisconsin buy theirs for \$13.09, in Maryland for \$13.31, in Illinois for \$15.31, in Kentucky for \$15.36, while in Tennessee the average for the whole state is \$16.26. Cottonwood is Tennessee's leading box material, and it is high in price. It possesses almost every requisite for a good box. It is strong, tough, hard to split, holds nails well, has no disagreeable odor or colored sap that will stain the contents. It is white in color, which is a quality greatly desired by certain shippers who wish to stencil their advertisements on the packages. The wood suits so many other purposes that box-makers must bid high for it or it will not come to them. That they get it in spite of cost and in amounts larger than any other wood, is the best

PLANING MILL PRODUCTS.
Table 2.

Kinds of wood	Quantity used annually feet B. M.	annually per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Red oak	30,399,000	20.65	\$24.88	\$ 756,200	22,133,000	8,266,000
White oak	27,887,825	18.94	24.27	676,939	23,022,000	4,865,825
Yellow poplar	25,470,825	17.30	24.08	613,287	22,620,000	2,850,825
Shortleaf pine	16,404,000	11.14	17.41	285,629	10,819,000	5,585,000
Red gum	12,500,000	8.49	12.92	161,491	7,536,000	4,964,000
Longleaf pine	9,154,000	6.22	20.97	191,932	.....	9,154,000
Chestnut	5,681,825	3.86	27.59	156,771	993,000	4,688,825
Beech	4,543,000	3.09	18.12	82,337	1,843,000	2,700,000
White ash	2,918,000	1.98	18.71	54,600	2,148,000	770,000
Basswood	2,426,825	1.65	18.87	45,788	2,113,000	313,825
Cottonwood	2,000,000	1.36	17.50	35,000	1,000,000	1,000,000
Cypress	1,880,000	1.28	27.47	51,650	.....	1,880,000
Sugar maple	1,500,000	1.02	19.97	29,950	1,125,000	375,000
Birch	915,000	.62	37.60	34,400	170,000	745,000
White pine	478,825	.32	16.53	7,914	365,000	113,825
Black walnut	388,000	.26	20.43	7,926	55,000	333,000
Cherry	376,000	.26	20.00	7,520	43,000	333,000
Sassafras	333,000	.23	20.00	6,660	.....	333,000
Sycamore	282,000	.19	13.67	3,854	157,000	125,000
Silver maple	275,000	.19	12.78	3,515	150,000	125,000
Black willow	250,000	.17	12.50	3,125	125,000	125,000
Hackberry	250,000	.17	12.50	3,125	125,000	125,000
Buckeye	243,000	.16	13.72	3,335	243,000	.....
Hemlock	223,825	.15	9.43	2,111	110,000	113,825
Tupelo	130,000	.09	24.23	3,150	80,000	50,000
Yellow oak	100,000	.07	15.00	1,500	100,000	.....
Mahogany	100,000	.07	116.00	11,600	.....	100,000
Butternut	42,000	.03	18.95	796	42,000	.....
White elm	30,000	.02	16.33	490	30,000	.....
Black gum	18,000	.01	12.72	229	18,000	.....
Black ash	15,000	.01	12.00	180	15,000	.....
Totals	147,214,950	100.00	\$22.03	\$3,243,004	97,180,000	50,034,950

special sizes and patterns. The planing machines which turn them out are generally adjuncts of the saw mills that cut the lumber. Red oak, which doubtless includes a number of species under that name, heads, for quantity, the list of thirty-one species. The rather large amount of black walnut in this industry is unexpected, since the wood is never used as siding and seldom as flooring except for parquetry which is not included in Table 2. Black walnut's low price may be accounted for by assuming that the material was purchased in the log. The cost of white pine is lower than would be expected for grades acceptable at a planing mill. The Massachusetts box-makers pay that much for what passes through their hands. Mahogany's price is rather low, but the prevailing grades may account for it. Thirty-one species in all is a good showing when it is considered that twenty-nine of them grow in Tennessee, though no part of the

evidence that it is looked upon as the box material par excellence of Tennessee.

Red gum, yellow poplar and shortleaf pine are extensively demanded for boxes and possess most of the essential features required. Medium weight is one requisite that should not be overlooked. Though a few pounds more for a single box might be a small thing to consider, it is not small if hundreds or thousands of boxes are shipped by freight, and the weight would be still more important were shipments to go by express. Buckeye and basswood, both present in large amounts in Table 3, are light in weight. They are likewise light in color which puts them, as far as stenciling qualities are concerned, in the class with cottonwood. It is worthy of note that these two woods which are nearest to cottonwood in color are nearest to it in cost. Except cottonwood, they are the costliest in Table 3.

BOXES AND CRATES, PACKING.
Table 3.

Kinds of wood	Quantity used annually feet B. M.	annually per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Cottonwood	22,550,000	28.92	\$21.99	\$ 495,900	12,550,000	10,000,000
Red gum	16,742,000	21.47	12.92	216,243	15,543,000	1,200,000
Yellow poplar	16,186,510	20.76	15.23	246,444	15,286,510	900,000
Shortleaf pine	13,158,820	16.87	12.45	163,773	4,658,820	8,500,000
Buckeye	2,116,617	2.71	17.29	36,590	2,116,617	.....
Basswood	1,796,470	2.30	17.35	31,163	1,796,470	.....
Chestnut	1,030,000	1.32	15.02	15,471	1,000,000	30,000
White pine	934,785	1.20	16.11	15,064	934,785	.....
White oak	925,000	1.19	16.83	15,570	925,000	.....
Black gum	865,000	1.11	9.69	8,380	865,000	.....
Beech	490,000	.63	15.21	7,455	490,000	.....
Sugar maple	210,000	.27	15.00	3,150	210,000	.....
Silver maple	198,000	.25	13.33	2,640	198,000	.....
Cucumber tree	125,000	.16	10.00	1,250	125,000	.....
White elm	125,000	.16	14.88	1,860	125,000	.....
Sycamore	117,000	.15	11.65	1,363	113,000	4,000
Slippery elm	115,000	.15	15.19	1,747	115,000	.....
Shittimwood	91,308	.12	14.11	1,288	91,308	.....
White ash	88,000	.11	13.00	1,144	14,000	74,000
Butternut	52,000	.07	9.00	468	52,000	.....
Table mountain pine	30,000	.04	12.00	360	30,000	.....
Yellow oak	20,000	.03	12.00	240	20,000	.....
Tupelo	6,000	*	12.00	72	6,000	.....
River birch	6,000	*	12.00	72	6,000	.....
Totals	77,979,510	100.00	\$16.26	\$1,267,707	57,271,510	20,708,000

*Less than 1-100 of 1 per cent.

The oaks are seldom used for boxes, except where extra strength is wanted, and weight is of minor consideration. It is true that nearly a million feet of white and yellow oak are listed in the table, but most of it was crates. Oak's strength creates a demand for it; but it is heavy and it nalls poorly. A study of each wood separately in the table would probably fail to show reasons why all are there, except that some are cheap and convenient, but others have special properties which give them a place whether they are convenient or not.

About one-fourth of the box material comes from other states, and cottonwood is imported in largest amounts and shortleaf pine next. No wood comes wholly from other states, and that which is brought in comes solely because it is more convenient to procure it there than in Tennessee. Most of the imports come from Arkansas and Missouri.

Furniture.

The manufacturers of Tennessee have entered into the furniture business in a serious way. They are competing successfully with all comers and their product reaches markets far from the places of manufacture. The state is still below North Carolina in the total quantity made, but it produces nearly three times as much as Kentucky. The abundance of good furniture material in the forests of the state, and in those within reach, give advantages which the Tennessee manufacturers are making the most of. They procure about two-thirds of their furniture wood in the state, and it costs them on an average \$22.34 per thousand feet. North Carolina furniture makers buy their raw material cheaper than that (\$18.23), but most other states pay more—Massachusetts, \$28.36; Illinois, \$39.09; Maryland, \$29.32; Wisconsin, \$25.22, and Kentucky, \$30.73. More than nine-tenths of Tennessee's furniture material shown in Table 4 is hardwood. The number of species used is large, and only two, longleaf and mahogany, come wholly from without the state, and mahogany is the only foreign wood in the table. The extraordinarily high cost of this wood was doubtless due to the small amount purchased and its high grade. Mahogany lumber usually costs about half the figure given in the table, but sometimes double or threefold that for extra fine figured wood.

A rather large quantity of red cedar is listed in Table 4. This wood has been used for furniture in this country since the first settlements on the Virginia coast. Some of the earliest records speak of the odor of the wood and of the favor in which it was held on that account. One of the important uses for it has always been for clothes chests and wardrobes. The belief has long prevailed that its odor drives moths and other insects away from clothing and prevents injury from that source. Large numbers of clothes chests are still sold every year to persons who believe the odor is offensive to insects. It is not known that any carefully conducted investigation has been made to determine red cedar's value in that respect. The most that can be said for it is that for three hundred years the belief has been common among people acquainted with the wood that clothes stored in cedar boxes and wardrobes are immune from insect attacks. Some of the Western cedars, particularly Port Orford and incense cedar, have the same reputation, and sassafras is not much behind them in reputed efficiency. It does not appear that any sassafras was used for furniture last year in Tennessee. It was once highly esteemed for bedsteads because of the belief that it contributed to the soundness of sleep by keeping troublesome nocturnal insects away.

FURNITURE.
Table 4.

Kinds of wood	Quantity used annually feet B. M.	annually per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Red gum	13,510,000	34.40	\$14.55	\$ 196,595	6,000,000	7,510,000
White oak	12,044,000	30.67	29.92	360,375	9,385,000	2,659,000
Red oak	9,143,000	23.28	24.03	219,720	7,243,000	1,900,000
Yellow poplar	1,037,000	2.64	25.25	26,184	1,017,000	20,000
White ash	655,000	1.67	24.27	15,895	280,000	375,000
Longleaf pine	650,000	1.66	18.77	12,200	.....	650,000
Shortleaf pine	610,000	1.55	16.61	10,130	310,000	300,000
Sugar maple	474,000	1.21	25.19	11,939	474,000	.....
Chestnut	269,000	.68	13.57	3,651	269,000	.....
Cottonwood	150,000	.38	25.00	3,750	50,000	100,000
Basswood	107,000	.27	24.60	2,632	107,000	.....
Tupelo	101,000	.26	19.97	2,017	1,000	100,000
Largetooth aspen	100,000	.25	25.00	2,500	100,000	.....
White elm	92,000	.23	18.05	1,661	62,000	30,000
Red cedar	80,000	.20	36.88	2,950	80,000	.....
Buckeye	50,000	.13	20.00	1,000	50,000	.....
Black gum	50,000	.13	15.00	750	50,000	.....
Yellow oak	50,000	.13	16.00	800	50,000	.....
Beech	25,000	.06	18.48	462	25,000	.....
Hickory	20,000	.05	19.50	390	20,000	.....
Birch	20,000	.05	18.00	360	20,000	.....
Black walnut	15,000	.04	36.67	550	15,000	.....
Sycamore	10,000	.03	16.00	160	10,000	.....
Cherry	10,000	.03	40.00	400	10,000	.....
Mahogany	500	*	300.00	150	.....	500
Totals	39,272,500	100.00	\$22.34	\$ 877,221	25,628,000	13,644,500

*Less than 1-100 of 1 per cent.

Sash, Doors, Blinds and General Millwork.

The articles manufactured from woods listed in Table 5 are too many to be enumerated separately, but they belong to groups and are shown in that way. It seldom happens that one factory makes all of them. It may devote all its energies to doors, and probably to a single grade or class of doors.

Many kinds and patterns of sash are demanded by the building trades, and an establishment may turn out but one or two kinds. Millwork is so broad a term that it covers a miscellaneous group of commodities that cannot be designated by any name more appropriate. Among the principal things included may be named stairwork, including balusters, railing, steps and newel posts; interior trim or finish, consisting in part of picture molding, baseboards, chair boards, panels, brackets, capitals, ornaments and shelving in niches and cubbyholes; porch columns and railing with spindles and lattice work, and many other kinds of dressed building material. The differences between the output represented in Table 5 and that classed as planing mill products and included in Table 2 are clear enough in general outline, but in details there must be more or less overlapping. The flooring, ceiling and siding of Table 2 is made according to general patterns, and is not usually manufactured for particular persons or markets; while much of the class of millwork belonging in Table 5 is made to order. A man may want finish of a special kind, wood or design for a house and gives the order for it, and the mill turns it out. A stair of unusual design or a portico, hallway, or suite of rooms requires millwork out of the ordinary, and such cannot be bought in the open market and must be made to order. General planing mills which produce flooring, siding and ceiling are usually, though not always, run in connection with a saw mill. The door and sash factory is not, but procures its raw material in the open market or has it sawed under contract. The machine in a plant of that kind must be designed for a greater variety of work than the simple ones in a planing mill which make only a few staple articles.

SASH, DOORS, BLINDS, AND GENERAL MILLWORK.
Table 5.

Kinds of wood	Quantity used annually feet B. M.	annually per cent	Average cost per 1,000 ft	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Shortleaf pine	15,208,500	39.80	\$17.88	\$ 271,906	4,886,500	10,322,000
Chestnut	4,410,000	11.54	35.06	154,600	1,360,000	3,050,000
Cypress	3,635,000	9.51	33.42	121,465	.....	3,635,000
Yellow poplar	3,601,500	9.42	30.28	109,055	2,851,500	750,000
White oak	3,216,500	8.42	25.78	82,936	2,617,500	599,000
Longleaf pine	3,049,000	7.98	16.35	49,862	.....	3,049,000
Red oak	2,881,500	7.54	21.66	62,425	1,956,500	925,000
Basswood	660,000	1.73	25.68	16,950	285,000	375,000
White ash	605,000	1.53	31.74	19,200	230,000	375,000
Shittimwood	200,000	.52	19.00	3,800	200,000	.....
Birch	198,000	.52	31.06	6,150	98,000	100,000
Red gum	161,000	.42	17.86	2,875	161,000	.....
Sycamore	100,000	.26	15.00	1,500	100,000	.....
Black walnut	68,000	.18	39.49	2,685	8,000	60,000
Cherry	67,000	.18	53.21	3,565	17,000	50,000
Beech	60,000	.16	14.83	890	60,000	.....
Chestnut oak	50,000	.13	15.00	750	50,000	.....
Red cedar	20,000	.05	33.75	675	20,000	.....
White pine	10,000	.03	20.00	200	10,000	.....
White elm	10,000	.02	14.00	140	10,000	.....
Sassafras	3,000	*	24.67	74	3,000	.....
Mahogany	2,500	*	188.00	470	.....	2,500
Totals	38,216,500	100.00	\$23.87	\$ 912,173	14,924,000	23,292,500

*Less than 1-100 of 1 per cent.

Shortleaf pine leads all others by long odds in millwork and constitutes nearly 40 per cent of all, though twenty-two woods are in use. Ten of the 15,000,000 feet are imported, chiefly from Arkansas and Missouri. It comes from that region because it is convenient. Some preference is shown the pine from those states because it is of excellent quality. The wood is white, soft and of good figure. Most of it goes to manufacturers in Western Tennessee because of their proximity to the source of supply; while the eastern part of the state depends on home-grown shortleaf, or procures it from states further south.

Vehicles and Vehicle Parts.

This industry is large in the aggregate, but it is made up of many small shops in all parts of the state and a few large factories. Almost every village has a shop which makes or repairs wagons though the number of such vehicles in a year is small for each. In collecting statistics for this report it was not practicable to include all blacksmith shops in rural districts, though some of them occasionally make or mend vehicles, but the larger shops and factories were included. Constant care was necessary to avoid counting the same material more than once. Vehicle making is peculiar in that some of the wood passes through two or more factories before it appears in finished form. One may rough-turn the spokes, and another finish them; hubs may be partly made in one factory and completed in another. The same comment applies to different parts of vehicles, both wagons and buggies. Carriage bodies may be made in a shop which turns out bodies only. Sometimes parts made in various places are assembled by a factory, and a complete vehicle is turned out, though the work was done in several places. Conditions like these do not exist in many industries, and vehicle making is peculiar in that respect. Hickory is the most important wood in the quantity used, but several others are higher in cost. The most costly is osage orange, which is used for farm wagon felloes. The price is figured on the finished pieces, ready for use, after all work has been done and all waste eliminated. Wagons with felloes of that wood give best service on sandy roads in dry regions. For very strong, large felloes beech is preferred to nearly all other woods. Yellow poplar, which is third highest in price in this industry, is made into carriage bodies. It finishes very well, takes high polish, and it holds paint. The small lot of black walnut was made into fine carriage finish.

Car Construction.

Nine woods make up the material employed in car construction and repair in Tennessee, according to Table 7. The number of woods is small, but the total quantity of lumber is fairly large. The car factories of Illinois reported the use of thirty-three woods, and a total amount of 407,333,000 feet, at an average cost of \$30.44 a thousand.

VEHICLES AND VEHICLE PARTS.

Table 6.

Kinds of wood	Quantity used annually feet B. M.	annually per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Hickory	19,760,200	59.00	\$23.94	\$ 473,112	18,479,200	1,281,000
White oak	10,504,800	31.36	26.19	275,097	9,084,800	1,420,000
Red oak	777,000	2.32	31.33	24,345	452,000	325,000
Red gum	718,000	2.14	25.15	18,059	164,000	554,000
White ash	648,000	1.93	18.12	11,739	427,000	221,000
Longleaf pine	487,000	1.45	20.05	9,762	.....	487,000
Yellow poplar	481,000	1.44	43.07	20,715	321,000	160,000
Beech	77,000	.23	20.52	1,580	2,000	75,000
Shortleaf pine	20,000	.06	18.00	360	20,000	.....
Osage orange	8,000	.02	200.00	1,600	.....	8,000
Basswood	5,500	.02	31.09	171	5,500	.....
White pine	5,000	.02	28.00	140	5,000	.....
Black walnut	1,000	*	175.00	175	.....	1,000
Totals	33,492,500	100.00	\$24.99	\$ 836,855	28,960,500	4,532,000

*Less than 1-100 of 1 per cent.

Tennessee's nine woods aggregate 14,164,918 feet at an average cost of \$19.41 a thousand. Illinois is the leading state in this country in car manufacture, and the comparison with Tennessee may be of interest. Car makers in Tennessee pay little more than half as much per thousand as is paid in Illinois; but the important difference should be recognized, that in Illinois a number of expensive foreign woods are used in large amounts, while Tennessee builders used no foreign material. The proportion of high-grade work, such as sleeping and dining cars, is higher in Illinois than in Tennessee, where mining cars constitute a leading item. Cars of that kind operate underground to bring coal to the surface, or on switches and top lines in bringing coal and ore to the standard railroads.

Seventy-seven per cent of all the wood entering the car shops in Tennessee is longleaf and shortleaf pine, and the proportion of these two species in Illinois is 62 per cent. Longleaf pine in the latter state costs \$29.28, and shortleaf \$27.52, while in Tennessee they cost, respectively, \$21.32 and \$18. In matter of cost the advantage is with Tennessee. Yellow poplar costs Illinois manufacturers \$51.59, and Tennessee \$42.12. This is a valuable material and is one of the best for interior car finish, and Tennessee has the advantage over Illinois. Other comparisons might be made, and in almost every instance concerning the cost of wood the advantage is with Tennessee. Nevertheless, conclusions should not be drawn from that showing alone, for the grades used may not be the same. It is none the less evident that Tennessee possesses the resources and occupies the geographical position to warrant a trial at making it one of the greatest car building centers of the country. The industry is not yet developed to compare with Illinois, but the field is ready for development. It has the wood, coal, iron and the water power. The latter has not yet been much thought of, but its development is destined to become one of the surprises which the future has in store. The water power is in the mountains of the east where the rivers pour down steep channels. It will last forever if the forests are protected against fire so that stream flow may be regular and not subject to alternate destructive floods and withering drought.

Car manufacture is only one of many industries which may become great in years to come if resources are wisely husbanded. Five oaks appear in the list of material in Table 7. That many more might be included, for they are obtainable.

CAR CONSTRUCTION.

Table 7.

Kinds of wood	Quantity used annually feet B. M.	annually per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Longleaf pine	5,755,096	40.63	\$21.32	\$ 122,708	.....	5,755,096
Shortleaf pine	5,163,925	36.46	18.00	92,952	.....	5,163,925
White oak	2,402,662	16.96	18.65	44,814	2,360,662	42,000
Red oak	400,000	2.82	16.25	6,500	250,000	150,000
Texas oak	211,056	1.49	18.49	3,903	.....	211,056
Chestnut oak	200,000	1.41	16.00	3,200	200,000	.....
Bur oak	16,132	.12	20.02	323	16,132	.....
Yellow poplar	11,300	.08	42.12	476	11,300	.....
Cottonwood	4,747	.03	20.64	98	.....	4,747
Totals	14,164,918	100.00	\$19.41	\$ 274,974	2,838,094	11,326,824

Handles.

Almost 90 per cent of the handles made in Tennessee are of hickory, several species being included under that name and not distinguished in trade, though they may be when trees yet stand in the forest. This is the best known material in the world for two important classes of wares—light vehicles and handles. It has been said with much truth that the hickory handles sell American hammers the world over. Substitutes for hickory have been sought in all markets of civilized countries; and the little known forests of barbarous islands and remote mountains have been ransacked in the search, but no satisfactory substitute has yet come to light. There is a rare toughness and elasticity in hickory which nature has denied to all other known woods. Some are stronger, many are harder, but the rare quality is lacking in all of them, and the fact has come to be generally recognized, so that the handle sells the hammer.

Hammers are not the only tools with handles. Axes are almost as important, but the handle is more frequently sold separately than in the case of hammers. There is a recognized difference in value between hickories, not so much between spe-

cies as in parts of the same tree. Some buyers, with special purposes in view, buy the butts of medium-sized trees and use only the white sapwood. The tops, which by some are considered more brash, and the red heartwood of the butts are disposed of to other buyers. As much of this discrimination may be based on sentiment and tradition as on characteristics of the wood. The red heartwood is more used now than formerly. Much of it goes into pick handles, which demand strength more than resiliency.

HANDLES.

Table 8.

Kinds of wood	Quantity used annually feet B. M.	annually per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Hickory	8,623,776	88.69	\$22.50	\$ 196,586	7,361,276	1,262,500
White oak	650,000	6.68	29.23	19,000	650,000	.....
Red gum	350,000	3.60	10.00	3,500	350,000	.....
White ash	100,000	1.03	10.00	1,000	100,000	.....
Totals	9,723,776	100.00	\$22.63	\$ 220,086	8,461,276	1,262,500

Though hickory far surpasses all other woods in Table 8, it is not the only one. A small quantity of white oak competes with hickory for handles. Some assert that by boiling the oak handle in oil it is rendered much tougher than when in its natural state; but further experiments and additional

thing else. It is impossible that so much difference can be due to freight rates. Some manufacturers specialize on high-class commodities and buy expensive wood; others cater to a different trade, and their raw material costs less. The rough shipping boxes are included as one of the commodities of

CASKETS AND COFFINS.

Table 9.

Kinds of wood	Quantity used annually feet B. M.	annually per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Chestnut	1,772,730	18.67	\$13.94	\$ 24,716	725,000	1,047,730
Shortleaf pine	1,600,000	16.85	12.97	20,750	1,250,000	350,000
Yellow poplar	1,548,685	16.31	22.63	35,043	1,060,000	488,685
Red gum	1,514,800	15.96	14.96	22,663	5,000	1,509,800
Cypress	1,014,339	10.68	15.96	16,186	.....	1,014,339
White pine	820,000	8.64	16.01	13,125	795,000	25,000
Basswood	508,038	5.35	20.82	10,576	350,000	158,038
Hemlock	300,000	3.16	12.00	3,600	.....	300,000
Buckeye	200,000	2.11	18.00	3,600	200,000	.....
Red oak	100,000	1.05	18.00	1,800	100,000	.....
Red cedar	95,493	1.01	42.01	4,012	95,493	.....
Black walnut	20,000	.21	45.00	900	20,000	.....
Totals	9,494,085	100.00	\$16.53	\$ 156,976	4,600,493	4,893,592

reports seem necessary to establish that claim. The ash listed in the table represents handles for hoes, rakes, shovels and pitchforks. Strength and stiffness fit that wood for the place it occupies as the most important handle material for agricultural tools. Red gum occurs in this table. It is made into certain tool handles and into a class known as

the casket and coffin industry, and most of the cheap lumber is used in their manufacture. In Tennessee some of the red cedar, which is next to the highest priced wood in the industry list, is made into outer boxes because it is a long-lasting wood. Another reason for the use of cedar for burial boxes is that custom so long demanded them when the wood was abundant and cheap that the demand continues though red cedar is now scarce. With pencil makers paying \$7.50 per ton for cedar logs, the casket makers must pay a correspondingly high price to procure this wood for burial boxes.

Chairs.

The reason for treating the manufacture of chairs separate from furniture is that the makers of chairs frequently confine their operations to that branch of the furniture business. Wood for chair making is usually cheaper than that demanded by manufacturers of other furniture. The same kinds of wood are used by both, but chair material is in smaller pieces, permitting of a closer utilization of waste through the working up of scraps. In some localities there are mills which saw nothing but chair material. Small and crooked logs are acceptable, and can be used for dimension stock down to one inch square and a foot or more in length. A general furniture factory could make small use of such material. There are standard sizes for chair stock, such as rounds, backs, seats, legs, but other kinds of furniture are made in such various patterns, and the fashions and styles change so often, that standards in sawed stock are not often practicable. Red oak is the principal chair wood in Tennessee as shown in Table 10. This wood, as was explained in a preceding paragraph of this report, is not a single species, but includes several oaks under one name. The chair stock mill makes a pretty clean sweep of the various oaks on a tract of land where it is operating, and after culling out some of the white oaks, the rest goes in as red oak.

The white oak may not be culled out, but all may go to the chair factory. Table 10 shows a remarkably even run of average costs of the different kinds of wood. The highest is \$15.53, the lowest \$10, and the average \$15.01. The quantity of sawdust and shavings in a chair factory is large because much

Caskets and Coffins.

The average cost of material used for coffins and caskets in Tennessee is low. The cost of the wood employed varies greatly in different parts of the country, and customs vary as to the kinds of wood used. In Louisiana more mahogany is reported than any other wood, while in Tennessee no mahogany is listed. In most regions in the eastern half of the United States chestnut is prominent as a material for caskets, coffins and burial boxes. The latter are the rough boxes enclosing the caskets. Manufacturers assign no special reason why chestnut should hold so prominent a place, except that custom demands it, and the demand is met. In most instances the grade of chestnut known to the trade as "sound wormy" is unobjectionable. Such wood has been perforated by small boring insects whose galleries are about the size of large pin holes, but otherwise the wood is sound. In the fin-

of the material is reduced to small dimensions; but considering the unpromising character of the bulk of the logs that go to the mills, and the large proportion of small pieces worked out, the waste at a chair factory is small.

which deals with the woods used rather than the particular uses of the commodities produced. Wood-ware may be a little more definitely defined, but here, too, there is often room for uncertainty regarding the exact limits of the industry. It is gen-

desired size and pressed into shape. It is bought in the log, and for that reason is cheaper than the other woods in Table 12.

Trunks and Valises.

One of the most noticeable features of Table 13 is the difference in cost of woods used in manufacturing an article as simple as a trunk. Nevertheless, there is need of woods of different properties and grades, and this accounts for part but not all of the difference in cost. Next to the highest in price is elm, which is generally a cheap wood. Its high cost to trunk makers in Tennessee is due to the fact that many of the users buy it after it is cut to the exact sizes needed. It is thus a manufactured article when bought and all waste has been removed. It is made into slats to strengthen the tops, sides and bottoms. Trunk makers in some other regions buy this material in the rough and work out the slats in their own factories, and, of course, they buy it cheaper. Prices paid for elm by trunk makers in four states, including Tennessee and ranging northward, are, Tennessee \$37.87; Kentucky, \$17.82; Illinois, \$25.60; Wisconsin, \$24.23.

What is true of the prices of elm is true of other woods employed by trunk manufacturers. Where a marked difference in cost exists for the same kind of wood, it is due to the form in which the manufacturers bought it. In Wisconsin cottonwood costs \$27; in Kentucky, \$37.50, and in Tennessee, \$41.36. This wood is purchased as veneer, either in large single sheets or glued together in three or more

CHAIRS.
Table 10.

Kinds of wood	Quantity used annually feet B. M.	per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Red oak	4,901,000	72.53	\$15.53	\$ 76,110	2,901,000	2,000,000
White oak	1,100,000	16.28	14.55	16,000	1,100,000	.....
Sugar maple	400,000	5.92	12.38	4,950	400,000	.....
Hickory	130,000	1.92	12.62	1,640	130,000	.....
Beech	125,000	1.85	12.30	1,538	125,000	.....
Birch	100,000	1.48	12.00	1,200	.....	100,000
Red gum	1,000	.02	10.00	10	1,000	.....
Totals	6,757,000	100.00	\$15.01	\$ 101,448	4,657,000	2,100,000

Pencil Stock.

Table 11 lists two woods for lead pencil stock in Tennessee—red and white cedar. Though reported in that way, it is probable that only red cedar is used, and what is called white cedar is the white sapwood of red cedar. The white cedar or arbor vitae in the mountains of Eastern Tennessee is a different species. The average cost of pencil cedar as shown in the table is misleading unless explained. It might seem unreasonable that cedar suitable for pencils should be purchased for \$8.30 a thousand feet, when other manufacturers pay \$25 and \$30 for what they convert into furniture. The difference in cost is due to the different forms in which the stock is purchased. The furniture people buy theirs as sawed lumber, after the slabs and sawdust have been removed; but the pencil wood is bought with all the waste. Not only are logs purchased, but also old stumps, fence rails, gate posts, barn logs, bridge cribs and cedar in all shapes, sizes and conditions, some of it half rotten, other weather checked, and all piled together, loaded on cars and sold by weight to the makers of pencil slats. This is the material which costs \$8.30 per 1,000 feet, when the weight has been reduced to board feet. It is evident that most of the collection of all cedar wood thus brought together is waste. By the time the slat maker has worked out such of it as he can use, he has thrown away perhaps four-fifths of all he bought. Though the mass of wood in the rough may have cost him \$8.30 per 1,000 feet, the slats will cost several times that much if estimated by the thousand feet. The factory which reduces the rough material to slats does not make the finished lead pencils. Other factories, some in New York, New Jersey or other states, and some in Europe, buy the slats and convert them into pencils ready for use. The slats are one-quarter of an inch thick, seven inches long and two and one-half inches in width. A slat of that kind makes six half pencils. Formerly when cedar was abundant pencil makers bought wide slats only; but cedar that can be worked into wide slats is becoming so scarce that narrow stock now finds ready sale. Other woods have been tried for pencils, and some have been fairly successful, particularly for the cheap grades; but the unremitting search that still goes on for red cedar is proof that no available and wholly satisfactory substitute has been found. Several qualities are demanded of a pencil wood. It must be soft and must whittle easily. To meet that requirement, it must be brittle so that the shavings will fall away as the knife cuts. The wood must be moderately light to keep transportation charges down when shipments are large or go long distances. It must be moderately dark in color, such as will not soil easily in handling. The wood must have a pleasing odor when freshly cut. It must not be cross-grained, for that lessens its good whittling qualities. Some of these qualities seem trifling, yet the buying public has learned to expect them in a pencil and is disappointed if any one of them is absent. The extensive search for substitutes among the many woods of this and other countries has demonstrated how hard it is to find a wood combining all the desirable qualities of red cedar.

PENCIL STOCK.
Table 11.

Kinds of wood	Quantity used annually feet B. M.	per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Red cedar	5,300,000	99.53	\$ 8.30	\$ 44,000	3,900,000	1,400,000
White cedar	25,000	.47	7.48	187	25,000	.....
Totals	5,325,000	100.00	\$ 8.30	\$ 44,187	3,925,000	1,400,000

Woodenware and Novelties.

Novelties and woodenware include a considerable but indefinite number of commodities. Novelties are small articles of various kinds and are either useful or ornamental. Some of the most common are paper knives, pen racks, rulers, small trays, boxes and receptacles for buttons, thread, jewelry and the like; two-piece boxes produced by the lathe, in which ink bottles, paints, pills, powders and other similar articles are shipped and sold. The line between novelties and toys on the one hand and woodenware on the other cannot be very clearly drawn. Whole groups of articles may fall in doubtful classes. Exact definitions and strict classifications are not necessary in a report such as this,

erally understood that woodenware overlaps on cooperage in certain directions. Small vessels made of staves are the work of the cooper, yet some of such belong with woodenware. Among that sort are firkins, keelers, piggins and small buckets and tubs, found principally in kitchen and pantry. Stave-made receptacles for salt, pepper, spices and other condiments used in cooking, are in this class. Water pails and candy buckets are within the limits also. A large part of the red cedar shown in Table 12 was manufactured into ware of this kind. Tennessee has long been noted for the excellency of its cedarware. A red cedar bucket with brass

WOODENWARE AND NOVELTIES.

Table 12.

Kinds of wood	Quantity used annually feet B. M.	per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Red cedar	1,036,800	31.79	\$24.00	\$ 24,888	1,036,800	.....
Cottonwood	1,000,000	30.66	20.00	20,000	.....	1,000,000
Red gum	750,000	22.99	20.00	15,000	.....	750,000
Cypress	250,000	7.66	20.00	5,000	.....	250,000
Beech	165,000	5.06	10.36	1,710	165,000	.....
Basswood	60,000	1.84	22.00	1,320	60,000	.....
Totals	3,261,800	100.00	\$20.82	\$ 67,918	1,261,800	2,000,000

hoops, made in Tennessee in 1767, was exhibited at the World's Fair held in St. Louis in 1904. The wood was sound and the hoops were bright after the lapse of 137 years. Factory-made ware of this kind has taken the place of the hand-made articles of former times. Not only is the red cedar more largely used than any other wood in this industry in Tennessee, but it is higher in price than any other. The entire quantity used grew in the state.

Other articles than staveware belong in this industry, and other woods furnish large amounts of material in Tennessee. Cottonwood follows cedar in amount, but all of the raw material comes from

ply and cut to the exact sizes needed, and in some instances it is bent in the form desired. Tennessee trunk makers bought yellow poplar for trays and compartments at \$17.33; in Kentucky it cost \$10 a thousand more. In Tennessee buckeye costs \$21.33, in Kentucky \$22. Similar comparisons might be made for other woods, and as great differences and as close agreements may be shown. The short-leaf pine reported second in quantity in Tennessee is so low in price that it can be no other than low-grade lumber employed in making very cheap trunks. The hickory and ash listed in this industry are used for slats. Woods made into veneer

TRUNKS AND VALISES.

Table 13.

Kinds of wood	Quantity used annually feet B. M.	per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Yellow poplar	1,181,000	40.86	\$17.33	\$ 20,470	1,181,000	.....
Shortleaf pine	700,000	24.22	9.00	6,300	700,000	.....
Basswood	310,000	10.73	24.56	7,614	205,000	105,000
Chestnut	200,000	6.92	16.00	3,200	100,000	100,000
Buckeye	180,000	6.23	21.33	3,840	105,000	75,000
White elm	168,000	5.31	37.87	6,362	143,000	25,000
White ash	75,000	2.60	13.27	995	40,000	35,000
Hickory	50,000	1.73	20.00	1,000	25,000	25,000
Red gum	15,000	.52	32.00	480	15,000	.....
Cottonwood	11,000	.38	41.36	455	11,000	.....
Totals	2,890,000	100.00	\$17.55	\$ 50,716	2,525,000	365,000

without the state. It is made into washboards, ironing boards, bread boards, cutting boards, drying racks and numerous articles found in kitchen, pantry and laundry. Cottonwood's white color is one of its good qualities. This makes it particularly serviceable where stenciling and printing are to be done on it. Makers of washboards value cottonwood highly because it stencils so well. Basswood closely resembles cottonwood in color and character of the wood, is used for the same purposes and is a little higher in price. It has some uses for which cottonwood is not suitable. One of these is pyrography; where pictures, ornaments and dec-

and used in several thicknesses are yellow poplar, basswood, buckeye and cottonwood. These are generally cut by the rotary process and may be had in sheets of any size wanted. This is an important consideration, for when a sufficient number of sheets have been glued one upon another to give the desired strength they may be cut to size, and by bending, a single piece will make the bottom and two sides of a trunk. It was formerly the custom to construct the box of a trunk of lumber and cover it with leather. That was before the days of the railroads, when the trunk that traveled at all went by boat and stage coach, and was handled with due consideration of the feelings of the owner, who was usually standing by and watching it go aboard or come off. But when trunks began to go by rail and chute-the-chutes in modern stations, stronger material than boards and calf skin had to be found for their construction; and sheets of veneer with an abundance of brass reinforcement and sheet iron overlay were brought into use.

The average cost of all wood used by trunk makers in Tennessee is \$17.55; in Wisconsin, \$23.11; Illinois, \$30.01; and Kentucky, \$44.81.

Agricultural Implements.

The line between a tool and an implement is not very definite when it concerns agricultural machinery. In a general way tools are small and implements large; tools are operated by hand and implements by horses or some other power. These are not hard-and-fast definitions, and it would not be difficult to find exceptions. The commodities represented in Table 14 belong chiefly to the implement class, if a difference is to be drawn between implements and tools. The sickle, scythe, cradle, hoe, fall and pitchfork are tools; the mowing ma-

chine, thresher, plow and cultivator are implements.

About half of all the wood reported was white oak, which includes a number of species. This wood possesses most of the properties demanded in this industry, the chief one being strength and the next hardness. Where hardness alone will suffice, beech answers well. It is suited for slides where one part of the machine must work back and forth, the surfaces sliding upon each other. The high cost of the beech in Table 14 indicates that the best grades were in demand. The wood is liked well for the fellos of very heavy wheels. Red oak and chestnut oak are utilized for strong frames. A large amount of yellow poplar appears, and much of it was made into hoppers, seed boxes, chutes, drawers and compartments in fanning mills, cleaners, drills and threshers. The shortleaf pine was used for the same purposes. It might be expected that ash would appear in this industry, and its qualities make it suitable for many purposes; but it is identified with the tool industry rather than with the manufacture of implements. If such tools as pitchforks, rakes, hoes, shovels and scythes were included in Table 14, ash would appear in large amounts, for it is the usual handle wood for such tools.

The manufacturer of agricultural implements is not yet as important in Tennessee as in some other states, but the abundance of raw material in the region and the accessibility of many markets justify the prediction that before many years Tennessee will attain a high place among the states in the manufacture of machinery for the farms. The fertility of the land, the diversified surface which calls for crops of various kinds and the mildness of the climate and abundance of rainfall assure great and permanent prosperity for Tennessee farmers. They will buy more farm implements in the future than in the past, for scientific methods are replacing the poor makeshifts of yesterday. Up-to-date farming calls for better machines and more of them. The forests of Tennessee contain an abundance of the woods needed in that line of manufacture, and the people have made a beginning in putting it to use. It is only a beginning, however. Tennessee ships twice as much implement wood to Illinois, there to be manufactured, as is worked up at home; and in many instances the finished machines are shipped to the region where the woods grew and are sold there. Full development of home resources will demand the manufacture of this wood at home. The state may become a manufacturing center along that line, instead of a feeder for other manufacturing centers. A comparison of what Tennessee is doing and what some of its neighboring states are doing is worth consideration. The state annually uses 2,890,000 feet of wood in producing agricultural implements, and pays an average of \$22.58 per thousand for it. North Carolina uses 3,391,000 feet and pays \$11.95; Kentucky, 6,610,000 feet at a cost of \$32.54; while Illinois, which has a comparatively small supply of home-grown wood and buys from other states 99.9 per cent of what it makes into implements, uses 103,649,000 feet, and pays \$34.54 a thousand for it.

AGRICULTURAL IMPLEMENTS.

Table 14.

Kinds of wood	Quantity used annually feet B. M.	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
White oak	1,425,000	49.31	\$ 33,175	725,000	700,000
Yellow poplar	450,000	15.57	18.44	8,300	400,000
Red oak	425,000	14.71	29.65	12,600	75,000
Shortleaf pine	325,000	11.24	20.00	6,500	325,000
Chestnut oak	250,000	8.65	17.20	4,300	250,000
Beech	15,000	.52	25.00	375	15,000
Totals	2,890,000	100.00	\$22.58	\$ 65,250	1,790,000

Sporting and Athletic Goods.

Table 15 represents, in Tennessee, what is properly termed a one-wood industry. That wood is hickory. Two others are listed, but they constitute less than three per cent of the whole. Golf sticks are the principal commodity. The shaft is hickory and the head persimmon. No explanation has been offered why dogwood is absent from Table 15, for it is one of the best materials for golf heads, and it is abundant in Tennessee. The head of a golf club must fulfill exacting requirements. It must be elastic and of sufficient hardness and toughness to wear smooth. Some woods which possess part of the requisite qualities lack the essential—they burst under the impact of the blow. That is the fault of hickory as the head of a golf stick, though as a shaft it has no equal. The two parts—head and shaft—call for different properties, and no wood, as far as present knowledge goes, possesses both of them in a high degree. That is why a golf stick is always of two kinds of wood. English beech, which differs somewhat from the American tree, was once the favorite wood for golf heads in this country as well as abroad; but it has lost its place to dogwood and persimmon.

More use is made of persimmon's white sapwood than of the heart which is dark. Shuttlemakers also want the sapwood, and the combined demand is met at the expense of the persimmon's dark heartwood which must find a market elsewhere.

The white ash listed in Table 15 was bought by makers of ball bats. The low price of hickory is

due to its purchase in the log or bolt form. The average value of hickory lumber in the mill yards of Tennessee in 1909, which are the latest available figures, was \$37.13, more than double the cost of the wood as listed in Table 15. Though in 1909 and again in 1910 Tennessee led all the other states in the quantity of hickory lumber produced, yet the makers of athletic goods in the state are sending outside for 98 per cent of their supply of this wood. The reason for it is that some of the largest users are near the state line, and it happens that the most convenient supply of the wood is across the border.

SPORTING AND ATHLETIC GOODS.

Table 15.

Kinds of wood	Quantity used annually feet B. M.	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Hickory	2,550,000	97.14	\$17.25	\$ 44,000	50,000
White ash	60,000	2.29	22.50	1,350	60,000
Persimmon	15,000	.57	35.00	525	15,000
Totals	2,625,000	100.00	\$17.48	\$ 45,875	125,000

Shuttles, Spools and Bobbins.

The three classes of commodities heading Table 16 are usually grouped as one industry because they are purchased by factories which spin and weave; but as far as Tennessee is concerned, shuttles constitute nearly the whole output of the industry. Two woods are employed, dogwood and persimmon. These have long been considered the best available material in this country for shuttles, though search for others has been wide and thorough since the advance in cost of Turkish boxwood took it from the American shuttlewood market. Dogwood and persimmon possess all the desired properties, though some of them in a less degree than boxwood. But when the Tennessee woods can be bought at less than three cents a foot, and boxwood costs nearly a dollar a foot, it is evident that the supply will be met by woods from Tennessee and surrounding regions. The

SHUTTLES, SPOOLS, AND BOBBINS.

Table 16.

Kinds of wood	Quantity used annually feet B. M.	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Dogwood	1,705,000	71.94	\$22.07	\$ 37,627	1,180,000
Persimmon	665,000	28.06	26.80	17,825	165,000
Totals	2,370,000	100.00	\$23.40	\$ 55,452	1,345,000

preceding industry, Table 15, shows the use of persimmon for gold heads. The heartwood is rejected as it is in shuttle making. The waste of the dark-colored heart would be complete were it not so well adapted to other uses. The persimmon is a species of ebony, and the heart is the portion which shows the color. It is bought by manufacturers of parquet flooring and by some furniture makers.

The persimmon tree grows to large size and passes through saw mills like other saw-logs. Statistics have not been compiled in a way to show the quantity of persimmon cut, nor the states which lead in production. It is known, however, that the amount is not large, and the persimmon is justly

cut dogwood in small lots and haul it to the towns where it is sold to dealers who in turn ship and sell to manufacturers when the collection amounts to a carload or more. The getting together of the wood in this manner is usually done by negroes who are willing to handle small quantities and are content with moderate returns. Often a few sticks, maybe only two or three, are carried to town in small wagons along with farm articles for sale. This custom prevails also in Southern States other than Tennessee. It is not possible to obtain statistics of amounts so many and small, except in

the aggregate after they reach the manufacturers. The table shows that most of the persimmon used grew outside the state.

Shuttle blocks are about 17 inches long and somewhat more than two and a quarter inches square. The blocks from which golf stick heads are made are not as long, but are larger in cross section. Dogwood and persimmon are used for both articles. Their hardness and the small liability of the wood to become abraded are their most important properties.

Boat and Ship Building.

Without an explanation the heading for this industry would be misleading because no ships and few boats are built in Tennessee. This heading is used for uniformity's sake in all state wood-using reports such as this, and all material employed in the industry is listed in the accompanying table.

In Tennessee practically all of the wood reported is white ash, and it is manufactured into oars. The white oak was used for boat repairs, and the cypress is so small in quantity as to be negligible. No other wood is equal to ash in the amount going into oars in the Southern and Middle States, and the product is sold in all parts of this country and in some foreign countries. In certain regions ash comes in competition with other woods for some kinds of oars. Paddles for canoes are of spruce oftener than of ash, for spruce is lighter and is strong enough. The yew tree that grows on the Pacific Coast might compete successfully with ash for oars if it were as abundant and accessible.

Table 17 probably does not do Tennessee justice as an exhibit of its boat building. Large numbers of skiffs and other small boats are made there and are found by thousands on the rivers and creeks; but they are not turned out of large factories and are not shown in the table. They are the output of small shops and of individual workmen in all regions of the state. The fact that they are so made is well known, but it has been impossible to compile figures to be used as statistics. This condition obtains in many regions of the United States. A wagonload of lumber and a few tools suffice for manufacturing small boats, and it is done everywhere and no report is made of it. This explanation is made to correct any wrong impression that might follow from an examination of Table 17. On the face of it Tennessee makes no boats, yet the fact is large numbers are made along the rivers of the state, but not in boat factories. Canoes hewn from trunks of yellow poplar are still occasionally seen on the rivers, though the high value of this wood in the market in recent years has diminished its use for dugouts. Historically yellow poplar has been the greatest boat wood of Tennessee. Reference has already been made to its early use for canoes in war and peace. That use continued for a century or more and has not wholly ceased. The wood was employed in a wasteful manner, for a trunk measuring from two to four thousand feet was often hewed into a single canoe; but yellow poplars of that dimension were plentiful then and it was right that the people should cut them for canoes if they needed them.

Fixtures.

Fixtures, as the term is considered in Table 18, are close akin to furniture, but differ in several

BOAT AND SHIP BUILDING.

Table 17.

Kinds of wood	Quantity used annually feet B. M.	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
White ash	1,750,000	98.53	\$27.00	\$ 47,250	1,750,000
White oak	25,000	1.41	23.00	575	25,000
Cypress	1,000	.06	45.00	45	1,000
Totals	1,776,000	100.00	\$26.95	\$ 47,870	26,000

particulars. Furniture is moved from place to place and is not designed for any particular room or space. Fixtures are intended to remain in the positions where the maker places them, and they cannot be moved without more or less injury. They are divided into three classes, based on the uses intended—office, store and bar. Office fixtures include desks and tables built in certain spaces and intended to be left there; partitions between different parts of the same room, and benches and seats which are made fast to the walls or the floor. Bar fixtures consist of racks and cabinets for glasses, frames in which to exhibit commodities for sale, and the bar itself. The fixtures for stores include counters, showcases, cabinets, shelves and benches and seats made to fit certain places. Banks use the same class of fixtures as offices. No attempt is here made to name or enumerate all articles classed as fixtures. That would not be possible, for special kinds and odd articles are constantly demanded. Sometimes the line separating fixtures from furniture cannot be exactly defined, nor the separating line between fixtures and finish, but after due allowance is made for exceptions the fixture industry is adequately defined in its scope.

No other industry in Tennessee buys wood of so high average price. The material is expensive because much of it is of high class and must be had in large sizes. Cabinets and counter tops require broad panels, and they are expensive. If extra wide, they are built up, usually of several ply veneer. An examination of Table 18 reveals the fact that a number of woods which are cheap in other industries are costly in this. That is due to high grade and large prices. Sycamore is \$30, white ash over \$40, red oak, \$42, white oak still higher and so on. The cheapest is shortleaf pine. The whole quantity of that wood listed was used by a single manufacturer who was able to buy it cheap. Fixture manufacturers in Kentucky pay an average price of \$26.20 for their wood; it costs \$34.52 in North Carolina, \$41.44 in Illinois, \$40.40 in Maryland, \$44.12 in Wisconsin, and \$38.28 in Tennessee.

It should be borne in mind in this instance as in so many others that a mere ratio between prices for woods employed in a given industry in a number of states is not always a safe ground for the conclusion that the material is cheaper or dearer in one state than in another. A difference in price for a certain wood may be due to difference in grade; or a large amount of a costly wood increases the general average of all; or one cheap wood in large quantity lowers the general average of all. Mahogany in Table 18 cost \$155 a thousand, and 80,000 feet were reported. Suppose it had been 800,000 instead of 80,000. The average cost of all woods reported for the industry would be raised above \$75 a thousand.

The woods in Table 18 which were largely employed as cores or backing for veneers or as inside frames or shelves are red gum, shortleaf pine, chestnut and black gum. The others possess figure, grain or color fitting them for outside places.

is that the wood must be fairly light, moderately cheap, not too dark in color, and it must produce elastic excelsior. The article has uses other than as packing material. Upholsterers make mattresses, cushions and filling for seats and backs of parlor furniture of it; but the amount going into commodities of that kind is much smaller than that employed for packing. Excelsior, even of the finest grades, is not in the same class with hair of Spanish moss for upholstery. It is packed in bales like hay and is sold by weight. It is not usually shipped far from the place of manufacture, but each industrial

a facsimile of the casting to be molded. It is buried in damp sand which is tamped about it. The pattern is then removed in a way provided for, and the hollow space, the shape of the pattern, remains. The metal is poured in and the casting is formed. The flask is the box which holds the sand into which the casting is run. High-class wood is not essential for flask making as it is for patterns. The foundry is not the only user of patterns. They are necessary in shops of many kinds, and a certain class of patterns are called models.

Most of the sycamore and some of the maple in the miscellaneous table were converted into butcher

EXCELSIOR. Table 19.

Kinds of wood	Quantity used annually feet B. M.	per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Yellow poplar	575,000	52.27	\$ 9.58	\$ 5,510	575,000	.....
Black willow	200,000	18.18	8.15	1,630	200,000	.....
Shortleaf pine	175,000	15.91	8.05	1,409	175,000	.....
Basswood	55,000	5.00	9.11	501	55,000	.....
Buckeye	50,000	4.55	9.24	462	50,000	.....
Cottonwood	45,000	4.09	9.20	414	45,000	.....
Totals	1,100,000	100.00	\$ 9.02	\$ 9,926	1,100,000	.....

region has factories which supply the markets within reach.

Miscellaneous.

Much wood is used for manufacturing purposes in Tennessee which does not go to any of the industries represented in Tables 2 to 19 inclusive. It is made into various articles, so different in character and purpose that they cannot be logically grouped in amounts large enough to be properly called industries. All such are represented in Table 20 as "Miscellaneous." Eighteen woods are included, all of them American, and all but one—longleaf pine—native of Tennessee. It is not practicable to list all the kinds of articles made from the woods shown in the miscellaneous table; but some of the most important follow.

Some of the black walnut is bought by manufacturers of firearms, and is made into gunstocks and pistol grips. This has always been the leading gunstock wood of Tennessee, as well as of the country generally, and it holds the place in spite of advancing price. It does not appear, however, that the price paid for the walnut in Table 20 was very high. In former times a good many gunstocks were made in Tennessee which never saw a factory. They were cut out by hand for old-fashioned rifles, and were usually of maple. At the present day a few gunstocks are so made in the state, though no report of them was compiled in a way to render the data available for Table 20. Yellow wood (*Cladrastis lutea*) is used. This wood is known also as yellow ash, yellow locust and gopher wood. It takes a good polish and is serviceable.

White pine is the best wood for patterns because it cuts easily and holds its shape well, provided it has been thoroughly seasoned. Choice pattern

blocks. The old-style block, which was simply a piece of a log the proper length and stood on end, is not holding the ground it once had. Health boards and sanitary committees have discouraged its use on the ground that it is not conducive to health. The piece of a log checks and the opening cracks form lodging places for bacteria and other impurities where the scrubbing brush cannot reach them. The built-up meat block is less objectionable because it checks less. Thoroughly seasoned pieces are fitted together and held with dowels and glue. Blocks of that sort wear as well as the one-piece kind and are replacing them.

Some of the hickory in the table was converted into skewers, a meat shop article, consisting of a small peg for preparing certain cuts of meat for the pot or oven.

A number of woods figure in the manufacture of playground equipments which are rapidly gaining in favor in all parts of the country. Among the articles are swings, slides, teeter boards, flying Dutchmen, toboggans and the like.

Brooms are listed among the miscellaneous manufactures. The handle is the only wooden part of most brooms. The search for suitable wood for broom handles is active. At one period in broom-making history in this country it was desirable that the handles be of light material such as basswood and yellow poplar; or, at any rate, woods were not discriminated against because they were light in weight. The advance in recent years in the price of broomcorn has caused manufacturers to look with more favor on heavy woods for handles. Brooms at wholesale are sold by weight, and if the handle is heavy a little less broomcorn may be used without resulting in an underweight broom. Handles are of beech, birch and maple, with smaller lots of other woods. In some Southern States gum and magnolia have been successfully tried.

The manufacturers of pumps draw for supplies upon the woods listed in Table 20. The sucker rods are of ash and hickory; the handles of beech, maple, hickory or ash; and the logs yellow poplar, maple and basswood. The well sweep of early times and the old oaken and cedar buckets that hung in the wells are passing away and the pump is taking their place, but the change is by no means complete in Tennessee. Though the manufacture of pumps has reached respectable proportions, the bucket and sweep linger among the hills and valleys.

Laundry methods and appliances are likewise undergoing change, and a considerable part of the wood listed in the miscellaneous table is converted into washing machines, stationary tubs, wringers, dryers and other modern conveniences which are driving from use the old-time back-breaking tubs made by sawing whiskey barrels in two. The old tub and its worthy mate, the home-made rubbing board, have not disappeared, nor will they soon disappear entirely; but machinery to run by steam or some other power than muscle has entered the field and has lifted from feminine shoulders part of the burden that has oppressed since the days when

FIXTURES. Table 18.

Kinds of wood	Quantity used annually feet B. M.	per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
White oak	510,000	33.27	\$43.33	\$ 22,100	285,000	225,000
Red gum	350,000	22.83	16.00	5,600	225,000	125,000
Birch	130,000	8.48	51.85	6,740	30,000	100,000
Shortleaf pine	100,000	6.52	12.00	1,200	100,000	.....
Black gum	100,000	6.52	16.00	1,600	100,000	.....
Mahogany	80,000	5.23	155.00	12,400	.....	80,000
Red oak	80,000	5.22	42.44	3,395	80,000	.....
Chestnut	60,000	3.91	21.33	1,280	50,000	10,000
White ash	55,000	3.59	40.45	2,225	30,000	25,000
Yellow poplar	30,000	1.96	35.00	1,050	30,000	.....
Sugar maple	20,000	1.30	25.00	500	.....	20,000
Sycamore	15,000	.98	30.00	450	7,000	8,000
Black walnut	3,000	.20	50.00	150	1,000	2,000
Totals	1,533,000	100.00	\$38.28	\$ 58,690	938,000	595,000

Excelsior.

The low average cost of wood bought by excelsior manufacturers is due to purchase in log form. Logs smaller than ordinary saw timber are suitable; but there should not be too many knots. Excelsior is nothing more than narrow shavings cut by machinery adapted to that purpose; and if these shavings are broken into short lengths, as is likely to be the case if the wood is knotty, the product becomes little better than sawdust, and, of course, depreciates in value. The principal use for it is packing breakable articles of merchandise for shipping. If the excelsior is not soft, yielding and somewhat elastic as a mass, its worth is reduced. The machines that make it are equipped with knife-like points for slitting the bolt of wood lengthwise, and another blade that shaves off the scored surface and makes the narrow, thin ribbons of wood constituting the manufactured article. There are different qualities, depending upon the fineness of the ribbons and the quality of the wood used as raw material. Yellow poplar is the leading wood for this industry in Tennessee, and costs \$9.58 per thousand feet; in Wisconsin the principal excelsior wood is aspen and costs \$11.37; in North Carolina white pine and yellow poplar are reported in equal amounts, the former costing \$6.34, the latter \$10. Most regions have one or more available woods; some have many. The most essential requirement

woods come from old trees such as are seldom found in forests now. Material of that class is often called pumpkin pine or cork pine. Foundries use some of the best obtainable wood for patterns. Other species have taken the place of white pine for certain kinds of patterns; cypress is one and sugar pine of California is another, but neither of them was reported by pattern makers in Tennessee. Foundry flasks go with patterns. The pattern is

MISCELLANEOUS. Table 20.

Kinds of wood	Quantity used annually feet B. M.	per cent	Average cost per 1,000 ft.	Total cost f. o. b. factory	Grown in Tennessee feet B. M.	Grown out of Tennessee feet B. M.
Red gum	3,414,628	24.76	\$14.40	\$ 49,162	1,050,000	2,364,628
Cottonwood	3,000,000	21.75	21.00	63,000	.....	3,000,000
Hickory	1,352,000	9.80	17.71	23,940	402,000	950,000
White oak	1,187,000	8.61	19.59	23,255	1,187,000	.....
Shortleaf pine	1,080,000	7.83	19.85	21,440	300,000	780,000
Red oak	1,050,000	7.61	18.17	19,075	990,000	60,000
Black ash	700,000	5.07	14.00	9,800	.....	700,000
Yellow poplar	565,000	4.10	18.69	10,560	565,000	.....
Chestnut	400,000	2.90	15.00	6,000	400,000	.....
Beech	325,000	2.36	15.23	4,950	300,000	25,000
Sycamore	200,000	1.45	15.00	3,000	200,000	.....
Sugar maple	115,000	.83	23.13	2,660	50,000	65,000
White ash	100,000	.73	14.00	1,400	100,000	.....
Basswood	100,000	.72	18.00	1,800	100,000	.....
Longleaf pine	100,000	.73	19.00	1,900	.....	100,000
Silver maple	70,000	.51	16.43	1,150	50,000	20,000
Black walnut	25,000	.18	30.00	750	25,000	.....
White pine	8,000	.06	33.75	270	3,000	5,000
Totals	13,791,628	100.00	\$17.70	\$ 244,112	5,722,000	8,069,628

Madisonville Chair Co. Madisonville
Johnson-Baker-Donaldson Chair Co. Morristown
Larkin Company of America. South Memphis
T. A. Gunn Tullahoma

Excelsior.

Fatton-Black Mfg. Co. Jackson
Knoxville Coffin Co. Knoxville
Knoxville Excelsior Mattress Co. Knoxville
Southern Excelsior Co. Nashville

Fixtures.

Athens Planing Mill Athens
Budde-Lindsay Mfg. Co. Jackson
Southern Seating & Cabinet Co. Jackson

Furniture.

Athens Table & Mfg. Co. Athens
Chattanooga Furniture Co. Chattanooga
Hunt Spring Bed Co. Chattanooga
W. S. Milne Cleveland
W. J. Oakes Chair Factory Columbia
J. H. Thomas & Co. Columbia
Erwin Mfg. Co. Erwin
The Greeneville Furniture Co. Greeneville
Exum Furniture Co. Johnson City
C. B. Atkins Co. Knoxville
The Knoxville Table & Chair Co. Knoxville
Walter Lutz & Co. Knoxville
The Proctor Furniture Co. Knoxville
Schaad & Rotach Knoxville
Tennessee Mantel Mfg. Co. Knoxville
Cherokee Mfg. Co. Maryville
Chickasaw Table Factory Memphis
Memphis Furniture Mfg. Co. Memphis
Tennessee Furniture Mfg. Co. Memphis
East Tennessee Woodworking Co. Morristown
Anchor Spring & Bedding Co. Nashville
Edgefield & Nashville Mfg. Co. Nashville
Indiana Lumber Co. Nashville
Myers Mfg. Co. Nashville
Rothschild Mfg. Co. Nashville
Standard Furniture Co. Nashville
Newcomb Mfg. Co. Newcomb
Wolfe Bros. & Co. Pinev Flats
T. W. Pittman & Co. Pulaski
John T. Walker Rogersville
Greenfield-Talbot Furniture Co. Tullahoma

Handles.

J. A. Isbell Baxter
Dixie Logging Tool Co. Chattanooga
A. H. Leathers Handle Co. Dickson
Fowlkes Handle Co. Fowlkes
W. J. Beasley Franklin
The Anchor Block Mills Co. Jackson
Unaka Handle Co. Johnson City
The Hartzell Handle Co. Memphis
Nashville Spoke & Handle Mfg. Co. Nashville
Sequatchie Handle Works Sequatchie

Miscellaneous.

National Refrigerator & Butcher Supply Co. Campaign
The Odorless Refrigerator Co. Chattanooga
Clarksville Foundry & Machine Co. Clarksville
Barnes Mfg. Co. Cleveland
H. L. Judd Co. East Chattanooga
W. J. & Hugh McAllister Fayetteville
The Wels & Lesh Mfg. Co. Jackson
The Wm. J. Oliver Mfg. Co. Knoxville
Florence Pump & Lumber Co. Memphis
Jorgensen Bennett Mfg. Co. Memphis
Lenox Broom Co. Memphis
National Washboard Co. Memphis
Oil Well & Supply Co. Memphis
J. T. Willingham Memphis
Ware & Goodwin Co. Trezevant

Pencil Material.

Cedar Products Co. Alton Park
Gulf Red Cedar Co. Lebanon
American Lead Pencil Co. Lewisburg
Houston & Liggett Lewisburg

Planing Mill Products.

J. E. Thompson Adams
J. F. Robertson & Co. Alamo
Donnell & Patterson Alexandria
J. P. Tinch Allardt
Athens Planing Mill Athens
J. A. Royle Baxter
Baxter Planing Mill Co. Baxter
Cloyd Bros. Bristol
Paxton Lumber Co. Bristol
Peter-McCain Lumber Co. Bristol
Stone-Huling Lumber Co. Bristol
D. F. Hargis Bumpus Mills
Hudson & Durdin Camden
Carthage Lumber & Hoop Co. Carthage
T. S. Colley's Sons Centreville
Charleston Lumber Co. Charleston
Chattanooga Lumber Co. Chattanooga
King-Baxter Lumber Co. Chattanooga
Union Lumber Co. Chattanooga
Barnes Mfg. Co. Cleveland
Marshall Planing Mill Cleveland
The T. H. Leinart Co. Clinton
G. P. Mayberry Columbia
Riverside Lumber Co. Columbia
J. H. Thomas & Co. Columbia
Vaughn Mfg. Co. Columbia
Crawford, Lowe & Qualls Cookeville
Scott Bros. Co. Cookeville
S. P. Bruner & Son Decherd
Dickson Planing Mill Co. Dickson
Earle Saeger Dickson
Hearn Lumber Co. Dyer
Star Planing Mill Elizabethton
N. Christianson Erin
Erwin Mfg. Co. Erwin
J. K. Williams Lumber Co. Fayetteville
Craig Lumber Co. Franklin
Southall Bros. Franklin
Williams & Mallory Franklin
C. E. Northrop & Son Gallatin
S. D. Simpson & Son Gallatin
J. H. Edens Hampton
Stowers Lumber & Mfg. Co. Harriman
C. D. High & Co. Hartsville
E. A. Dorris & Sons Hendersonville
Hohenwald Planing Mill & Brick Mfg. Co. Hohenwald

Wildner & Leach Huntingdon
S. B. Edgar Jefferson City
Jellico Lumber Co. Jellico
Harris Mfg. Co. Johnson City
Nelson Lumber Co. Johnson City
Broadway Mfg. Co. Knoxville
Chavannes Lumber Co. Knoxville
F. B. Cooley & Son Knoxville
Knoxville Lumber Co. Knoxville
T. M. Michaels Knoxville
D. M. Rose Lumber Co. Knoxville
Ross Lumber Co. Knoxville
Brown Hunt Co. Lafayette
Freeman Mill Co. Lafayette
R. B. Freeman, Jr. Lafayette
A. P. Wyley Lawrenceburg
Wilson County Planing Mill Co. Lebanon
Electric Lumber Co. Lenoir City
B. N. McGaugh & Son Lewisburg
Sanders Bros. & Co. Lewisburg
T. Edwards Lexington
Draper Bros. Livingston
Mellers, Augustin & Co. Loretto
A. W. Ward Lumber Co. Loudon
Lynnville Lumber Co. Lynnville
G. H. Wooley McKenzie
Hutchins & Alcott McMinnville
McMinnville Spoke & Lumber Co. McMinnville
Walling Lumber & Mfg. Co. McMinnville
J. R. Burlason Madisonville
A. E. Boyce Manchester
City Lumber Co. Martin
Bittle & Hufstetter Co. Maryville
Maryville Planing Mill Maryville
G. N. Mize Maryville
Clinton Lumber Co. Memphis
Cole Mfg. Co. Memphis
Darnell-Taenzer Lumber Co. Memphis
George O. Friedel Lumber & Mfg. Co. Memphis
Lee Lumber Co. Memphis
Memphis Hardwood Flooring Co. Memphis
Moore & McFerren Memphis
Walden Braxton Mfg. Co. Memphis
York Mfg. Co. Memphis
W. J. Keaton Milan
Monterey Planing Mill Co. Monterey
East Tennessee Woodworking Co. Morristown
I. P. Fort Co. Morristown
J. M. Hull Moshelm
Perkins-Crichlow Co. Murfreesboro
Bradford Wholesale Furniture Mfg. Co. Nashville
The Davidson, Hicks & Greene Co. Nashville
I. N. DeHart & Son Nashville
Edgefield & Nashville Mfg. Co. Nashville
Indiana Lumber Co. Nashville
Kirkpatrick & Co. Nashville
Nashville Hardwood Flooring Co. Nashville
Southern Lumber & Mfg. Co. Nashville
Standard Box Co. Nashville
Tennessee Oak Flooring Co. Nashville
Newcomb Mfg. Co. Newcomb
H. B. Ault New Market
McCabe Lumber Co. Newport
L. A. Ward Obion
The Paris Lumber Co. Paris
J. B. Sowell Petersburg
S. T. Wakefield Petersburg
Wolfe Bros. & Co. Piney Flats
Portland Planing Mill Co. Portland
Tennessee Lumber Mfg. Co. Pottsville
J. M. Patterson & Son Pulaski
T. W. Pittman & Co. Pulaski
Tennessee Saw & Planing Mill Quebeck
John T. Walker Rogersville
Troy & Tillman Rutherford
Sevierville Planing Mill Co. Sevierville
Landers & Co. Shelbyville
Ransom & Frierson Shelbyville
F. J. Bluhm Smithville
O. M. Davis Jr. & Co. Smyrna
Carter & Potter Sparta
East Sparta Planing Mill Co. Sparta
Graham & Shackley Spencer
Springfield Planing Mill Co. Springfield
U. S. Beard Sweetwater
S. Young Sweetwater
Tellico River Lumber Co. Tellico Plains
Samuel Weaner Tracy
Trenton Lumber Co. Trenton
The Anderson-Stegall Mfg. Co. Tullahoma
Walter C. Gordon Tullahoma
G. T. McGhee Van Lear
Mansfield Bonner Co. Viola
Robert Patton Watertown
J. T. Anderson & Son Waverly
Lucas Land & Lumber Co. Waverly
Young Bros. Waverly
Buchanan & Gower Waynesboro
White Bluffs Planing Mill White Bluffs
J. A. Walton Winchester

Sash, Doors, Blinds and General Mill Work.

Athens Planing Mill Athens
Bristol Door & Lumber Co. Bristol
Cloyd Bros. Bristol
Reynolds Lumber Co. Bristol
Stone Huling Lumber Co. Bristol
Hudson & Durdin Camden
Chattanooga Lumber Co. Chattanooga
Chattanooga Sash & Door Co. Chattanooga
King-Baxter Lumber Co. Chattanooga
Lookout Planing Mills Chattanooga
Union Lumber Co. Chattanooga
Sewanee Lumber Co. Clarksville
F. L. Smith Sons Co. Clarksville
Barnes Mfg. Co. Cleveland
J. L. & J. Hughes Cleveland
Marshall Planing Mill Cleveland
The T. H. Leinart Co. Clinton
G. P. Mayberry Columbia
Vaughn Mfg. Co. Columbia
Earle Saeger Dickson
Erwin Mfg. Co. Erwin
Chas. E. Johnson & Bros. Etowah
W. J. & Hugh McAllister Fayetteville
Craig Lumber Co. Franklin
C. E. Northrop & Son Gallatin
S. R. Simpson & Son Gallatin
Dame Mantel Co. Harriman
American Mantel Mfg. Co. Knoxville
Broadway Mfg. Co. Knoxville
Chavannes Lumber Co. Knoxville
F. B. Cooley & Son Knoxville
H. L. Ingles Mantel Co. Knoxville

Knoxville Furniture Co. Knoxville
Knoxville Lumber Co. Knoxville
Nickerson Mfg. Co. Knoxville
D. M. Rose Lumber Co. Knoxville
Schubert Lumber Co. Knoxville
Tennessee Mantel Mfg. Co. Knoxville
Wilson County Planing Mill Co. Lebanon
Electric Lumber Co. Lenoir City
John J. Lutz Mfg. Co. Loudon
W. B. Presley Loudon
D. D. Smythe Lynchburg
G. H. Wooley McKenzie
J. R. Burlason Madisonville
Bullders' Lumber Co. Memphis
Clinton Lumber Co. Memphis
Cole Mfg. Co. Memphis
Denton Lumber Co. Memphis
Lee Lumber Co. Memphis
Wabash Screen Door Co. Memphis
Walden Braxton Mfg. Co. Memphis
J. M. Hull Moshelm
Perkins-Crichlow Co. Murfreesboro
Williams Bros. Murfreesboro
Allen Bros. Nashville
Buchanan Bros. Nashville
I. N. DeHart & Son Nashville
R. A. Griffin & Sons Nashville
Home Building & Mfg. Co. Nashville
Kirkpatrick & Co. Nashville
McGinnis & Co. Nashville
George Moore & Sons, Nashville
Newcomb Mfg. Co. Newcomb
McCabe Lumber Co. Newport
T. W. Pittman & Co. Pulaski
Sevierville Planing Mill Co. Sevierville
Landers & Co. Shelbyville
Ransom & Frierson Shelbyville
O. M. Davis Jr. & Co. Smyrna
Hogan Bros. South Pittsburg
Sparta Colonial Column Co. Sparta
Springfield Planing Mill Co. Springfield
U. S. Beard Sweetwater
S. Young Sweetwater
Samuel Weaner Tracy City
Bransford Lumber Co. Union City
Robert Patton Watertown
White Bluffs Planing Mill White Bluffs

Ship and Boat Building.

T. J. Martin Dover
Anchor Boat Oar Co. Memphis
Eagle Boat Works Memphis

Shuttles, Spools, Bobbins, Etc.

Speyer Lumber Co. Algood
E. B. Chester Brownsville
Dorman & High Cookeville
J. Murchison Dickson
Hohenwald Block Mills Hohenwald
The Anchor Block Mills Co. Jackson
Anchor Boat Oar Co. Memphis

Sporting and Athletic Goods.

E. B. Chester Brownsville
Anchor Boat Oar Co. Memphis
E. G. Willingham Memphis

Trunks and Valises.

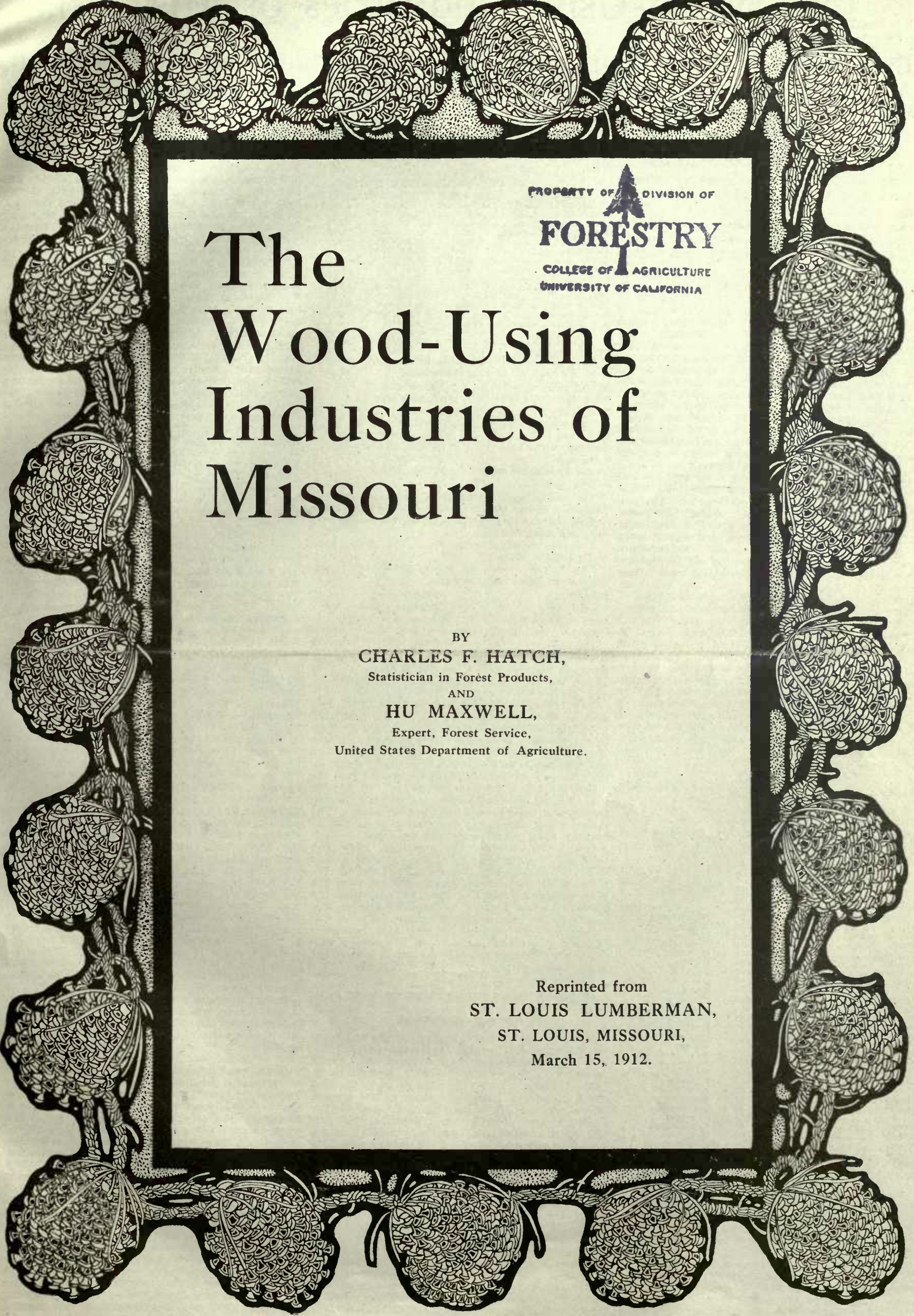
The G. E. MacKenney Trunk Co. Chattanooga
Harris Mfg. Co. Johnson City
Southern Trunk & Bag Co. Knoxville
Whittle Trunk & Bag Co. Knoxville
I. P. Fort Co. Morristown
Ewing & Hooper Nashville
Nashville Trunk Co. Nashville
White Trunk & Bag Co. Nashville

Vehicles and Vehicle Parts.

Beveridge & Taylor Bristol
E. B. Chester Brownsville
Buckeye Spoke Co. Centreville
Chattanooga Buggy Co. Chattanooga
The Chattanooga Wagon Co. Chattanooga
Chattanooga Wheelbarrow Co. Chattanooga
Hickory Spoke Works Chattanooga
Taylor Lumber Co. Chattanooga
Cleveland Buggy Works Cleveland
The T. H. Leinart Co. Clinton
Campbell Mfg. Co. Dickson
T. J. Martin Dover
Dresden Spoke Co. Dresden
Imperial Wheel Co. Dyersburg
Craig Lumber Co. Franklin
C. E. Northrup Gallatin
R. H. Sindle & Co. Gallatin
Enterprise Wagon Co. Greeneville
Lamons Wagon Co. Greeneville
W. N. Clayton Halls
Halls Spoke Co. Halls
The Mitchell Wheel Co. Hohenwald
Frank H. Port & Co. Knoxville
T. Edwards Lexington
J. C. Bibbey Spoke Co. Livingston
J. A. McCarroll Loudon
Burrroughs-Ross-Coville Co. McMinnville
Manchester Mfg. Co. Manchester
Bell Buggy Co. Memphis
Brooks & McCarty Co. Memphis
J. C. Dix Son & Co. Memphis
James & Graham Wagon Co. Memphis
Jorgensen Bennett Mfg. Co. Memphis
Lilly Carriage Co. Memphis
Wilson & Vance Memphis
Standing Stone Mfg. Co. Monterey
Philnot Lumber Co. Morristown
Carver Lumber Co. Morristown
H. L. Witt & Sons Morristown
Allen Bros. Nashville
Rock City Spoke Co. Nashville
Inman Bros. Newbern
Pulaski Rim & Spoke Co. Pulaski
John T. Walker Rogersville
E. J. Evans & Son Smithville
Sparta Spoke Factory Sparta
N. C. Blanchard Co. Spring City
M. R. Campbell Tullahoma
Campbell & Dann Mfg. Co. Tullahoma
John O'Donnell Union City

Woodenware and Novelties.

The Wels & Lesh Mfg. Co. Jackson
Columbia Package Co. Memphis
Perkins-Crichlow Co. Murfreesboro
Indiana Lumber Co. Nashville



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The Wood-Using Industries of Missouri

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AND
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By Charles F. Hatch, Statistician in Forest Products, and Hu Maxwell, Expert Forest Service, United States Department of Agriculture.

PREFATORY NOTE.

The following report was prepared by Charles F. Hatch, statistician, and Hu Maxwell, expert, under the direction of H. S. Sackett, chief, office of wood utilization, United States Forest Service. It is published and thus made available to the public through the courtesy of the St. Louis Lumberman.

INTRODUCTION.

The area of Missouri is 69,415 square miles, of which 680 are water. About 40,000 square miles are under forest cover, but that includes many large areas of cut-over or brush land, where timber of commercial size is scarce. Other regions contain uncultured forests of great value. Estimates of the total remaining stand of timber have not been made, nor does such an estimate appear practicable with the meager available data. If it is assumed that the average for the entire wooded area of the State is 1,000 feet board measure per acre it would foot up 25 billion feet still uncut. It has been estimated that the State contains 10 billion feet of uncut short-leaf pine, on 3 million acres.

Originally, the surface of the State was covered with forests, some very heavy, others thin. Much of the best was removed to open farms. The pioneers selected the rich bottom lands for their homesteads where the best timber grew. There being little market for it, the settlers used what timber they needed and destroyed the rest. All accounts agree that some of the timber on the fertile bottom lands was of exceptional size and quality, and rich in variety. There are more than one hundred tree species native to Missouri, and most of them attain sizes fitting them for use, and practically all have been put to some use, either sold as lumber in the market, pressed into service as farm timber, or at least as fuel. Many valuable trees reach their largest size in the region in which Missouri is situated. It is well known that when a species covers a large part of the country it attains its highest development in some favored part of its range. The table which follows presents at a glance some of the well-authenticated records of finely developed trees of numerous species in Missouri. Doubtless, in many cases, individual trees much larger have been seen in the State, but records were not preserved.

RECORD OF TREE MEASUREMENTS IN MISSOURI.

Species—	Height of diameter, measure, ft.	Diameter of tree, feet	Height of tree, feet	County
Sycamore	2	15	65	Mississippi
Catalpa	3	3	90	Dunklin*
Cypress	6	130	90	Cape Girardeau
Cottonwood	10	125	100	Mississippi
Pecan	6	130	100	Mississippi
Black walnut	7	110	100	Benton
Black willow	8	100	100	Pemiscot
Tupelo	10	120	100	Stoddard
White oak	9	100	100	Howard
Willow oak	3	100	100	New Madrid
Pin oak	4½	100	100	Howard
Bur oak	6½	125	100	Howard
White elm	7	100	100	Pemiscot
Yellow poplar	9	110	100	Cape Girardeau
Sweet gum	5	130	100	Cape Girardeau
Basswood	7½	110	100	Howard
Buckeye	3	95	100	Howard
Hackberry	4	124	100	Howard
Spanish oak	9	90	100	New Madrid
Sassafras	3	70	100	Mississippi
White ash	5½	100	100	Mississippi
Honey locust	4½	125	100	Howard
Water locust	3	80	100	New Madrid
Persimmon	3	80	100	Mississippi
Redbud	2	30	100	Mississippi
Dogwood	2	45	100	Pemiscot
Hornbeam	1½	45	100	Mississippi
Beech	6	100	100	Stoddard

*Canoes were hewn from the trunk of this tree.
†This pecan was 80 feet to the first limb.
‡The trunk of this poplar measured 90 feet to the limbs.

In 1909, which is the latest official return of lumber production by the United States Census, Missouri stood 23 in the list of 45 States reporting. It is worthy of mention that the State which stands midway in the list in point of lumber production, also occupies a place nearly in the geographical center of the United States—a little east of it. The table which follows gives the cut of lumber in 1909, and the average value of each species at the mill. The figures are from "Forest Products of the United States, 1909," compiled by the Bureau

of the Census in co-operation with the Forest Service.

LUMBER CUT IN MISSOURI, 1909.

Kinds of wood	No. mills reporting	Feet.	Average value at mill
Oak	1,820	271,623,000	\$15.18
Shortleaf pine	455	142,271,000	11.59
Red gum	282	83,905,000	11.98
Hickory	630	33,259,000	29.95
Cypress	125	32,891,000	15.88
Elm	810	27,913,000	15.18
Cottonwood	509	17,987,000	18.17
Ash	354	12,685,000	21.75
Sycamore	501	10,526,000	13.12
Maple	434	10,376,000	14.37
Black walnut	384	4,314,000	42.39
Red cedar	9	2,984,000	24.11
All others	—	9,425,000	—
Total	—	660,159,000	—

The oak listed in the table includes several species, perhaps all of the following:

White oak	Yellow oak
Post oak	Spanish oak
Bur oak	Pin oak
Overcup oak	Black jack
Chinquapiu oak	Water oak
Swamp white oak	Shingle oak
Cow oak	Lea oak
Texas or spotted oak (red oak)	Willow oak

The maple probably includes sugar or hard maple, silver or soft maple, black maple, and box elder.

The elm includes white elm, slippery elm, cork elm, and wing elm.

The ash includes white, black, red, green, blue, and pumpkin ash.

The hickory listed in the table doubtless embraces the following species:

Shagbark	Small pignut
Shell bark	Bitternut
Mockernut	Pecan
Pignut	

The "all others" is made up of a large number of species, some of which are of much greater importance in other States than in Missouri, such as yellow poplar, beech, basswood, cherry, hackberry, and willow.

This report, in its plan of treatment of the subject, is divided in three parts. In the first part, consideration is given to the kinds of wood growing in the State or brought in for manufacturing purposes. The supply of available timber in Missouri, and the extent to which it will probably figure in the future, are considered. In the second part the industries which draw a portion or all of their raw material from the forests are presented statistically, and their annual demands are shown. The tables which accompany the discussion of the industries show what woods are employed in each industry, the cost, and the quantities used. The third part is a summing up of uses for each species in all the industries. It does not pretend to give a list of all the uses for which a certain wood has been or may be found suitable, but only those reported in actual practice by manufacturers in Missouri. In the discussions of industry tables in the second part, the purpose has been held constantly in view of explaining, as far as information warrants, what reasons underlie the use of a wood for a particular commodity.

THE WOOD-USING INDUSTRIES OF MISSOURI.

Kinds of Wood Used.

Missouri manufacturers report the use of 56 species of wood, and in 1910 they consumed 443 million feet in producing their commodities. These woods, with the quantity of each, are shown in Table I. The common names are given in the first column, and the botanical names in the second. These are the official names recognized by the United States Forest Service. Nearly all commercial woods have different names by which they are known in different localities. It occasionally happens that the name by which a wood is known in one part of the country is never spoken in another region. Thus, a well-known wood is called white wood in Massachusetts and yellow poplar in Missouri. Some of the pines possess more than a dozen names, and some of the oaks nearly as many. Confusion and misunderstanding often result. The Forest Service, wishing to establish a uniform list of names for the commercial woods as far as could be done in a practical way, compiled an official "Check List of the Forest Trees of the United States, Their Names, and Ranges," and in all Forest Service reports and publications each one of the trees is always accorded its official name. It is

believed that, in this way, a certain species will finally come to be known everywhere by a single and recognized name. The process, however, will be slow. People in one locality who have always known a tree by a certain name will not be quick to drop that one for another. It will do no harm, however, for them to know what the official name is—that which it is hoped will sometime be recognized in all parts of the United States.

This applies to the common names only. Nearly every tree, however, has two names; one the common or English, the other the botanical or Latin. The botanical names are given in the second column of Table I for the convenience of persons who may wish to consult them, and to assist in the identification of the species. There is no such confusion among botanical names as among common (principally scientists) make use of the botanical names, and they agree among themselves what the names shall be, and all call them the same. For example, the botanical name of short-leaf pine is *Pinus echinata*, and botanists in all parts of the world, whether in America, Germany, India, or Japan, all call the tree by that name when they speak of it, though perhaps some of them do not know what the tree's English name is. This is the explanation of the purpose of the second column of names in the table—for the convenience of persons who may wish to ascertain, or to refresh their memory as to the world-wide name of any tree in the table.

Twenty-nine of the woods listed in the tables came wholly from without the State, while 24 were grown partly within. Only 3 were produced entirely by Missouri. They were butternut, Spanish oak, and hackberry, no more than 62,000 feet in all. Ten woods were wholly supplied by foreign countries. Only one foreign wood—mahogany—supplied a million feet to the Missouri manufacturers.

Short-leaf Pine.

Four valuable southern trees are usually grouped as the yellow pines of the South. They are long-leaf, short-leaf, loblolly, and Cuban, all confined to the Atlantic and Gulf coast region, and the lower Mississippi valley. Only two were reported by Missouri wood-users, long-leaf and short-leaf. The latter grows in Missouri, the former does not. Short-leaf pine is of more rapid growth than long-leaf, and the wood is softer, often a little lighter in color, and many prefer it for doors, sash, blinds, and window frames. The softest of it bears considerable resemblance to white pine. The State now furnishes a little more than half of what is demanded by its manufacturers of wooden products. Most of the remainder comes from Arkansas. The short-leaf pine does not grow north of Missouri in the Mississippi valley, and there is no reason to suppose that it ever will. As a species, it is not extending its range, but is withdrawing from regions where it once grew, and seems to be retreating south. It once was found in New York, and later it was lumbered on the Potomac river and on some of the upper tributaries of the Ohio. In some of those regions a single tree can now scarcely be found. Southern Missouri is at this time the northern range of the species in the Mississippi valley; and it is the opinion of many observing men that the tree is soon to disappear there as a commercial wood. Young trees are not coming in sufficient numbers and vigor to make up the loss of old forests which are passing. The Missouri manufacturers use more short-leaf pine than of any other two woods.

Red Gum.

Of the woods used in Missouri, red gum is second largest in quantity, and the State supplies one-third of it. Most of the State-grown wood of the species comes from the southeastern part. Users frequently list two kinds, white and red. The white is more often called sap gum. It is all the same wood, however. The white wood is the outside, or sapwood; the red is the colored heartwood. Some gum trees are nearly all colored wood, others are largely the white sapwood. One manufacturer prefers one kind of wood, another takes the other kind. It depends upon the purpose desired. Some of the fine rotary-cut veneer which is finished to imitate Circassian walnut is sapwood. The naturally watered or clouded appearance of the wood bears close resemblance to the very expensive Circassian walnut which comes from the Caspian sea region. Few woods have risen more rapidly and steadily in favor during late years than red gum. It was not so long ago that it was little thought of, and most of it is still employed in this country

all parts of the State and small amounts are cut in all the counties. It is not the tree's habit to produce pure forests, like short-leaf pine, but trees are scattered among forests of other species, growing best where the soil is fertile and deep. When no obstacles are met, the hickory likes to send a large central root, like a radish, deep down into the subsoil. It is a tree of fairly rapid growth, and the wood is separated in two parts, white and red. The white is the sapwood, and in young trees makes up most of the trunk. Many small trees show only a small core of redwood in the center; large trees increase the proportionate quantity of the red. The white wood of a young trunk becomes red when the trunk is old. Hickory is not peculiar in this respect, however, since most trees change the sapwood to heartwood as the tree becomes old. The belief is well-nigh universal that the white wood of the hickory is better than the red; yet the differences are so slight as to be negligible, and for some purposes the red wood is fully equal to the other. The red is more often rejected through prejudice or misunderstanding than for any just cause. There are many degrees of excellence in both the white and the red. The butt of a tree is usually better than the top, and a young trunk growing in the open is more apt than a large one to possess the desired properties of toughness, elasticity, and strength. Of course, a large trunk near the ground is freer from knots than is the top of the same tree; and the matter of knots often has much to do in determining the fitness of hickory for special purposes.

It is well known that good commercial hickory is becoming scarce. The demand is enormous; but until recent years there was always plenty a little farther back, and a higher price would bring it to market. But the time has now come when not much lies farther back anywhere, and even if higher prices were offered, few new sources would be made available though the supplies might be used up a little faster. It is by no means too early to discuss the effects which will follow decline in the hickory output. Scarcity is bound to come, and nowhere in the world has there yet been found a wood to take hickory's place for some of its most exacting uses. Claims have been made for a few, notably some species of eucalyptus and the crow-foot elm of Australia; but these claims have not yet been made good. The supply of hickory can be lengthened by economy, by using this wood for the highest purposes only for which it is suitable, and substituting other woods in inferior places. There is much waste and it might be lessened. In some instances it seems well-nigh unavoidable because of distance from market and other economic conditions which prevent full utilization. There is, nevertheless, much waste which might be prevented by care and foresight.

Hickory might be grown with profit. There is much land in Missouri suited to that purpose. Woodlots planted with trees properly spaced, and the trunks cleared of limbs to give clean and smooth boles, would grow rapidly into money. The cordwood from the tops and limbs of such a cutting, when the woodlot is harvested, would, if near a good market, be worth enough to pay a large part of the taxes and other costs incurred in bringing the trees to marketable size. A hickory need not be very large to make good handles, and the growth of a few more years will give it size sufficient for larger commodities.

Yellow Poplar.

Missouri is not a large producer but is a rather large user of yellow poplar. This fine tree is at its best farther east, in Tennessee, Kentucky and West Virginia, but 86 mills reported cutting some of the lumber in 1909 in Missouri. It is another of the valuable timbers which are passing away. The cut for the whole country in 1909 was 23 per cent less than it was ten years earlier. Poplar was once used for nearly all ordinary purposes, but it has now become expensive and goes chiefly into high-class work. Missouri finds place for nearly ten and three-quarters million feet of it a year, which is several times as much as its forests produce. Ninety per cent of the total demanded by the factories of the State comes chiefly from Tennessee and Kentucky. It finishes very smooth, and it takes stains so well that one of its principal uses is as imitation of mahogany, cherry, and birch. It was once largely used for farm wagon beds, but it is made into bodies and panels for buggies, carriages, and automobiles. There is no wood in this country that will paint to better advantage, and that quality gives yellow poplar one of its principal values. The trunks grow large, tall, and free from limbs half or two-thirds of the way to the tops. They yield clear lumber, and of high grade. No American hardwood surpasses it in this respect, and few softwoods are its equal. Extra wide pieces are cut, suitable for large panels, or whole counter tops.

White Ash.

Six species of ash are found in Missouri, all of some commercial importance, and in the aggregate of much value. Only one species is reported by manufacturers in the State, the white ash. There is no question that most or all of the others are used, but they are not separately distinguished by those who handle them at the mills and fac-

ories, and thus go in under one name. The white ash is more abundant than the others; perhaps in Missouri it exceeds in quantity all the others combined. The differences between the wood of that species and that of the other ashes associated with it are not apparent to the ordinary observer. The species of ash in Missouri are the white, black, blue, green, red, and pumpkin. It is noticeable that all, except the pumpkin ash, are named from some color. It is difficult to assign a satisfactory reason why this is so. The winter buds and the bark of the red ash suggest the name, but the red color is by no means pronounced; the other species in the list have not that much to suggest the colors which commonly go with their names.

Ash is a strong, stiff, serviceable wood. White ash is usually considered a little better than the others for general use. It is widely distributed in this country, and Missouri produces some of the best in the market, though it is not among the largest producers, as nine States were ahead of it in 1909, Arkansas standing first on the list. More than four per cent of the country's ash lumber is credited to Missouri. This species seldom forms thick forests, but usually the trees grow scatteringly, a single tree or a few in a place. It may be said generally that ash is used where strength and rigidity are desired in furniture, machines, and particularly in farm tool handles, such as shovels, rakes, scythes and hoes. The grain of the wood is rather coarse, yet it may be nicely finished and it then presents a handsome appearance in furniture and interior finish. It is the most widely used wood in this country for boat oars. It is heavier than spruce and cedar and for that reason they are sometimes preferred to it for oars. The ash is well able to hold its own among other trees in the matter of reproduction, and it will maintain a place in the forest for a long time to come. Its seeds are winged, and the wind carries them. They do not, however, fly as readily or as far as the maple's seeds, whose wings whirl them rapidly in air and help to sustain them, while the ash's seed has a wing so narrow and of such a shape that it does not whirl as rapidly as the maple's and can not carry the load so far. Seedling ashes, therefore, are usually found in the vicinity of the parent trees.

Douglas Fir.

This wood was unknown in the eastern and middle regions of the United States a few years ago, and as a comparatively new comer, it has met with favor. Most of it is cut in Washington and Oregon, but it abounds in the northern Rocky Mountain States. A common name for it is Oregon pine, and it is occasionally called red fir. The trees attain great size, and very large timbers are cut from them. In Missouri it enters into competition with long-leaf pine probably oftener than with any other. The two woods are much alike in many ways. Both are very strong and stiff, and are used for similar purposes. Douglas fir is cut in larger quantity than any other wood in the world, except the southern yellow pines, and is so cheap in the regions where it is produced that it is able to force its way into markets hundreds or thousands of miles away. More than five million feet yearly are bought by manufacturers in Missouri at an average price of \$33.76 delivered at the factory. That is between seven and eight dollars more than the average price paid in the State for long-leaf pine.

White Pine.

The reign of the white pine in the United States is a thing of the past, though a fairly large amount is still demanded by Missouri manufacturers. The tree does not grow in the State, and the lumber now used there comes principally from the Lake States, where it was once lumbered in enormous quantities, but now to a much less extent. One of its largest uses in Missouri is for patterns. No other wood as satisfactory can be had. Of course, much white pine lumber is still in the market, but not all that passes for white pine is the genuine article. Some is Norway pine cut in the Lake States and Canada; some is the western white pine (a different species) from the Northern Rocky Mountain States; the California sugar pine furnishes some of it, and the western yellow pine more, and a small amount is the Mexican white pine. This last is said by good judges to be the nearest approach to genuine white pine lumber in this country. These several species pass as white pine in the lumber market, and it is difficult to determine how much of the total is the real article. All are good woods, and for some purposes are doubtless as good as white pine. No manufacturer expects, nor should the buying public expect, to obtain white pine now of a grade equal to that on the market when the original pine forests of New England, New York, Pennsylvania, and the Lake States were available.

Silver Maple.

In Missouri this tree is usually called soft maple, and four and a half million feet are bought annually by factories, at an average cost a little under \$25 a thousand. One-third of it is cut in the State. The only other maple reported was sugar or hard maple. It was demanded in smaller quantity and cost nearly ten dollars more a thousand.

Most of it came from States north of Missouri. The wood of these two maples bears much resemblance. Their differences are well expressed by the terms hard and soft as applied to the wood. That of the silver maple is weaker and of the sugar maple stronger. Both produce accidental forms of growth called birdseye. This is not, as some suppose, a different kind of tree, but the birdseye effect is caused by buds that grow up through the wood during many years, and never succeed in forcing their way through the bark. Birdseye effect is found in other woods than maple, and is due to similar causes.

The botanical ranges of the sugar and the silver maple lie in the same general regions—the eastern and northeastern parts of the United States, extending into the Gulf States—but their commercial ranges differ. Most of the sugar maple is cut in northern regions, but not much in the South. The reverse is true for silver maple. Little is cut in the North, and a comparatively large amount further south. Missouri produces more silver maple than sugar maple. Sawmills do not usually keep the two species separate where they cut both, for which reason it is difficult to determine the proportionate quantities of each in the output. The census returns compiled by the United States do not list maple separately in lumber returns, though five or six species contribute to the total. The maple is a tree difficult to exterminate. It produces multitudes of seeds, ripens them in the spring and scatters them well before the early summer rains are over, and maple reproduction is heavy. Young trees thus constantly come on, and their effect on the lumber supply will be apparent in future years. Trees, like the cypress, which go and leave few seedlings to take their places, can not be counted upon in the country's future lumber supply, as the maple can.

White Elm.

This was the only elm listed by the Missouri manufacturers, but there can be no question that other species of elm were included. Four are found in that State in quantity to make them commercially important. The white elm is most abundant, and is associated with slippery elm, cork elm, and wing elm. The name "rock" elm is sometimes applied to all of these, by different persons and in different localities. It is a term like "rock" oak which does not mean any tree in particular, although the man who uses the term may know what species he has in mind. White elm is the most common of the elms in most regions where different species grow; slippery elm is seldom mistaken for any other, because of its thick, soft, mucilaginous inner bark; cork elm is so named on account of the dark, chocolate colored corky excrescences on the small twigs; and wing elm receives its name from a very similar growth, but in its case, the excrescences are flattened, like little keels, on opposite sides of the twigs, and resemble long narrow wings.

Workers in wood say that few trees show as readily as elm the effect of soil upon wood. One soil may produce brash wood, another a very tough one; and there seems to be much difference in weight and color, which is accounted for by differences in soils. This may explain why in one locality the name rock elm is applied to a certain species, and in another locality the term is given to an elm of a different species. The wood of all the elms is coarse and characterless, and is never employed where handsome appearance is the object sought.

Sweet Birch.

Manufacturers of furniture, interior house finish, and other wood commodities in Missouri use nearly three million feet of birch, which comes almost entirely from outside the State. A large part of it is sweet birch, also called cherry birch and mahogany birch because it is frequently finished in imitation of those woods. It is a northern tree, rather expensive when it reaches the furniture factory, and it is becoming scarce. The name "sweet" is given it because the soft new growth of wood just under the bark in early summer is often scraped off and eaten by children and others. It has an aromatic flavor and a pleasant and peculiar taste. Most of the oil of wintergreen of commerce is made from this birch. There are other birches in the lumber market, but yellow birch is probably the only one which ever passes for the sweet birch. Most of it comes from regions where the sweet birch grows, and the heartwood of the two species bears considerable resemblance, but no one would ever mistake a standing tree of one for the other. River birch grows in Missouri, and doubtless some of it is used, though no manufacturer reported it. The wood is very plain, presents no figure, and the color is dull and without character; yet the wood possesses substantial qualities which fit it for many common purposes.

Chestnut.

This wood does not grow in Missouri, and there is no reason to suppose that it will ever be planted in the State for commercial purposes. The largest supply comes from Pennsylvania, West Virginia, Kentucky and Tennessee. Some chinquapin, which resembles chestnut, grows in Missouri and

is occasionally made into lumber, but more frequently cross-ties.

Sycamore.

This is a waste land tree, in the same class with cypress in that particular. It has no objection to good ground, but thrives on mudflats, hollow banks, and gravel bars, and it thus brings profit where otherwise there might be none. It occasionally attains large size, but the best lumber comes from trees of moderate dimensions, because the largest are usually hollow. The growing of sycamore for profit is perhaps practicable in Missouri where there is much wet land and many tracts liable to such frequent overflow as to be unsuited to agriculture. Sycamores plant themselves in countless thousands along streams where the space is sufficiently open to let in the sun, and the ground moist. Growth is rapid, and as soon as the trunk develops enough heartwood to make boards six or eight inches wide, cutting may begin. Sycamores from 10 to 15 feet in diameter have been measured in the State, but they were never plentiful, and probably none that large exists now. Missouri stands second among the States in the production of sycamore lumber, being exceeded only by Indiana, and produces nearly five times as much as its factories demand, and yet about half of their demand is supplied by imported lumber.

Basswood.

Missouri ranks low in the production of basswood. In 1909 the census report gave 111 mills cutting it. The chief supply comes from the North, and Missouri is on the extreme western edge of the tree's region. Basswood is soft and white, and has no grain or figure to make it attractive. It finishes nicely, but always presents a plain appearance. The name "bee tree" is sometimes given it, and this is supposed to mean that the trunks are frequently hollow and are occupied by wild bees for storing honey. This, however, is a misnomer, for the trunks are no more liable to hollowness than other trees. The bloom is abundant, is rich in honey, and bees frequent it—hence, the name.

Black Willow.

This tree is not of great importance in Missouri at present, but its value will increase, rather than diminish in the future because it grows rapidly, and thrives on land too wet or too much subject to overflow to be attractive to farmers. At an age when cypress is scarcely large enough for handspikes, willow may be cut for saw logs. Immense quantities of it will come to maturity on comparatively small tracts, from 100 to 200 trees to the acre having been reported. It is the most common willow in this country, though many other species are found. It grows from Maine to California, but only where water is abundant. It reaches its best size and form near large water courses where it prefers low, rich ground, but it will do fairly well on thin soil if moisture conditions are right. Until recent years the willow was seldom put to any purpose; but it is now becoming valuable for certain commodities. Millions of feet of it are annually made into boxes in the United States, principally for meats and other provisions. It is one of the substitutes for yellow poplar and cottonwood for wagon beds, and furniture makers are working it into interior places where its appearance does not matter. It is not a handsome wood, its color being dark and dull. Some manufacturers call it brown cottonwood. The lumber is tough, light, difficult to split, and is cheap. Trees four feet in diameter are occasionally cut, but the average size of willow saw logs is less than half of that. The willow's importance in Missouri would seem to lie principally in the future. The wild forests will be cut out in time, and only species which will pay best will be planted and cared for. As rough, coarse lumber, willow will commend itself, because of its rapid growth and the large yield per acre.

Sitka Spruce.

Five woods known as spruce figure in the country's lumber output, the red, black, white, Engelmann, and Sitka. The three first named come from the north and northeast, the Engelmann is a Rocky Mountain species, and the Sitka's home is in Oregon and Washington. The Missouri manufacturers use two of these woods, the black and the Sitka, but much more of the latter than of the former. The two woods average about the same in price when they reach that State. The grades used are rather high.

Locust.

This is one of the hardest, strongest, and most enduring woods in this country. It was originally confined to the eastern half of the United States, and was best developed in the Appalachian Mountains between Georgia and New York, but the species has spread through the agency of man to many districts where it did not formerly exist. The tree is well known in Missouri, though it is doubtful if it was found there at the coming of the early settlers. Its rapid growth, and the natural beauty of its foliage and bloom, together with the excellence of its wood for posts and pins, made it a favorite with those who planted trees for ornament and use. However, the reports of Missouri

manufacturers who work in wood do not show that a single stick of home-grown locust was used in the State, and the demand was met from without. In some parts of the country the tree suffers much from the attacks of the locust borer (*Cyllem robinia*) which perforates the trunk and large branches. Forty other known enemies attack the tree, but most of them do little harm. The honey locust is found in Missouri, but is inferior to the above named locust in all respects except size, and it has not been reported for manufacturing purposes in the State.

Black Walnut.

The Missouri sawmills cut more than thirty times as much black walnut as the factories in the State make use of. The State ranks fifth as a producer of this cabinet wood; those above it, in the order named, are Ohio, Indiana, Illinois and Kentucky. The best walnut lumber is cut from large trees, for age is necessary to give the heartwood the rich color which makes it valuable. For that reason, the planting of walnut trees for the purpose of growing timber does not promise as quick returns as in the case of some other species which grow no faster. The wood has great value, and is becoming scarce. It is the highest priced wood in the United States that goes to market as lumber, though osage orange, which is sold for a special purpose, is above it.

The Cedars.

Four cedars figure in Missouri's wood-using industries, but in rather small quantities. Spanish cedar, from Mexico, supplies most, and it is all made into cigar boxes. Next is western red cedar from Oregon and Washington, and its chief use is for doors and frames. Red cedar, which grows in all parts of the South, East, and Middle West, is in much demand by coffin and casket makers; but the total amount consumed in Missouri is small because the wood is expensive and scarce. Lead-pencil makers pay so much for red cedar that they secure most that reaches the market. There are two pencil slat mills in the State. The northern white cedar reported came from the Lake States. It is frequently known as arbor vitae, and is seldom sawed into lumber, though large quantities are made into poles, posts and formerly into street paving blocks. That converted into lumber is chiefly consumed by manufacturers of canoes and small boats, but a little finds place as car lining or ceiling.

Minor Species.

Several woods are reported in use by Missouri manufacturers, but in small quantities. Hackberry is one of them. This bears more resemblance to ash than to any other, but is in most ways inferior to it. The species is not plentiful, but scattering trees range over the country. Sassafras occasionally attains to saw-log size, and it goes to sawmills with logs of other species. The lumber is not generally set apart and kept separate, but sometimes flooring is made of it. An old belief prevailed, and possibly yet survives in some localities, that sassafras floors and bedsteads repel troublesome insects, and conduce to sounder sleep. Whether that view is correct or not, the wood makes good flooring, wears well, is handsome in appearance, strong for its weight, lasts well in damp situations, and in pioneer days was much employed along the Mississippi river for dugout canoes. It reaches large size in Missouri. Pecan is a species of hickory which is at its best in the region south of Missouri. It is substituted for hickory in some situations where great toughness is not required. Holly appears among the woods used in the State, but in quantity so small as to be unimportant, and it is not plentiful in Missouri. It is in most demand by the manufacturers of brush backs and musical instruments. Butternut receives little more than mention among the woods in use. If it can be had in sufficient amount it serves well in many places, and in some can be substituted for black walnut. It is lighter in color, and to some it is known as white walnut. It is native to Missouri, but most of the butternut lumber in the market is cut in Texas, Indiana and Wisconsin. A peculiar far western tree is listed by manufacturers in Missouri, but the total amount demanded yearly is only a few thousand feet. The tree is the yucca, a sort of palm, growing in California and Arizona, with a trunk a foot or more in diameter, consisting of tough fibers and a kind of pith, not much resembling wood. It is cut in thin strips and veneer, and is used for surgeons' splints and as wrapping material for bottles.

Foreign Woods.

A number of foreign woods are employed by manufacturers in Missouri, but mahogany and Spanish cedar are the only ones demanded in fairly large amounts. Circassian walnut comes from the Caspian sea provinces of Russia and Turkey. It generally costs about twice as much as black walnut, or an average of \$203.33 per thousand in Missouri. It has pleasing figure, and the colors are subdued. It is not practicable to give even approximate figures by which to compare the amount of the genuine with woods employed for imitation in this country; but it is certain that imitations are seen much oftener than the real. Perhaps the ratio

of the imitations to the true Circassian walnut in furniture, finish, and musical instruments exceeds ten to one. Prima vera or white mahogany, is a native of southern Mexico and Central America. It has been in the market about thirty years, and is not a true mahogany though it is not farther from it than are some of the darker woods on the market which pass for mahogany. The foliage is bright yellow, at least at certain seasons of the year, and trees may be distinguished at long distances. Historically, prima vera occupies a unique place in that it was well known to the lumber trade many years before botanists knew of its existence. The tree was first described by Captain John Donnell Smith of Baltimore, who found it growing in Guatemala in 1890. His name was given it by botanists. Furniture makers have expressed the opinion that it is less durable than true mahogany, but it is not apparent that sufficient tests of the matter have been made to warrant a conclusion.

Turkish boxwood is used in amount so small in Missouri that it is of interest there only because of its great cost per foot. It is one of the most expensive woods in the world, and in Missouri the price was a dollar a foot, and it sometimes costs more than that. Ebony comes from a number of foreign countries and is of different shades of blackness. It is the heartwood of different species of persimmon trees. Some of the best comes from Ceylon, Madagascar and the east coast of Africa. There is historical evidence that ebony was cut for commercial purposes on the Red Sea coast 5,000 years ago, and some of the wood cut 4,500 years ago is still in a good state of preservation. Tulip wood is a name applied to several woods which are brightly colored, or variegated. The small amount used in Missouri came from Brazil. The principal objection to it is that the bright colors are liable to fade upon long exposure to the air. Rosewood listed in Missouri is a native of Africa, but there are different species of rosewood from different regions. The satinwood is a native of India, and so is vermilion.

INDUSTRIES.

The various woods available to manufacturers in Missouri are listed and discussed on preceding pages, and the wealth of forest resources is large. It remains to be shown what industries avail themselves of those resources, and to what extent. The following pages will present that information in considerable detail, and it will be pointed out, in many instances, why one wood is more valuable than another for certain purposes.

Boxes and Crates.

The manufacture of boxes and crates is the largest of the wood-using industries of Missouri, measured by the amount of material used, but more money is spent for the lumber in the sash, door and general millwork business. Boxmakers generally use a rather cheap class of material. Many buy it in the log and convert it into lumber or veneer themselves, and thus keep cost down. There are wood-using industries in Missouri, however, which buy their raw material at a lower price than boxmakers buy theirs. The cheapest of all is bought by excelsior makers.

The boxmaking industry includes practically all boxes and crates, except cigar boxes which are considered as belonging to an industry by themselves. The piano box and the large shipping case used for dry goods are the limit in one direction, and the pint or pound container is the limit in the other. There are all kinds and sizes between. Formerly when lumber was plentiful and much cheaper than it now is, the custom was to make most boxes of lumber from one-half to one inch thick; but as the price of lumber rose from year to year, the boxmaker used thinner lumber, in an effort to make a given amount go farther. The use of veneer in this industry has increased. The kind employed by boxmakers is nearly always rotary cut. A log three or four feet long is fixed in a machine like a lathe and is turned rapidly while a powerful knife is held against it, slicing off veneer in ribbons as broad as the log is long. It varies in thickness from 5-16 to 1-50 of an inch. Frequently three sheets of veneer are glued together, making three ply, with the grain of the middle sheet running across that of the other two. This is very strong, and is much used by boxmakers in the manufacture of large shipping cases. The corners are reinforced with lumber. A well-made reinforced box of three-ply veneer is not only cheaper than a box made of boards, but it is also stronger, unless the board box is of extra thick lumber.

Advance in the cost of lumber has caused boxmakers to resort to cheaper grades. At one time clear, soft white pine was most frequently the box material in all regions within reach of the white pine country; for it was, when all things were considered, the most satisfactory wood for that purpose. The day of the clear white pine box is long past. This species is yet much used in many States, but it is not the clear lumber. The box boards are sawed from small, defective logs, from tops, and from sapwood. Wood of that kind was once thrown away at the white pine mills, or was

left in the woods by the log cutters. Missouri still works more than half a million feet of white pine into boxes yearly, largely into florist boxes, which is a very small amount compared with red gum, cottonwood, short-leaf pine and others. More than half of all the box material demanded annually in Missouri is red gum. Some of it goes into very cheap boxes and crates, and some into those of high class. That wood is plentiful, and answers most purposes well, either as boxes, crates, fruit baskets, or small cups for berries. Cottonwood answers as well for all purposes, and for some it is better liked, because of its white color. It is more expensive than red gum, and naturally where the gum will do as well, cottonwood must give way. Packers who ship meat in wooden boxes consider cottonwood among the most suitable woods for such boxes, because it is free from odor and taste. Willow from States further south is a pretty active competitor with Missouri cottonwood for meat boxes. It is darker than cottonwood, but otherwise is as satisfactory. Considerations which give cottonwood an important place in the manufacture of meat boxes, cause the employment of yellow poplar and tupelo for butter boxes. Most of the basswood reported was bought by lard box-makers, and its principal recommendation is that it is odorless and tasteless. The maker of shipping containers for provisions must make a closer study of the properties of woods, with regard to odor and taste, than any other manufacturers. Some kinds of foods absorb impurities so readily that proximity to objectionable wood may ruin the contents of a box. Other food products, such as apples, potatoes, and most vegetables, are affected little or not at all. When the maker of egg cases selects cottonwood he is influenced by the wood's color and lightness, not its lack of taste or smell. For the same reason, cottonwood seems to be the favorite material for boxes in which to ship sirup cans. The prevailing use of red gum in Missouri for apple barrels is due to the wood's cheapness and toughness, and white elm hoops are recommended for banana hampers. Strength of material seems to be the only consideration. Drums (a kind of barrel) for shipping coffee are made of sycamore veneer. They are almost air-tight. Sycamore has long enjoyed a high reputation as a tasteless and odorless wood. Sugar drums, for powdered sugar, are of cypress. They are constructed in nearly the same way as the sycamore coffee drums. The makers of cheese boxes with best rims give preference to white elm. It is very tough and bends without splintering.

An examination of Table II shows that several rather high-priced woods are bought by boxmakers. Among these woods are Douglas fir and Sitka spruce from Washington to Oregon, redwood and yucca from California, and red and white oak. Some of these are made into boxes of large size, such as piano boxes, where strength is demanded, and good grades of lumber must be had. Others, as redwood, are intended for boxes of a permanent kind, such as tool boxes, or boxes in which beer bottles or milk bottles are carried about. They are used again and again and must be not only strong, but respectable in appearance. The yucca listed in this industry is a desert palm from California and Arizona, and is used for veneer bottle packing.

BOXES AND CRATES, PACKING.

TABLE II.

Kinds of wood.	Quantity used annually		Average cost per 1000 ft.	Total cost f. o. b. factory	Grown in Missouri feet B. M.	Grown out of Missouri feet B. M.
	feet B. M.	per cent				
Red gum	69,705,118	62.42	\$ 15.42	\$ 1,074,837	18,822,773	50,882,345
Cottonwood	17,513,347	15.68	21.38	374,352	4,068,499	13,444,848
Shortleaf pine	12,029,800	10.77	13.82	166,297	2,834,350	9,195,450
Cypress	5,533,605	4.96	15.30	84,644	478,794	5,054,811
White elm	2,483,103	2.22	15.87	39,408	660,867	1,822,236
Sycamore	1,147,090	1.03	17.18	19,177	672,373	474,717
Tupelo	621,000	.56	13.35	8,290	500,000	121,000
White pine	586,600	.52	26.68	15,648	-----	586,600
Red oak	519,749	.47	32.84	17,070	342,576	177,173
White ash	298,158	.27	18.00	5,366	149,079	149,079
Sweet birch	200,000	.18	28.00	5,600	-----	200,000
Silver maple	182,868	.16	17.00	5,109	93,834	89,033
Basswood	177,000	.16	30.11	5,330	50,000	127,000
Yellow poplar	145,300	.13	18.06	2,624	100,000	45,300
Sugar maple	121,911	.11	18.31	2,233	62,556	59,356
Longleaf pine	110,000	.10	13.36	1,470	-----	110,000
Black gum	90,000	.08	17.00	1,530	45,000	45,000
White oak	88,230	.08	32.79	2,893	58,813	29,417
Hickory	81,820	.07	20.00	1,636	40,910	40,910
Norway pine	9,000	.01	25.00	245	-----	9,000
Douglas fir	7,000	.01	35.00	245	-----	7,000
Sitka spruce	7,000	.01	35.00	245	-----	7,000
Redwood	3,500	*	36.29	127	-----	3,500
Yucca	3,500	*	36.29	127	-----	3,500
Totals	111,664,699	100.00	\$ 16.41	\$ 1,832,483	28,980,424	82,684,275

*Less than 1/100 of 1 per cent.

Planing-Mill Products.

Planing-mill products, as considered in Table III, include flooring, ceiling, siding, finish, and such molding as is used in the interior finish of houses. These products are usually made by planing-mills run in connection with sawmills. Nearly 94 per cent of all of it is short-leaf pine. This excellent wood is abundant in Missouri, and in regions south, and the quality of the wood is high. In softness and color some of it is claimed to approach white pine, and is popular for siding, ceiling and molding. It is employed also in large amounts for flooring; but if in situations where wear is heavy, it has not quite the lasting qualities of the harder long-leaf pine which grows a little farther south, but is not

listed in this industry in Missouri. The convenience of short-leaf pine accounts for its low average price. The grades are rather high, and \$13.71 for such lumber is cheap. It is based on the boards when they reach the planer.

The reported average cost of white oak in this table is low. The only explanation offered is the proximity of the wood to the factories. It is nearly all produced in Missouri, and it is notable that the small amount imported from other States costs \$70 a thousand, or about the price in other States of white oak suitable for flooring and molding. Siding is not made of white oak. The native-grown red oak, and that brought from other States, follow almost exactly the same rules as the white oak, namely, the home-grown wood is cheap, and the imported is expensive. Some of the manufacturers explain the difference in cost by pointing out that the imported oak is much better than that cut in Missouri forests. At any rate, they say, only high grades are brought into the State, while all grades make up the average cost of that procured at home.

The cheapest wood listed in this industry is cottonwood, all of which is home grown; but the amount is not large. Red gum is cheap and does not reach the importance in the industry which might be expected of a wood so highly regarded away from home, particularly in some foreign countries.

Most of the flooring included in this table is the ordinary tongued and grooved kind, yet parquetry belongs here, although much work after it leaves the planing mill is necessary before it becomes a finished product. The black walnut listed in the table was used for parquetry and inlaid borders and fields, but some of the woods which are associated with it, being demanded in small amounts, were not reported by the manufacturers, perhaps for the reason that most of the colored woods were supplied by carpenters and contractors who laid the parquetry floors. Among woods put to that use are black walnut, already mentioned, which is of dark color; maple, white in color, and forming sharp contrast with walnut; mahogany and ebony, dark or black in color; vermilion, red; holly, white; cherry, red; and oak for borders and general pattern pieces. White pine is soft, and is liked for a foundation on which to lay the parquetry floor.

The waste in a planing mill is an important item, even when the best economy is practiced. Four or five hundred pounds of wood (and sometimes twice that) are planed off of every thousand feet passing through the machines. Manufacturers make special effort to lessen this loss by finding sale for shavings, sawdust, and the dust from polishing belts. Shavings are occasionally sold at 25 cents per

PLAINING-MILL PRODUCTS.

TABLE III.

Kinds of wood.	Quantity used annually		Average cost per 1000 ft.	Total cost f. o. b. factory	Grown in Missouri feet B. M.	Grown out of Missouri feet B. M.
	feet B. M.	per cent				
Shortleaf pine	62,256,677	93.89	\$13.71	\$ 949,495	66,896,677	2,360,000
Cypress	2,195,000	2.97	19.84	43,556	1,745,000	450,000
Red gum	1,400,000	1.90	13.15	18,412	1,400,000	-----
Red oak	489,500	.66	15.17	7,420	437,500	52,000
White oak	263,500	.36	15.16	3,995	235,500	28,000
Cottonwood	125,000	.17	12.00	1,500	125,000	-----
Black walnut	36,000	.05	64.44	2,320	5,000	31,000
Totals	73,765,677	100.00	\$ 13.92	\$ 1,026,698	70,844,677	2,921,000

Sitka spruce, from the same region as Douglas fir, is demanded in more than twice the amount of that wood. Many of its uses are the same as Douglas fir, but it is employed indoors rather than out. It is light in weight, white in color, strong, rigid, and generally free from objectionable knots and defects, and is an ideal material for interior house or hall finish, except that it has little figure.

Another substantial wood from the Pacific coast which fills a place in this industry is the western red cedar. The amount demanded is much below Douglas fir and Sitka spruce. It is more frequently mentioned for window frames than for any other purpose, and the part of the frame where it generally appears is the sill. That is the bottom piece of the frame, and if outside, it is much exposed to dampness, and therefore subject to decay. The western cedar is one of the so-called "everlasting woods," and it is purposely selected for window sills because of its ability to resist decay. The eastern red cedar, which grows in Missouri, but reaches its best development in Tennessee, is also selected for window sills, and a rather large amount of it is so used in Missouri. Cypress, which is also an enduring material, is employed for the same purposes, but the whole frame is made of cypress more frequently than the sill alone.

Cypress and California redwood are specially reported as suitable for fire doors and fire shutters because they contain no resin and are slow to take fire. Redwood is the less combustible and absorbs water so readily that if dampened, its incombustibility is increased in a marked degree. Some manufacturers refer to the slow combustion of white pine as one of its chief recommendations for fire doors and shutters. It contains little resin, but when it takes fire it is speedily consumed.

The high-grade cabinet woods listed in this industry, such as cherry, black walnut, Circassian walnut, mahogany, satinwood, sweet birch, vermi-

two-horse wagon load. The buyers are distillers of wood alcohol, livery stables which use the shavings for horse bedding, and some shavings are thrown on muddy walks. Sawdust is generally salable in large towns. About 10 cents a sack retail is the price for that spread on saloon and meat-shop floors, and the demand for it is rather large. Certain floor-cleaning compounds are made of sawdust with chemicals added. The dust is often ground to powder before the chemicals are added. Another use for sawdust is as an absorbent for nitroglycerin in dynamite manufacture.

Sash, Doors, Blinds and General Millwork.

Statistics of this industry in Missouri are given

supplied three million feet to this industry, and much of it was made into beds for farm wagons and the tops of business wagons. Beech is very strong and stiff, and serves as automobile frames. It serves likewise as feloes for very heavy wagons, some preferring it to white oak because it shrivels and swells less under seasonal changes, and tires are less likely to work loose. When extra large spokes are required, white elm is sometimes used. The hackberry reported was probably substituted for ash, and the pecan for hickory. Sycamore is made into shelving for bakers' wagons, because it is easy to keep clean. Red gum was used for sides and panels of coal wagons. Ash is occasionally employed for the same purpose. Red gum sideboards for farm wagons were reported, and the small quantity of black spruce in the table was used in the same way. Some of the manufacturers made wagon tongues of red oak. Basswood bonds well and is valuable for panels. Hearse and undertaker wagon manufacturers prefer this wood.

Furniture.

Although twenty woods contribute to the supply of furniture material in Missouri, four-fifths of all is supplied by four woods—red gum, white oak, silver maple and red oak. Red gum is nearly half. In no other industry is this wood so largely employed in imitation. When carefully selected it passes without much staining for Circassian walnut, and it may be printed to resemble maple and oak. Silver maple also is printed to imitate oak; and sweet birch passes for other woods, while yellow poplar takes the color of birch and is substituted for it. The art of finishing and staining wood has been so perfected that almost any effect can be produced to order, and the purchaser's tastes can be satisfied. Some imitations are apparent and deceive no one who examines them carefully; but others are so skillfully executed that none but an expert can separate the true from the false.

Furniture makers have made a close study of different woods and understand what each is best suited for. Some give their best service as outside material; others seldom so appear, but make the inside, hidden parts. Where strength or hardness is desirable, it is possible to select woods to fulfill the conditions; if smoothness is wanted, rather than figure or grain, there are woods of that kind. There are white, sanitary woods, attractive in appearance and easily kept clean. Such material is popular for kitchen and pantry furniture; and among woods of that kind are basswood, cottonwood, maple, ash, sycamore and yellow poplar. Woods which wear smooth by sliding, one upon another, are demanded by furniture manufacturers for drawers and drawer slides, and for the slides of extension tables. A wood which serves that purpose well must be hard and have a fine grain. Sugar maple, beech and birch fulfill the conditions.

Furniture of solid oak, mahogany, birch, walnut, cherry or other handsome, costly woods is now seldom made. The cost would be excessive, and unless the material were long and carefully seasoned and the joining and fitting executed in the most skillful manner, the heavy pieces of furniture would be likely to warp out of shape, and pull apart at the joinings. This danger is avoided by using cores or backing of built-up veneers of softwoods or of the softer kinds of hardwoods. The article of furniture, such as a chair, table, or chiffonier, is thus made of two parts, the inner frame of cheap woods, and the outer visible part of thin sheets of costly veneers glued upon the frame work. Such a piece of furniture has the appearance of being solid oak, walnut, or some other handsome material, and the core of cheaper wood nowhere appears. When deep carving is desired, the outer wood must be thick enough to receive the cutting. Occasionally a buyer insists on furniture of solid oak, mahogany, or some other cabinet wood. The manufacturer gives him what he wants, but even then, in most cases, the furniture is built up of veneers and overlays. In that case, if for example, the wood is to be mahogany, the whole article, core as well as outside, is of the specified wood and there is no deception as to material. The manufacturer takes the extra trouble of building up the furniture instead of making it of thick, solid pieces, because his reputation is at stake and he knows that the built-up article is better. A table top three inches thick of solid wood almost invariably warps and checks, but if built of transverse sheets of veneer, it stands time and weather, changes, and retains its shape. Good backing or cores for veneers should have but small tendency to warp and twist. White pine is by many considered the ideal wood for that purpose, but basswood, cottonwood, chestnut, soft maple, and several of the pines are satisfactory.

One factory seldom makes all kinds of furniture. The business is highly specialized. The making of chairs is so distinct from furniture manufacturing in general that it is often regarded as a separate industry. Further than that, chair factories are specialized. Some produce dining-room chairs; opera and hall chairs are the exclusive output of some; others manufacture pulpit chairs, dentists chairs, barber chairs, or perhaps cheap camp stools. The same practice obtains among makers of other kinds of furniture. That which is upholstered falls into a class; davenports, lounges, and couches are sometimes the special

HANDLES.

Kinds of wood.	Quantity used annually		Average cost per 1000 ft.	Total cost f. o. b. factory	Grown in Missouri feet B. M.	Grown out of Missouri feet B. M.
	feet B. M.	per cent				
Hickory	14,174,000	72.16	\$ 19.35	\$ 274,230	6,602,500	7,511,500
White ash	2,580,000	13.14	15.96	41,188	1,287,500	1,292,500
Red gum	1,750,000	8.91	16.25	28,438	1,750,000	-----
White oak	770,000	3.92	15.17	11,680	770,000	-----
Red oak	310,000	1.58	14.39	4,460	310,000	-----
Sugar maple	35,000	.18	23.71	830	-----	35,000
Cypress	22,000	.11	18.00	396	-----	22,000
Totals	19,641,000	100.00	\$ 18.39	\$ 361,222	10,720,000	8,921,000

TABLE VIII.

product of a factory; bedroom suites, or even bedsteads only, may constitute the output; and some large establishments make only kitchen, dining-room or porch furniture. All of these are brought together in statistics shown for Missouri in Table VII.

It can be readily understood that all furniture factories do not demand the same kinds of wood. The maker of cheap camp stools has no use for cherry, walnut, or mahogany; the manufacturer of parlor pieces needs little elm, cottonwood, or pine, except possibly as backing for veneer. In Missouri the tops of kitchen tables are usually of basswood, cottonwood, or soft maple. These are known as sanitary woods; they are easily kept clean. The sapwood of red gum is liked for the bottoms and backs of drawers, and elm and soft maple are also so employed. A rather large amount of sycamore is used, some high-class, other cheap. When quarter-sawed it makes handsome table tops and carved chair arms; the common grades go to kitchen tables and the interiors of book cases, wardrobes, bureaus, and cupboards. White elm is employed in carvings for wardrobes, kitchen safes, and brackets. White and red oak are so universally used in furniture manufacture that almost every department of the business owes something to them. The use of mahogany for furniture in Missouri appears small; but its place is supplied with imitation mahogany made of birch, red gum, and yellow poplar. Red cedar meets a demand for an aromatic wood as bottoms for drawers in bureaus and chiffoniers, shelves and backs of wardrobes, and as chests in which clothes are stored. The belief is widespread, and has existed during generations, that the odor of red cedar protects furs and clothes against moths, and other injurious insects. At any rate, a pleasant odor is imparted to clothing left for a considerable time in contact with the wood. The real efficiency of cedar in destroying insects is a matter on which opinion differs. It does not appear that a scientific investigation of the question has ever been made. The opinion has prevailed during three hundred years that a red cedar clothes chest is proof against moths. The same opinion is held regarding the incense cedar of California, the Port Orford cedar of Oregon, and the one-seed juniper and mountain juniper of western Texas.

little is used above the tree's butt cut. Toughness and resiliency are the most essential properties. There are other commodities into which the remainder of the hickory tree may be worked, and the waste is not necessarily excessive, though some times it is not small. Articles made from hickory, other than handles, are buggy spokes and rims, shafts, poles, axles, sucker rods for pumping deep wells, dowels, shewers, athletic goods, and many more. Meat packers buy hickory cordwood for smoking meat. If as much of a hickory tree is worked up as is fit for one or more of these commodities, there will be little left to rot in the woods. Sometimes, however, the hickory lumbering is carried on in districts so far from transportation that only the choice parts of trees can be taken out with profit. The principal hickory region of Missouri is the southeastern part of the State, and several large and many small operators are located there. Not half of the hickory cut in Missouri is converted into the finished products in the State, but much is shipped elsewhere either in the rough or in the partly manufactured form.

Though hickory is the most important it is not the only wood valuable to Missouri handle manufacturers. Two and a half million feet of white ash are used. This wood is highly satisfactory as handles for certain farm tools, particularly pitchforks, rakes, hoes, and shovels. It is stiff, strong, and moderately light.

White oak is occasionally substituted for hickory in railroad pick handles, and even for ax handles, but for ax handles it lacks much of measuring up to hickory.

Much of the sugar maple and cypress in the table was made into broom handles, and a small part of the red gum was so used.

Large numbers of small handles of various patterns are turned out, and for some of them there is not much choice of wood. Among handles of that class are hand grips on bucket pails and on boxes and packages. Red gum is largely used for that commodity, and red oak and ash contribute to the supply. There are gimlet, awl, auger, chisel, saw, and other tool handles. Some are made from waste. Whip handles are reported as a by-product of saddle-tree factories, cut from pieces sawed out to give

FURNITURE.

Kinds of wood.	Quantity used annually		Average cost per 1000 ft.	Total cost f. o. b. factory	Grown in Missouri feet B. M.	Grown out of Missouri feet B. M.
	feet B. M.	per cent				
Red gum	12,739,650	45.23	\$ 19.81	\$ 252,333	4,876,250	7,863,400
White oak	6,147,000	21.82	43.61	268,088	1,940,875	4,206,125
Silver maple	2,120,000	7.13	21.96	46,557	424,830	1,695,170
Red oak	1,999,000	7.10	36.26	72,483	583,125	1,415,875
Cottonwood	1,515,000	5.38	22.45	34,019	304,500	1,210,500
White elm	1,092,000	3.88	21.79	23,795	359,500	732,500
Sugar maple	1,013,500	3.60	23.72	24,037	61,670	951,830
Sycamore	644,000	2.29	19.37	12,475	479,000	165,000
White ash	443,000	1.57	26.98	11,950	1,500	441,500
Yellow poplar	149,000	.53	27.35	4,075	117,500	31,500
Shortleaf pine	123,800	.44	24.89	3,082	14,000	109,800
Sweet birch	57,900	.21	51.05	2,956	-----	57,900
Cypress	44,000	.16	20.34	895	-----	44,000
Black walnut	31,000	.11	73.38	2,275	-----	31,000
Basswood	15,000	.05	35.00	525	-----	15,000
Hickory	10,000	.03	21.00	210	-----	10,000
Tupelo	10,000	.03	18.50	185	-----	10,000
Mahogany	9,200	.03	183.15	1,685	-----	9,200
White pine	2,000	.01	92.50	185	-----	2,000
Black cherry	500	*	84.00	42	-----	500
Totals	28,165,550	100.00	\$ 27.05	\$ 761,852	9,162,750	19,002,800

TABLE VII.

*Less than 1/100 of 1 per cent.

Handles.

The statistics in Table VIII, relative to the manufacture of handles, include many sizes, from handles for gimlets and awls to those for cant hooks. Seven woods figure in this business and nearly twenty million feet are consumed. Hickory is the most important, and white ash next. Most handles require fairly high grades of wood, yet the average prices paid are low. The apparent inconsistency is easily explained by the fact that most handle woods are bought in the log or billet form, and little work has been done on them when they reach the factory. Some of the material does not pass through a sawmill, and no Sawyer's bill is included in the cost. Billets are sometimes split in the woods and go in the rough form to the handle maker or go in the form of bolts. Sometimes they are rough-turned before they go to the finishing factory. This holds good for hickory chiefly, but some white oak and white ash go through the splitting and rough-turning process.

The bulk of the 14 million feet of hickory is made into ax, pick, and sledge handles. Such handles are 36 inches long, but the bolts are cut 40 inches to allow for trimming the ends to rid them of seasoning checks. Wood of that kind is measured by the cord or rank and this is good for about 300 handles. A lathe makes 400 handles a day. In selecting material for ax, pick, and hammer handles,

shape to the saddle tree. They are of ash, maple, oak, and hackberry.

A by-product of handle factories is the dust from the sanding belts. This is very fine particles of wood, like flour, and it is bought by manufacturers of floor-cleaning compounds, and dynamite. Some of the finest dust is used for polishing silver ware.

Fixtures.

Fixtures are closely related to furniture. The line separating the two industries is often difficult of definition. Fixtures are generally made for a particular room or place, while furniture is not so restricted. Fixtures are adjuncts of banks, offices, stores, saloons, halls, and hotels. They consist of showcases, counters, presses, and cabinets, window seats, wall benches, soda fountains, exhibition racks, bars, fixed desks, shelving, and many others of similar kind. They differ from interior finish which is made fast to walls, ceiling, or floor, and can not be removed without considerable injury to the finish and the room.

Fixtures are made in much the same way as furniture; similar materials are used, and similar effects are produced by selecting and grouping woods. Veneers are as largely employed as in furniture, and shelving and panels hold the relative place which they occupy in furniture. In Missouri 28 woods are reported in this industry, and four of them

little disposition to check and warp. The scrubbing parts of brushes may consist of bristles from Turkey, Russia, China, or from this country; rice root from Italy, palm from the South, or wooden splints made in nearly any locality.

The manufacturers of bakers' tools and appliances use yellow poplar exclusively, because bakers will take no other. Increase in cost in recent years does not appear to have lessened the demand for wood in that industry. The well-known properties of yellow poplar, which create and maintain the demand for it, are whiteness, fineness of grain, small liability to check and split, absence of odor and taste and good wearing qualities. Flour scoops, mixing troughs, dough boards and rolling pins are some of the tools and appliances used by bakers. Between them and certain commodities generally listed as woodenware the line is not clearly drawn.

The small quantity of wood for gunstocks in Missouri is supplied by black walnut and a little English walnut. The stocks for airguns are included and they are made exclusively of black walnut, but the more costly English walnut is worked into pistol grips and the stocks of other firearms. Black walnut is strong for its weight and takes fine finish, but it is maintained by some that there is no reason, beyond old custom, why it should exclude many other woods for gunstocks. The preference often shown for English, French, Italian and Circassian walnut in the gunstock industry is due to the softness of colors and the fine figure of the wood. Some of the choice pieces cost from \$5 to \$10 for enough for a single stock. English, French and Italian walnuts are really the same species (*Junglans regia*) and it is not native of Europe, but seeds were brought in (as is supposed) from Persia by the Romans, and were planted first in Italy and France. Many woods are called Walnut, which are not related to it, such as red gum and prima vera. Hickory was formerly known as walnut in Virginia and the States north of the Potomac.

The shoe-last industry in Missouri has grown to considerable importance, and all of the wood comes from other States. Only two species are reported—sugar maple and basswood. The latter is not made into lasts, but a related commodity, fillers or forms. They are inserted in shoes to maintain their shape when not being worn. "Trees" over which rubber boots are made are often of basswood and serve as lasts. Practically all the lasts in this country are of sugar maple. Other woods, such as beech, sycamore and persimmon, are often listed as last material, but in practice they are hardly ever used. Most of the sugar maple in this industry is cut in Michigan. Manufacturers say that the grain and seasoning properties of maple in that region are superior to any other. The wood is split in billets, generally large enough to make three lasts, is air-dried two years or more, and then is seasoned several months in a kiln. Patterns or models for lasts are made by hand, but the lasts are made by machinery. Every change which fashion calls for in the shape of shoes demands a new set of lasts and the old becomes useless. An exhibit of the different shapes of lasts in this country during the past century would form a valuable exhibit for a museum. St. Louis manufactures great numbers of shoes, but most of the lasts used there come from outside the State. An average block from which a last is made contains a foot and a half of wood, beard measure, and costs about 10 cents. The block from which a filler is produced contains half a foot of wood.

The making of advertising signs of wood seems to belong more to the small shop than the large factory. It is customary for a carpenter to cut the beard or beards in the desired shape and the village sign painter letters them. They are seen over the doors of blacksmith shops, shoe shops and like places; finger beards at forks of roads, advertisements to be nailed on posts and fences, and the more pretentious bill boards which are familiar sights along railroads. When large numbers of wooden signs are wanted—such as sewing machine manufacturers, soap sellers and cleaning powder makers employ—they are printed by machinery. A higher class of workmanship is demanded for signs with raised letters. Each letter is cut separately and nailed in place. Redwood from California and white pine from the Lake States are well liked for raised letters. They are easily cut and satisfactorily hold their shape. Where signs are to be painted white pine is well suited because the spirits of turpentine in the paint affiliates with the surface of the wood. Shortleaf pine is listed for frames in which muslin signs are to be displayed. Cypress and redwood work to advantage when extra wide pieces are desired.

Sucker rods employed in pumping deep wells are of hickory and are from 18 to 35 feet long. The chief demand comes from oil fields.

Saddle trees, cart trees, stitching horses and whip stocks are grouped as part of a single industry in Missouri because they are reported together. The whip stocks are a byproduct of the saddle tree factory and are made from wood cut out in shaping the saddle tree. The making of hames is a kindred industry. Woods so employed are white oak, white ash, white elm and beech. Saddle-tree woods are sugar maple, silver maple, white elm, sycamore, white oak, red gum, hackberry, basswood and white ash.

Telephone and telegraph pins are made of white

oak and locust. It is not improbable that several other oaks contribute to the supply. The chief requisite is that the material must be strong and must resist decay.

The heads for rocking horses are made of red gum, and the rockers of this toy, and likewise of shoofties, are made of white elm. The bodies are principally of cypress.

The value of redwood is insisted upon in the manufacture of ice-cream refrigerators. Next to cork the wood is said to be the best obtainable non-conductor of heat. It is very porous, free from pitch, easily worked and may be obtained in any desired dimension.

The makers of blacksmiths' bellows prefer cottonwood for certain parts of the mechanism because of its lightness, to which is combined sufficient strength to meet requirements.

Stems for tobacco pipes are made of paper birch from Minnesota. It behaves well in the lathe and turns easily and finishes with a good surface. It is liked where accurate cutting is desired because it does not quickly dull tools. Two hundred thousand feet of this birch were reported for pipe stems in Missouri.

MISCELLANEOUS.

Table with 6 columns: Kinds of wood, Quantity used annually (feet, per cent), Average cost per 1000 ft., Total cost factory, Grown in Missouri (feet, per cent), Grown out of Missouri (feet, per cent). Lists various woods like Red gum, White oak, Hickory, etc.

Summary by Industries of Woods Used in Missouri.

Table XXVI is a summary of all the wood-using industries in Missouri. It is a counterpart of Table I, which is a summary by species. Both tables present the same totals but interpret them in different ways. The first shows how much of each wood is used, the cost, etc.; the last shows how much wood of all kinds is demanded by each one of the 24 industries of Missouri. Fifty-six woods are listed in Table I and 24 industries in Table XXVI. In this enumeration "miscellaneous" is classed as an industry, though it is only a grouping of many items. It is numbered 25. The highest average price was paid for aeroplane woods, the lowest for that made into excelsior. The box and crate industry demanded the largest amount of wood, aeroplanes the least. Excelsior and valise makers drew the largest per cent of their material from the State, and five drew none—laundry appliances, sporting and athletic goods, patterns, frames and molding and aeroplanes.

SUMMARY BY INDUSTRIES OF WOODS USED IN MISSOURI.

TABLE XXVI.

Table with 6 columns: Industries, Quantity used annually (feet, per cent), Average cost per 1000 ft., Total cost factory, Grown in Missouri (per cent), Grown out of Missouri (per cent). Lists industries like Boxes and crates, Planing mill products, Sash, doors, blinds and general millwork, etc.

*Less than 1/100 of 1 per cent.

Additional Statistics.

The foregoing statistics and discussions are based on a study of the wood-using industries of Missouri made by the United States Forest Service in 1911. It was explained on a preceding page that this study did not include the rough lumber cut by sawmills unless it was further manufactured, nor the output of shingles, lath, cooperage, wood-distillation, cross-ties, veneers and telegraph and telephone poles. However, statistics relating

to these commodities have been collected yearly by the Bureau of the Census, co-operating with the Forest Service, and in order to make the report on Missouri's wood-using industries more complete, an abridgement of the Census figures is presented in the following paragraphs. The cut of lumber as reported by the Census is shown on page 3 of the report. Certain other forest products are not elsewhere included and are shown in paragraphs which follow.

Cooperage.

Cooperage as a whole includes three commodities—staves, heading and hoops. Two classes of cooperage are recognized, tight and slack. The former includes barrels and kegs intended to contain liquids; the latter those not meant for liquids. The principal commodities shipped in tight cooperage are oils, alcoholic liquors, molasses, vinegar, and cider. Alcoholic liquors demand the highest grade barrels. The wood of which they are made must be dense or the liquor will leak through the pores. White oak is one of the most serviceable materials for barrels of this kind. Some woods too porous for use in transporting alcohol are satisfactory for molasses and certain oils. Slack cooper-

TABLE XXV.

Table with 6 columns: Kinds of wood, Quantity used annually (feet, per cent), Average cost per 1000 ft., Total cost factory, Grown in Missouri (feet, per cent), Grown out of Missouri (feet, per cent). Lists woods like Red gum, White oak, Hickory, etc.

age may be divided into several classes. Paints, sugar, flour, cement and other powdery commodities require barrels almost water tight or the contents will sift through; but crockery, potatoes, fruits and articles of that kind go without loss in barrels with large openings between the staves.

In 1909 slack cooperage was listed in Missouri as follows:

STAVES.

Table with 2 columns: Kind of wood, Value. Lists Red gum, Elm, Ash, Sycamore, Maple, Cottonwood.

SETS OF HEADING.

Table with 2 columns: Kind of wood, Value. Lists Red gum, Ash, Maple, Cottonwood, Elm.

HOOPS.

Table with 2 columns: Kind of wood, Value. Lists Elm, Red gum.

LATH.

Table with 2 columns: Kind of wood, Value. Lists Elm.

SHINGLES.

Table with 2 columns: Kind of wood, Value. Lists Elm.

HOFS.

Table with 2 columns: Kind of wood, Value. Lists Elm.

SHINGLES.

Table with 2 columns: Kind of wood, Value. Lists Elm.

HOFS.

Table with 2 columns: Kind of wood, Value. Lists Elm.

SHINGLES.

Table with 2 columns: Kind of wood, Value. Lists Elm.

HOFS.

Table with 2 columns: Kind of wood, Value. Lists Elm.

SHINGLES.

Table with 2 columns: Kind of wood, Value. Lists Elm.

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Table with 2 columns: Kind of wood, Value. Lists Elm.

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Table with 2 columns: Kind of wood, Value. Lists Elm.

SHINGLES.

Table with 2 columns: Kind of wood, Value. Lists Elm.

HOFS.

Table with 2 columns: Kind of wood, Value. Lists Elm.

SHINGLES.

Table with 2 columns: Kind of wood, Value. Lists Elm.

TANNING MATERIAL.

Tanbark:	Species	Value
Tons	Hemlock	\$14,339
1,103	Chestnut	60
15	Myrobalan	98
2		
Tanning Extracts:	Species	Value
Pounds	Querbracho	\$41,631
1,298,767	Chestnut	1,996
102,420	Hemlock	40
1,000		

Veneers.

Most of the veneer made in Missouri is rotary cut. It is usually measured by log scale and the output in that State in 1909 was as follows:

Red gum	18,208,000
Cottonwood	4,883,000
Tupelo	800,000
White oak	726,000
Elm	610,000
Red Oak	400,000
Sycamore	387,000
Maple	370,000
Ash	228,000
Yellow pine	200,000
Walnut	200,000
Cedar	161,000
Hickory	118,000
Locust	58,000
Basswood	10,000
Birch	6,000
Total	27,365,000

Uses of Wood by Species.

There is no universal wood—that is, one fit for everything that is made of wood, but some have ranges of uses so wide and varied that they are in general demand. Such a wood is white oak, yet it is not suitable for a shoe last, a spool, a pattern, a wooden limb or a violin. Other woods are in practice restricted to a few uses which they fill so well that by a sort of common consent they are set apart for those special uses; for instance, paper birch for spools, persimmon for shuttles, locust for small hubs and tree nails, and Spanish cedar for cigar boxes. It is interesting and instructive in a manufacturing State like Missouri to bring together all the commodities made of a certain wood, in all the industries, and present them in a single list. This is done in the pages which follow. The species are arranged alphabetically so that any one of them may be easily found. The commodities under each species are also arranged alphabetically for a like reason. It should not be supposed that the uses given include all that the species is fit for. The list gives only uses reported in Missouri. In another State the same wood might have a list of uses much shorter or much longer, depending upon supply and the extent to which wood manufacturers are diversified in that region. An example will suffice. In Missouri sugar maple is reported in the manufacture of 61 articles, and yet in Michigan its uses are three times as many; but in Missouri shortleaf pine has twice as many uses as the same wood has in Michigan.

Manufacturers in Missouri report the use of 56 species of wood in that State. Without doubt several others are used and are not separately reported. There are more than a dozen commercial oaks contributing to the lumber cut of Missouri, but several are called simply oak, or, if they belong to the white oak group, they are listed as white oak; or if to the red oak group they are designated as red oak or yellow oak. Among the oaks which almost certainly enter generally into the manufactured products of Missouri, though not separately reported, are the following:

Cow oak,	Scarlet oak,
Chinquapin oak,	Water oak,
Swamp white oak,	Shingle oak,
Texan oak,	Willow oak,

Some of these are generally classed by lumbermen as white and others as red oak. It is usually easy to distinguish the species of the two groups by observing the acorns. White oaks ripen their acorns in one year; red oaks require two. Hickories are grouped in the same way. With most mill men hickory is hickory and no identification of species is attempted. In practice not much harm results, because the hickories are all good, although there are different degrees of fitness for special purposes. There are seven commercial hickories in the State and all of them are used for similar purposes. They are:

Bitternut hickory,	Mockernut hickory,
Shellbark hickory,	Pignut hickory,
Water hickory,	Small pignut hickory,
Shagbark hickory,	

There are two woods which are classed as mahogany in manufacture. By some they are kept separate, and others consider them as one. Botanists draw a clear distinction. The mahogany that has been in the American and European market for two hundred years or more is the American species, the genuine mahogany. It grows in Mexico, Central America, Northern South America, the West Indies and a small quantity in Florida. It all grows in America, except that a little has been planted in other countries, notably in the East Indies, where a small amount is cut for market. The other wood that passes in commerce as mahogany comes from South Africa and is botanically a different species, though it is a very fine wood and many consider it in every way equal to American mahogany. There are a

number of other woods which sometimes pass for mahogany, some foreign which are sold in their natural color, others American, which must first be stained to give them the mahogany color. Among home woods most frequently passing for mahogany (first being stained) are yellow poplar, sweet birch, black cherry and red gum. Some success has attended efforts to stain California eucalyptus in imitation of mahogany. The so-called white mahogany is *prima vera* and is listed under its proper name in this report.

The uses for which the several woods are reported in the lists which follow should not be understood to include all the uses for which the woods are suitable. In many instances, classes or ranges of uses only can be shown. For example, white oak listed for furniture includes many articles and kinds of furniture. It would be impracticable to name all of them. In the same way, when cottonwood is listed for boxes that is deemed sufficient without specific mention of each kind of the score or hundred sorts of boxes for which this wood is used in Missouri. It will thus be understood that no greater completeness is claimed for the lists of uses than that they indicate the scope and range of usefulness which has been found for the different woods of the State.

Basswood.

Agricultural implements, automobiles, bank fixtures, baskets, bottle packing, boxes, bread boards, carriage panels, caskets, cigar boxes, corn planters, crates, cultivators, drawer bottoms, excelsior, fanning mills, go-carts, grain separators, grass seeders, hobby horses, ironing boards, kitchen cabinets, kitchen tables, meat boards, molding, music cabinets, picture frames, refrigerators, sample cases, show cases, sleeve boards, soap boards, stretching horses, table tops, trays, trunks, wheelbarrows.

Beech.

Agricultural implements, baskets, boxes, brush backs, chairs, coat hangers, electro base blocks, fanning mill frames, fixtures, furniture, hames, handles, hand sleds, hobby horses, meat boards, planes, pulleys, refrigerators, showcases, stepladders, trunk slats, washing machines, weighing machines, wheelbarrows, woodenware.

Black Cherry.

Bases for electros, furniture, interior finish, models, musical instruments, parquetry, patterns, saw handles, store fixtures, trays (for jewelry).

Black Pine.

Cigar boxes.

Black Spruce.

Aeroplanes, automobiles, blinds, ceiling, doors, finish, fixtures, musical instruments, picture frames, shelving, siding, sounding boards, violin tops.

Black Walnut.

Automobiles, ballot boxes, bank fixtures, carvings, furniture, gun stocks, handles, interior finish, knobs, molding, music cabinets, passenger cars, pianos, picture frames, showcases, steering wheels, wooden novelties.

Black Willow.

Boxes, crates, drawer bottoms, meat boxes, office fixtures, pantry shelves, wagon beds, wooden limbs.

Boxwood.

Engraving blocks, tools.

Bur Oak.

Bookcases, cars, chairs, fixtures, furniture, hay presses, interior finish, molding, stairs, threshing machines, wagons.

Butternut.

Furniture, interior finish, molding, novelties, screen doors, window frames.

Chestnut.

Burial boxes, caskets, coffins, fixtures, furniture, interior finish, mirror frames, molding, musical instruments, pianos, picture frames, showcases, toys.

Circassian Walnut.

Bank fixtures, chairs, finish, furniture, knobs, molding, panels, pianos, picture frames, steering wheels, stools.

Cottonwood.

Agricultural implements, baskets, blacksmith bel-lows, bookcases, bottle packing, buggy bodies, boxes, cart trees, chairs, clothes racks, crates, dough boards, drawer bottoms, doors, egg cases, excelsior for mattresses, fanning mills, fixtures, ice boxes, interior finish, ironing boards, kitchen tables, ladders, lawn swings, mirror frames, molding, panels, picture frames, poultry coops, refrigerators, saddle trees, sash, shelving, siding, sleeve boards, threshing machines, towel racks, veneer cores, wagon beds, washboards, washing machines, woodenware.

Cypress.

Agricultural implements, alfalfa renovators, beehives, boats, broom handles, burial boxes, caskets, ceiling, coffee drums, coffins, cornice, counter tops, disc cultivators, disc furrow openers, fire doors, fixtures, furniture, grain separators, hothouse sash, ice-cream freezers, interior finish, ironing boards, laundry tubs, molding, newel posts, office fixtures, organ pipes, panels, porch blinds, sash, seed cleaners, shiplap, showcases, shuttles, siding, silos, sleeve boards, spindles, stair railing, tanks, thresh-

ing machines, windmills, window frames, window screens, window sills.

Douglas Fir.

Bank fixtures, bottle packing, car beams, car siding, ceiling, corn huskers, doors, drills (grain), drug cabinets, extension ladders, flooring, furniture, grain separators, hay-press plungers, hay-press sweeps, hothouse benches, hothouse sash, ice boxes, interior finish, mantels, newel posts, passenger cars, plumbers' woodwork, poles (flag), potato planters, porch columns, porch railing, refrigerators, shelving, showcases, sideboards, siding, standing desks, tanks, vehicle tongues, wagon beds, wagon tongues, weighing machines, windmills, window frames, window sash, window sills.

Ebony.

Bass viol pegs, brush backs, celo finger-boards, guitars, lodge furniture, mandolins, piano keys, violin finger-boards, violin pegs.

English Walnut.

Gun stocks.

Hackberry.

Cart trees, handles, saddle trees, stitching horse jaws, wagon boards.

Hickory.

Agricultural implements, automobile wheels, ax handles, axles, buggy poles, buggy shafts, cant hook handles, cultivators, double trees, dowels, eveners, grain separators, hammer handles, hubs, huskers, ladders, limbs (artificial), mallets, neck yokes, oxbows, pike poles, pitmans, rules, separators (grain), shellers, singletrees, spokes, wagon gears, wagon poles, wheelbarrows, whip handles, windmill rods.

Holly.

Brush backs, novelties, parquetry.

Locust.

Agricultural implements, hubs, tree nails.

Longleaf Pine.

Agricultural machinery, awning poles, bank fixtures, bean boxes (scales), boxes, car material, cart shafts, ceiling, chicken coops, columns (porch), cornice crates, door frames, doors, drug cabinets, eveners, extension ladders, fanning mills, fixtures, flooring, handcars, hay presses, huskers, ice boxes, interior finish, kitchen furniture, passenger cars, plumbers' woodwork, potato diggers, refrigerators, sash, shoeboxes, siding, silos, spindles, stair horses, stair rails, stair steps, stepladders, tanks, tent poles, threshing machines, wagon beds, wagon poles, weighing machines, windmills, window frames, window sash, window sills.

Longleafed Willow.

Artificial limbs.

Mahogany.

Airship propeller, airship wheels, automobile handrails, automobile dashboards, bookcases, book-racks, burial boxes, cabinets, carvings (caskets), caskets, chairs, china closets, coffins, counter tops, filing cabinets, fixtures, furniture, hall grasses, hall trees, interior finish, mandolin, mirror frames, molding, office fixtures, panels, parquetry flooring, patterns, pews, pianos, picture frames, plumbers' woodwork, pulpits, showcases, sleeping cars, telephone boxes, turned work, umbrella stands, violins, wall cases, wardrobes.

Northern White Cedar.

Street car ceiling.

Norway Pine.

Screens, window frames.

Paper Birch.

Tobacco pipe stems.

Pecan.

Wagon crossbars.

Post Oak.

Locomotive pilots, sign posts, signs (railroad), wagon stocks.

Prima Vera.

Musical instruments.

Red Cedar.

Burial boxes, caskets, clothes chests, coffins, furniture, office fixtures, wardrobes, window sills.

Red Gum.

Ballot boxes, bank fixtures, baskets, bookcases, boxes, china closets, cigar boxes, clothing cabinets, coffee drums, counter tops, crates, desks, doors, drawer bottoms, dressers, filing cabinets, furniture, garment hangers, hobby horses, hall trees, handles, interior finish, mirror frames, mission furniture, molding, musical instruments, office fixtures, opera chairs, panels, parlor furniture, pedestals, pianos, picture frames, plumbers' woodwork, refrigerators, saddle trees, shipping drums, shoe-flies, typewriter tables, veneer bottle packing, window frames, wardrobes.

Red Oak.

Agricultural implements, automobiles, balusters, bookcases, bookracks, boxes, brackets, cabinets, ceiling, chair stock, chair closets, cupboards, desks, door frames, door knobs, doors, eveners, fanning mills, farm wagons, filing devices, flooring, furniture, ice boxes, interior finish, lawn furniture, molding, Morris chairs, musical instruments, newels, office partitions, panels, parquetry floors, passenger

The Wood-Using Industries of Alabama

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The Wood-Using Industries of ALABAMA

BY
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AND
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WOOD USING INDUSTRIES OF ALABAMA

Bureau of Wood Utilization of Forest Service Tells of Plants Already Established and Opportunities for New Enterprises; Division of Various Woods among Existing Manufactures.

NOTE.

The following report was prepared by John T. Harris, statistician, and Hu Maxwell, expert, under the direction of H. S. Sackett, chief of the Office of Wood Utilization, United States Forest Service. It is published and thus made available to the public through the courtesy of the LUMBER TRADE JOURNAL, New Orleans, La.

CONTENTS.

	Page
Preface	19
Woods used in Alabama.....	19
Longleaf pine	20
Shortleaf pine	20
Loblolly pine	20
Spruce pine	20
White pine	20
Cuban pine	20
Cypress	20
Magnolia	20
Red cedar	20
Hickory	20
Birch	20
Yellow poplar	20
Gum	20
The oaks	20
Dogwood	20
Elm	20
Chestnut	21
Cottonwood	21
Persimmon	21
Mahogany	21
Green haw	21
Wild cherry	21
Hackberry	21
Black walnut	21
Spanish moss	21
Planing-mill products	21
Sash, doors, blinds, and general millwork.....	22
Peaking boxes and crates.....	22
Car construction	22
Vehicles and vehicle parts.....	22
Excelsior	23
Chairs	23
Boxes, tobacco	23
Agricultural implements.....	23
Furniture	23
Handles	23
Sporting and athletic goods.....	23
Shuttles, spools, and bobbins.....	23
Fixtures	24
Refrigerators and kitchen cabinets.....	24
Caskets and coffins.....	24
Ship and boat building.....	24
Woodenware and novelties.....	25
Miscellaneous	25
Summary	25
Percentage of woods used by industries.....	25
Cost of woods by industries.....	25
Lessening waste	25
Woods waste.....	25
Mill waste.....	26
Substitution, etc.....	26
Forest conditions.....	27
Co-operators	27-28
Uses of wood	29
Appendix	29
Annual lumber cut.....	30
Softwood distillation.....	30
Cooperage	30

PREFACE.

The state of Alabama embraces 33,000,000 acres, of which about 24,000,000 are classed as wooded land, 9,000,000 farm land, and 500,000 water surface. In this division the water surface alone remains fairly constant, while the proportionate amounts of wood and agricultural land change from year to year. In some instances, old fields are lapsing into forest, but in many more instances the wooded areas are being converted into farms. In its original condition the whole region now included in Alabama was wooded, the exceptions being so few as to be

unimportant. Clearings were made in a small way by the native Indians who cultivated corn, pumpkins, and melons; and about 200 years ago more extensive clearings were begun by the first European settlers. From that time until the present, the primeval forests have steadily given way to cotton, grain and tobacco. For a long time the timber was an encumbrance, as was the case in so many other parts of the United States where the ground was wanted for crops. A little was used for fences, bridges, and buildings, but there being no manufacturing, most of the timber cut in clearing farms was burned either for fuel, or in log heaps. Although Alabama has anchorage and sea coast, the early people built few ships, and sought no over-sea trade. As early as 1777, however, naval stores were manufactured to a small extent at Mobile, the chief product being tar.

The soft woods; that is, pines and cypresses, grow in all regions of Alabama, though not everywhere equally dispersed; but the pine belt, where the finest forests of longleaf pine are found is about fifty miles wide and lies in the southern part of the state on lands usually flat and sandy. The general elevation of this belt is not much above sea level. Next above this, northward in the state, is the cotton belt, which consists of broad, rolling prairies, with many strips of timber still remaining. The soil is black and fertile and the region is crossed by many streams. Still north of this is the mineral belt, where coal and iron are mined and constitute the chief wealth of the region at this time. Timber of some kind is found all over the hills, beneath which the minerals lie. This timber has been and still is of much value in mining operations, though in this report little mention is made of it for the reason that most mine timbers are used in the rough—as pit posts, props, ties, lagging, etc.—and this report deals with manufactured products only. Considerable areas of pine in this part of Alabama were stripped many years ago by charcoal burners who found sale for their products at the iron furnaces. The mining of iron in this region was stimulated during the civil war by demands for the metal in the South when supplies from other parts of the country were difficult to procure. The confederate ship, Tennessee, was built of Alabama iron; and large cannon foundries obtained their supplies from the same mines. Much of the iron was smelted with charcoal made from pine cut in the vicinity. To this day charcoal pits are common in the region and hills are still being cleared of pine (some other woods also) to meet the demand. Still north of the mineral belt in Alabama lies the cereal belt, where grains constitute the leading crops. This region embraces the fertile lands of the Tennessee river valley, extending entirely across the state, east and west. When the primeval forests covered the country, this was a remarkable hardwood region; but the fertility of the soil tempted the early settlers to cut the woods to make corn fields. Comparatively little of the timber was sent to market, for it was not salable at that time. However, in this region some of the best hardwoods of Alabama are still found.

Alabama is well supplied with facilities for shipping its forest products by land and water. Railroads are numerous, and they handle in a satisfactory manner the business that comes to them. The state's rivers give 1,500 miles of inland navigation, without counting the streams too small for steamers, yet large enough for a raft or for floating logs. Mobile is the gateway to the sea, and to the maritime countries of the world. It has a splendid harbor, connected by a twenty-six-foot channel with the Gulf of Mexico. The harbor always presents a busy scene, and it is seldom without two or more foreign vessels loading for distant ports. It is the confident belief of the business men of Mobile, and of the whole state, that the completion of the Panama canal will add immensely to Mobile as a shipping port and port of entry, and that new markets for the products of forest and factory will be opened on the western coast of Central and South America, as well as in the Orient.

The output of the sawmills in Alabama in 1910,

according to the federal census of that year, which is the latest thus far published, was 1,465,623,000 feet. The cut was made up of eighteen species. It should be explained, however, that in some instances two or more species are grouped as one. For example, all pine is listed under the common name "yellow pine," though at least five species are included, viz., longleaf, shortleaf, loblolly, Cuban and spruce. The same method was pursued in tabulating oak lumber in the census returns. All is classed simply as oak, though it is well known that more than one species—perhaps half a dozen species—are included. The compilers of census statistics pursue that method because it is impossible to list each species of oak or pine separately, as many mills which convert them into lumber make no distinction between species. The drain upon Alabama's pine has been very heavy. In 1910 it constituted ninety per cent of the whole sawmill output. It is, therefore, evident that any lessening of the available pine supply will affect in a visible way, the state's total lumber output.

The state's timber resources are yet very large, though the drain in the past has been heavy. Decline in value need not follow decline in output. Closer utilization and preparation of the product for other markets, may more than make good all losses due to a smaller total output. This can be brought about by converting more of the rough lumber into finished product; that is, prepare it for markets which will pay more for it, and by that means sell a less quantity of forest products for more money. Farmers are learning to make more profit from a small tract of land by intensive cultivation than was realized from large tracts under the old way of growing one thing and selling it in the rough. Timber men can follow the same plan and do as well. Lumber sold as it comes from the sawmill is one commodity only; manufactured into furniture, boats, vehicles, finish, and the like, it becomes a number of products, each of which has a market of its own.

This study of the utilization of wood in Alabama was undertaken by the United States Forest Service in the hope that it would assist manufacturers and timber owners in the state in converting the wood into commodities which will be most profitable. The figures brought together and shown in the various tables should not be regarded as dry statistics, for each table tells a story of progress and success. It is an exhibit of diversified industries with the forest as the raw material and the finished products as the salable commodity. The census figures for 1910 (1,465,623,000 feet) show the timber converted in a year into lumber. The tables in this report show that nineteen industries in the state use 726,816,900 feet of rough lumber a year; and that 105,000,000 more is simply planed and is sold in that form, while the remainder is apparently disposed of in the rough form. About 36,000,000 of the 726,816,900 feet demanded by manufacturers is brought into Alabama from other states; and about 770,000,000 feet of lumber cut yearly in Alabama is used in the rough or is shipped outside the state for further manufacture.

It is a well-known economic principle that the community, region, or state which produces abundance of raw material and converts it into finished products ready for use, is more prosperous than the region which sends its half-finished product away from home to be completed. It is unnecessary to show by argument and figures the value of manufacturing concerns to a region; the facts are self-evident. Alabama is producing abundance of lumber, but about half of it is not being further manufactured in the state. Some of it, of course, is demanded for use in the rough form; but there is no reason why all necessary manufacturing can not be done in the state, thus employing home people, and keeping the money at home. Cheap power is abundant, and facilities for shipping the finished products are adequate.

WOODS USED IN ALABAMA.

Manufacturers in Alabama report the yearly use of thirty-eight woods, ranging in amounts from

484,130,000 feet for longleaf pine to 500 feet for cherry, and in average cost per 1,000 feet, delivered at the factory, from \$131.24 for mahogany to \$10 for basswood and sycamore. It is reasonably certain that several additional species are in use though not separately reported. Among the oaks, doubtless yellow oak (*Quercus velutina*) and water oak (*Quercus nigra*) are in use, for they are plentiful and of good form in some parts of the state. One birch is listed, but probably three at least are in use, the sweet birch (*Betula lenta*), yellow birch (*Betula lutea*) and river birch (*Betula nigra*). Several species of hickory are generally grouped as one; two cypresses bo-

tanically distinct are considered one at the sawmill; two or three elms grouped under a common name; hackberry and sugar berry are not distinguished apart, and doubtless other woods are grouped and given a common name, or else they may be lost sight of entirely in the lumber yard. It is not customary for lumbermen and manufacturers to distinguish as carefully between species as botanists do, nor, for practical purposes is it necessary to do so. However, each wood possesses an individuality of its own, and has certain qualities and characters which differ from those of all other woods, and it may be expected that as woods become more

valuable, and their fitness for specific purposes shall be more carefully studied, the custom of using them indiscriminately and without regard to their names, will gradually pass away. Perhaps not much change should be expected in the grouping and names of old familiar species; but a large number of less plentiful and less known woods are coming into use to meet special requirements or to take the place of woods which are becoming scarce. It will soon become necessary to apply names to these in order that the trade may intelligently handle them. Alabama has at least twice as many useful woods as are shown in Table 1 which follows:

TABLE 1.
SUMMARY OF KINDS OF WOOD USED IN ALABAMA.

Kinds of wood.		Quantity used annually		Average cost	Total cost	Grown in Ala-	Grown out of
Common name—	Botanical name—	Feet B. M.	Per cent.	per 1,000 ft.	f. o. b. factory	bama, per cent.	Ala., per cent.
Longleaf pine	<i>Pinus palustris</i>	484,130,000	66.61	\$11.92	\$5,770,692	93.92	6.08
Shortleaf pine	<i>Pinus echinata</i>	165,148,500	22.72	11.56	1,909,434	99.03	.97
Red gum	<i>Liquidambar styraciflua</i>	18,666,200	2.57	11.62	216,989	94.52	5.48
White oak	<i>Quercus alba</i>	12,380,800	1.70	20.14	249,674	95.25	4.75
Yellow poplar	<i>Liriodendron tulipifera</i>	12,275,500	1.69	15.59	191,409	97.60	2.40
Tupelo	<i>Nyssa aquatica</i>	7,932,000	1.09	10.23	81,159	97.35	2.65
Red oak	<i>Quercus rubra</i>	5,943,500	.32	18.91	100,504	94.83	5.17
Hickory	<i>Hicoria</i>	5,281,000	.73	21.03	111,055	99.34	.66
Loblolly pine	<i>Pinus taeda</i>	2,850,000	.39	11.86	33,800	100.00	.00
White ash	<i>Fraxinus americana</i>	2,330,500	.32	21.29	49,610	77.13	22.87
Cypress	<i>Taxodium distichum</i>	1,823,000	.25	15.05	27,430	88.21	11.79
Spruce pine	<i>Pinus glabra</i>	950,000	.13	14.71	13,975	68.42	31.58
Post oak	<i>Quercus minor</i>	860,000	.12	19.07	16,400	99.30	.70
Dogwood	<i>Cornus florida</i>	750,000	.10	14.20	10,650	60.00	40.00
Cuban pine	<i>Pinus heterophylla</i>	725,000	.10	11.26	8,162	100.00	.00
White elm	<i>Ulmus americana</i>	570,000	.08	14.89	8,490	100.00	.00
Evergreen magnolia	<i>Magnolia foetida</i>	515,000	.07	10.15	5,225	100.00	.00
Black gum	<i>Nyssa sylvatica</i>	486,000	.07	10.53	5,120	100.00	.00
Chestnut	<i>Castanea dentata</i>	485,000	.07	15.55	7,540	13.40	86.60
Cottonwood	<i>Populus deltoides</i>	481,500	.07	18.96	9,108	100.00	.00
Birch	<i>Betula</i>	375,000	.05	27.57	10,340	.00	100.00
Persimmon	<i>Diospyros virginiana</i>	326,000	.04	15.03	4,900	100.00	.00
Beech	<i>Fagus atropurpurea</i>	320,000	.04	10.36	3,315	96.88	3.12
Willow oak	<i>Quercus phellos</i>	259,000	.04	20.80	5,386	46.33	53.67
White pine	<i>Pinus strobus</i>	221,000	.04	41.27	9,120	.00	100.00
Mahogany	<i>Swietenia mahogani</i>	158,600	.03	131.24	20,815	.00	100.00
Sweet magnolia	<i>Magnolia glauca</i>	148,000	.02	11.10	1,643	100.00	.00
Red cedar	<i>Juniperus virginiana</i>	130,000	.02	23.46	3,050	61.54	38.46
Black walnut	<i>Juglans nigra</i>	62,500	*	36.64	2,290	.00	100.00
Pin oak	<i>Quercus palustris</i>	60,000	*	40.00	2,400	.00	100.00
Texas oak	<i>Quercus texana</i>	59,900	*	38.40	2,300	90.15	9.85
Hackberry	<i>Celtis occidentalis</i>	50,000	*	15.00	750	100.00	.00
Sugar maple	<i>Acer saccharum</i>	35,000	*	17.57	615	71.43	28.57
Basswood	<i>Tilia americana</i>	10,000	*	10.00	100	.00	100.00
Green haw	<i>Crataegus viridis</i>	9,900	*	15.00	150	100.00	.00
Sycamore	<i>Platanus occidentalis</i>	7,000	*	10.00	70	100.00	.00
Wild china	<i>Sapindus marginatus</i>	1,000	*	15.00	15	100.00	.00
Cherry	<i>Prunus serotina</i>	500	*	100.00	50	.00	100.00
Totals		726,816,900	100.00	\$12.24	\$8,893,735	94.99	5.01

*Less than 1/100 of 1 per cent.

Longleaf Pine.—In quantity this is by far the most important wood used by manufacturers in Alabama. It has needles longer than those of other pines associated with it; its sap is thinner in proportion to the heart wood than is that of any other pine; and in strength and stiffness it ranks among the best and above most other timbers of the state. It is one of the slowest growing pine of the South, and for that reason it is not likely to figure as much in future supply as some of its associates which grow faster, thereby producing a new forest in a shorter time. The original stands of this species are of fine form for lumber, they shade the ground so effectively that they suppress the seedlings of most other trees, and thus they have held their place for long periods of time in nearly pure forests. But when the old stand is removed by lumbermen, or is thrown by storm, and the sunlight enters, the longleaf seedlings are unable to maintain their place under the pressure of competition from more vigorous species (loblolly and Cuban pines in particular) and the former longleaf forest is gradually replaced by other kinds of trees. The encroachment of farms upon the longleaf forest, however, is doing as much as any other cause, or all other causes combined, to end the supremacy of the longleaf pine. The land where this tree is at its best is not the most fertile in the region, but it has been found well suited for root crops, and in many instances for orchards, and as the lumberman takes the pine off, the farmer and the fruit grower enter into possession. For this reason, and for the reason already stated, that the young longleaf pine is often unable to compete in the struggle with other species for possession, it may be expected that the cutting of this species will practically come to an end when the primeval forests have been removed. It has been and still is a most valuable resource, but its importance may be expected to decline in the future.

Shortleaf Pine.—Men engaged in the lumber business often group two or three pines under the name shortleaf. Loblolly and Cuban pine are liable to be

so classed, though botanically they are quite distinct species from the shortleaf (*Pinus echinata*). In Table 1 shortleaf stands next to longleaf in quantity and that is doubtless its proper rank in Alabama; but there is little doubt that much loblolly and Cuban pine have been reported as shortleaf. The needles of shortleaf pine are usually three to five inches long; those of loblolly six to nine inches; the Cuban eight to twelve inches, while those of longleaf pine are sometimes as much as eighteen inches in length, though usually considerably shorter. Shortleaf pine has thick sapwood, except in large and old trees. It grows rapidly during its first forty to sixty years, and more slowly afterwards. It reproduces vigorously, and quickly takes possession of openings in the forest. The wood is weaker and softer than longleaf, but for some purposes—notably for doors, frames and interior finish—it is preferred to longleaf by many, while for floors, beams and long, heavy timbers, longleaf usually gives better service. The shortleaf pine is found in practically all parts of Alabama, but is not equally distributed over the state, being scarcer in some localities than in others.

Loblolly Pine.—This pine shows a disposition to take complete possession of ground when it finds conditions favorable, such as abandoned farms, or tracts from which other forest trees have been removed. This is the tree which, within the past century, and particularly in the past fifty years, has occupied so much abandoned farm land in Virginia, North Carolina, and further south and west. It grows rapidly, and young trees, up to a foot or more in diameter, are largely sapwood. It is a large contributor to the lumber supply of the South, and the fact that less than 3,000,000 feet are credited to it in Alabama, as shown in Table 1, is pretty strong evidence that it has gone to market under some other name, most probably as shortleaf.

Spruce Pine.—In "Timber Pines of the Southern United States," by Charles Mohr, published in 1897, an apology for including this tree was thought nec-

essary; for it was considered of little or no commercial value at that time, and it was given place among the timber pines "in order to dispel for the future its confusion with some of these trees." The opinion concerning spruce pine held at that time has been much modified since; and though the species is not abundant, the lumber is considered excellent. Of all the southern pines, the wood of this tree has been pronounced the nearest approach to white pine. The tree grows rapidly; is nearly all sapwood until the trunk reaches maturity; and it thrives in the shade better than any of the pines with which it is associated. The wood is in demand for doors, sash and frames; it is white and clean, and holds its shape well. The tree's leaves are among the shortest of the pines. Charles Mohr, whose unfavorable opinion has been referred to, predicted that when forestry methods came into practice in the South, the spruce pine would be found worthy of attention.

White Pine.—This tree does not grow in commercial quantities in Alabama, and what is used comes from the Lake states or from the mountains of eastern Tennessee, Kentucky, or western North Carolina. A western wood (*Pinus ponderosa*) is making its appearance in some southern shops and factories under the name of white pine or California white pine. It belongs to the yellow pine group. It was not separately reported in Alabama.

Cuban Pine.—This valuable tree belongs to the southern yellow pine group and is much used, though it generally goes to market under some other name—sometimes as longleaf, occasionally as shortleaf, but more frequently as loblolly. The standing tree resembles longleaf, but the appearance of the wood—its thick sap and small heart—resembles loblolly. In strength it is little or not at all inferior to longleaf. The tree reproduces vigorously, spreading upon open land; it grows rapidly and comes to merchantable size much sooner than longleaf; and it promises to become one of the most important timber trees of the state. Judging from its geographical location in this country, the Cuban pine

seems to have spread northward through the peninsula of Florida into the adjacent regions further north, and it is still spreading rapidly by taking advantage of openings in the forests of other species, made by lumbermen.

Cypress.—Alabama is not a large producer of cypress when compared with Louisiana, Florida, Mississippi, and some other states. This tree thrives best in swamps, and Alabama has no large tracts of such land. Two species of cypress grow in this state, but they are so nearly alike that few recognize any difference between them.

Magnolia.—Two species of magnolia are in use—the evergreen and the sweet. The former is more abundant, the trees of greater size, the leaves are longer, and the flowers much larger, being from six to eight inches across; the sweet magnolia being only two or three inches. The wood of the evergreen magnolia bears some resemblance to yellow poplar, though the heart is often much darker; while the wood of the sweet magnolia (the heartwood) is a rich brown that polishes well, and when carefully selected and finished, it is one of the handsomest woods of the southern forests.

Red Cedar.—A very small part of the total cut of cedar in Alabama is shown in Table 1, because that represents only what passes through shops and manufacturing plants, while the bulk of the cedar is used for poles and posts. In northern Alabama the railroad yards are filled with cedar poles and posts, the former for telephone and telegraph lines, the latter for fences. Many are shipped to other state. Pencil manufacturers search so diligently for cedar that it is not unusual to see a train load of old cedar fence rails on the way to market, there to be converted into pencils. In some instances buyers of cedar build a new post and wire fence in exchange for the old cedar rails. This is a remarkable change from twenty-five years ago. There are two species of red cedar in Alabama, but they are so similar that few persons recognize the difference, and in the market no distinction is made. Red cedar holds its ground with remarkable vigor. If it were not such a slow-growing tree it would be one of the most valuable in this country. It is found in more than half of the United States, but it thrives best in the South. In a region extending from eastern Tennessee, northern Georgia, and eastern Kentucky to central and western Texas, it is not unusual to see this cedar in tens of thousands, taking possession of stony ridges, sterile hillsides, sandy flats, and steep ravines. Posts by millions are now cut from land where fifty or seventy-five years ago few cedars grew. This statement applies to a wider region than Alabama, but as much to that state as to any other. If left growing for a long period of years—a century or more—these cedars would attain a size fitting them for use in the manufacture of pencils, chests and furniture, but the ordinary land owner does not want to wait so long and he cuts his trees when they are large enough for posts and poles. The mature cedars that stood in old forests have nearly all been cut to meet demand in the past. Houses, barns, mills, bridges, and fences were formerly often built in part or wholly of cedar. That, of course, is no longer possible.

Hickory.—Seven or eight species of hickory are grouped as one in Alabama and are reported by manufacturers simply as hickory. That is the practice in all hickory regions, because it has been found impossible, or at least impracticable, to separate and distinguish between the different hickories. Among those growing in Alabama are bitternut, nutmeg, pecan, paleleaf, pignut, mockernut, shagbark, and water hickory.

Birch.—The remarks concerning hickory apply also to birch, except that fewer species are used in Alabama, and all that was reported came from outside the state. The birches which possess attractive color and grain, and for that reason are demanded for furniture and finish, consist principally of two species—sweet birch (*Betula lenta*) and yellow birch (*Betula lutea*). Both are northern trees, extending southward along the Appalachian Mountain ranges to North Carolina and Tennessee. Birch that is cut in the Lake States is usually yellow birch, though sweet birch is lumbered in that region also; while birch from Pennsylvania, Maryland, West Virginia, and neighboring regions is likely to be the sweet species, though yellow birch is cut also. Several other birches grow in the United States and are valuable for certain purposes, but the majority of them show little color, grain or figure in the wood. No one of them is reported for use in Alabama. The river birch (*Betula nigra*) grows in considerable abundance along the streams of that state and is doubtless put to use though not reported. It is a plain but substantial wood.

Yellow Poplar.—In addition to supplying its own shops and factories with nearly twelve million feet of yellow poplar, the state of Alabama is now exporting large numbers of poplar logs to Europe. The logs are stripped of bark to reduce weight and lessen the space they will occupy in the holds of vessels. This splendid timber tree reaches the southern

limit of its commercial range in Alabama.

Gum.—Table 1 lists the wood of three species of gum in Alabama, red, black and tupelo. Two other gums grow in the state and doubtless are made use of, though not reported. They are the water gum (*Nyssa biflora*) and sour tupelo (*Nyssa ogeche*).

The Oaks.—In Table 1 six oaks are listed, white, red, post, willow, pin and Texan. This separates the oaks into species, with the amount of each used, with as much accuracy as available information will allow; but its absolute accuracy is doubtful. It is reasonably certain that more than six kinds of oak are used by Alabama manufacturers, and it is probable that several were grouped under one or more names. Water oak, yellow oak, and live oak are fairly abundant in Alabama, yet do not appear in the table, while red oak (*Quercus rubra*) barely enters the northeastern corner of the state, yet it was largely reported. The most likely explanation is that some of the oaks, which do not appear under their own names, were reported as red oak. In compiling this report, the figures furnished by manufacturers were used, but an explanation is deemed necessary because of the various names by which the same oak may be known and reported. White oak and red oak are two general terms by which many lumbermen report oaks of various species. Those which have pointed-lobed leaves and ripen their acorns in two years are generally called red oak, and those with one-year acorns and round-lobed leaves are known as white oak. There are about fifty oaks in the United States, and at least one-third are found in Alabama. Among them are white oak, red oak, post oak, overcup oak, chestnut oak, chinquapin oak, cow oak, Durand oak, live oak, Texan oak, yellow oak, Spanish oak, black jack oak, water oak, shingle oak, and willow oak.

Dogwood.—This is not a timber tree as the term is usually understood, but is cut in considerable quantity and is usually bought and sold by the cord.

Elm.—Manufacturers reported the use of only one elm in the state, the white elm. That is the common and most abundant elm in the United States, and it grows in practically all the states east of the Rocky Mountains. Alabama has two other species of elm, both serviceable for manufacturing purposes, and doubtless both are in use. They are wing elm and slippery elm; the latter may be known by its mucilaginous inner bark, and the former by the flat keels on the twigs and sometimes on the large limbs and trunk of the tree. When this elm is not in leaf, the peculiar appearance of the flat twigs will not fail to attract attention.

Chestnut.—In Alabama the chestnut approaches the southern limit of its range.

Cottonwood.—This wood does not occupy an important place in Alabama, either as rough lumber or as a finished product. Only thirteen mills in the state cut it in 1910, while there were 110 in Mississippi, 126 in Arkansas and 300 in Missouri.

Persimmon.—The persimmon is not cut for general lumber but for special commodities, principally shuttle blocks, and golf sticks.

Mahogany.—The mahogany used in Alabama was grown in West Indies, Mexico and Central America. Another wood usually classed as mahogany and largely demanded by manufacturers of furniture and finish in this country comes from Africa.

Green Haw.—This wood is seldom reported by wood-using industries. It may reach eight or ten inches in diameter of trunk. The wood is light in color, resembling ironwood.

Wild Cherry.—This is not a foreign tree brought into this country, as its name might imply. It grows from Georgia to Arizona, but probably will never attain to any more importance in the timber supply than it now holds. It is sometimes called soap berry because substances extracted from the roots and the fruit have been used for soap. The true soap berry is a closely related species.

Hackberry.—This tree grows in practically all sections of the state, and is often bought and sold as ash.

Black Walnut.—A little black walnut is used in Alabama, but none of it is state-grown. This wood was once popular for many purposes, but it has lost some of its popularity in recent years. If it were demanded now in as large amounts as formerly, the price would be very high, for the wood is scarce, and no uncultured forests exist from which new supplies may be drawn.

Spanish Moss (*Dendropogon usenoides*).—This is not a wood, but as a product of the forest it is entitled to mention. It is gray in winter but light green in spring and summer, and hangs in long festoons from the branches of trees. It is most abundant in swamps, and on the flood plains of rivers. On dry uplands it is scarce or absent. In localities which, because of warmth and dampness, favor its growth, it frequently covers trees so completely that most of the branches are invisible. Although the growth has the appearance of moss, and is nearly always spoken of as such, it is not really a moss, but a plant of the pineapple family, and it bears leaves, flowers and fruit. It is not even a parasite, accord-

ing to the opinion of most botanists who have studied it; that is, it takes no substance from the tree on which it grows. It is an air plant, deriving its subsistence from the air and the rain and dew. It is propagated either by seeds or by small parts of a parent plant blown by wind against the trunk or branches of the tree. Small rootlets develop at first and secure the young plant in its new position by tying it to the tree's bark; but afterwards the rootlets disappear and the plant hangs on the tree much as clothes might hang across a line. It grows in strands and festoons which may attain a length of several feet, usually three or four, but occasionally more than ten.

Early settlers attempted to convert the moss into provender for farm stock, but with little success, though it was said that deer in winter would eat it. It has long been employed as filling for mattresses, cushions, and horse collars. It is prepared for such use by curing and ginning it, by which process the gray or green leaves and bark are removed, and a black thread-like material, resembling horsehair, remains. In late years another use for it has been found, and the market is said to be good. The moss is dyed bright colors, generally green or blue, and is sold for store decorations where woodland scenes are to be imitated. It is sent to market in crates or bales.

In Table 1 the third column of figures gives the average price paid at the factories for each of the species. Where the amount is large and the buyers many, the cost shown in the table may be accepted as representative but in some instances the amount of wood is rather small, and perhaps the whole quantity was purchased by two or three factories, and the cost may appear too high or too low. This may be explained by the circumstances under which the purchases were made. If the wood is wanted for a special purpose, none but a very high grade may answer, and the price will be unusually high. Or, if a very low grade will do, the cost may be unusually low. In some instances in Alabama black walnut was bought for less than twenty dollars a thousand feet. Without an explanation that price would seem ridiculous, but it becomes reasonable if it is stated that the purchase was in the log, and the logs were small, nearly all sapwood, and suitable only for boxes or some other common purpose. In Table 1, pin oak costs \$40 a thousand, Texas oak \$38.40, while red oak costs only \$18.91, and white oak \$20.17. On the face of it, the prices seem absurd for it is well known that ordinarily pin oak and Texan oak are not worth more than white and red oak. But the two latter woods were purchased in millions of feet each, and the costs are averages of many sales; while only a few thousand feet of pin and Texan oak were bought, and for particular purposes demanding extra high quality. The statistics as compiled for these tables in this report show what was actually reported by manufacturers. If in a few instances apparent inconsistencies are found in cost, they may generally be attributed to the smallness of the amount bought, or to the fact that it was of unusual quality or dimensions.

Planing-Mill Products.

This is very much the largest wood-using industry in Alabama, and accounts for eighty per cent. of all the wood reported. When the further fact that ninety-six per cent of all shown in Table 2 consists of two species, longleaf and shortleaf pine, is considered, the importance of these species becomes apparent. The principal commodities included in this industry are flooring, molding, ceiling, siding and other finish for interior and exterior of buildings. The average cost of the rough lumber when it reaches the planer is low, \$11.72; and its low cost is chiefly due to the fact that most of the operators of planing mills are owners of sawmills also, and the cost of the lumber is figured upon the price of stumpage (often for less than such stumpage can now be bought), the delivery of the logs to the mill and the sawing. Estimated in that way, the average cost is shown to be very low. In many cases, no profit is included and sometimes not even the depreciation of the plant.

A number of large mills in Alabama employ convict labor under contract with the state, paying \$25 to \$30 per man per month. The effect on production is apparent. The mills are kept going in dull seasons, for the expense goes on and must be met, with the result that overproduction is stimulated. In some of the Southern states, cotton planters are asked to reduce their acreage when there is danger of too much cotton being grown. The sawmills might adopt the same policy, but those who are under contract to pay for convict labor can not join the others in curtailing output, for the labor charges go on and must be earned by operating the plants. The sentiment among business men in some parts of the state is pretty strong that the state should employ its convicts upon public roads where their labor will be less likely to conflict with private enterprise, and sound business principles.

TABLE 2.
PLANING MILL PRODUCTS.

Kinds of Wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Longleaf pine.....	415,176,000	71.01	\$11.77	\$4,885,353	386,919,000	28,257,000
Shortleaf pine.....	146,164,500	25.00	11.42	1,669,509	145,164,500	1,000,000
Red gum.....	8,882,000	1.52	10.87	96,571	8,832,000	50,000
Yellow poplar.....	6,950,000	1.19	12.83	89,168	6,850,000	100,000
Loblolly pine.....	1,900,000	.32	11.63	22,100	1,900,000	.....
White oak.....	1,683,000	.29	17.79	29,933	1,516,000	167,000
Cypress.....	1,030,000	.18	15.09	15,540	1,015,000	15,000
Spruce pine.....	850,000	.15	15.26	12,975	550,000	300,000
Red oak.....	755,000	.13	16.08	12,140	588,000	167,000
Tupelo.....	500,000	.09	10.00	5,000	500,000	.....
Cuban pine.....	300,000	.05	10.83	3,250	300,000	.....
White pine.....	140,000	.02	45.00	6,300	.....	140,000
Black gum.....	100,000	.02	12.00	1,200	100,000	.....
Chestnut.....	85,000	.01	11.06	940	65,000	20,000
Sweet magnolia.....	74,900	.01	11.52	863	74,900	.....
White ash.....	31,500	*	12.38	390	1,500	30,000
Birch.....	20,300	*	34.48	700	.....	20,300
Beech.....	20,000	*	13.25	265	10,000	10,000
Basswood.....	10,000	*	10.00	100	.....	10,000
Sugar maple.....	9,800	*	24.49	240	.....	9,800
Sycamore.....	2,000	*	10.00	20	2,000	.....
Totals.....	584,684,000	100.00	\$11.72	\$6,852,557	554,387,900	30,296,100

*Less than 1/100 of 1 per cent.

Sash, Doors, Blinds and General Millwork.

Many commodities other than those named in the caption of the table are the products of this industry, though sash, doors, blinds and interior and exterior finish are the principal ones. The lathe plays an important part in this industry, and its output consists of spindles for grills, balusters for stairs and porches, and larger pieces such as columns, and newel posts. Brackets, pedestals and capitals are also among the usual products. As in Table 2, longleaf and shortleaf pine surpass in quantity all the other woods and together constitute over ninety-one per cent. of the total.

The average cost is low for an industry which turns out many products of high class, but the gen-

eral average is affected by the cheapness of the two largest items, longleaf and shortleaf pine. Sweet magnolia and black gum are the cheapest shown in Table 3. The first of these, when well selected and properly finished, is a very handsome wood, though it is little known. The rich brown of its heartwood will compare favorably with black walnut.

The yellow poplar's cost is so low as to suggest that most of the purchases were in log form, and even then its cheapness is not wholly accounted for. This wood and white pine usually range very nearly the same in price under similar circumstances; but here the pine's is more than four times the cost of the poplar. The latter was bought in small quantities, and the former in larger amounts.

TABLE 3.
SASH, DOORS, BLINDS, AND GENERAL MILLWORK.

Kinds of Wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Longleaf pine.....	47,195,000	70.08	\$12.94	\$ 610,713	46,100,000	1,095,000
Shortleaf pine.....	14,589,200	21.66	12.33	179,898	13,989,000	600,200
White oak.....	1,310,500	1.95	21.01	27,529	1,268,000	42,500
Yellow poplar.....	1,125,000	1.67	15.37	17,296	990,000	135,000
Red oak.....	1,087,500	1.61	16.34	17,775	1,080,000	7,500
Tupelo.....	1,057,000	1.57	11.48	12,134	847,000	210,000
Red gum.....	381,800	.57	12.62	4,820	381,800	.....
Cypress.....	358,000	.53	15.20	5,440	358,000	.....
Beech.....	100,000	.15	10.50	1,050	100,000	.....
Blrch.....	54,800	.08	48.17	2,640	.....	54,800
Sugar maple.....	25,200	.04	14.88	375	25,200	.....
White ash.....	25,000	.04	15.00	375	25,000	.....
Sweet magnolia.....	13,000	.02	10.00	130	13,000	.....
Mahogany.....	10,000	.01	160.00	1,600	.....	10,000
White pine.....	8,000	.01	65.00	520	.....	8,000
Black gum.....	6,000	*	10.00	60	6,000	.....
Black walnut.....	2,000	*	30.00	60	.....	2,000
Totals.....	67,348,000	100.00	\$13.10	\$882,415	65,183,000	2,165,000

*Less than 1/100 of 1 per cent.

Packing Boxes and Crates.

The boxes made in Alabama, and shown statistically in Table 4, are used chiefly for marketing the products of the orchard and truck garden, though egg cases were made in large numbers. The principal articles manufactured were hampers, grape baskets, berry boxes, cabbage crates, fancy boxes, and crates in which to ship smilax, holly, and moss. Fifty thousand feet of the cottonwood listed in the table was of the species known as swamp cotton-

wood. It is a wood less plentiful than the common cottonwood and is also in less demand which accounts for its low price. Black walnut at \$18 is cheap, even for logs, but the box makers probably made use of logs so small and containing so large a percentage of white sapwood that few other industries would buy them. The average cost of lumber as shown in Table 4, runs regularly not much above or below the average of \$10.89, the extreme range being from \$9 to \$18 for the fifteen species.

TABLE 4.
BOXES AND CRATES PACKING.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Red gum.....	8,517,000	37.95	\$11.80	\$100,525	7,585,000	932,000
Longleaf pine.....	6,450,000	28.74	10.00	64,500	6,450,000	.....
Tupelo.....	3,200,000	14.26	10.94	35,000	3,200,000	.....
Shortleaf pine.....	2,050,000	9.13	10.05	20,600	2,050,000	.....
Yellow poplar.....	810,000	3.61	12.16	9,850	810,000	.....
Evergreen magnolia...	500,000	2.23	10.00	5,000	500,000	.....
Cuban pine.....	300,000	1.34	9.00	2,700	300,000	.....
Cottonwood.....	200,000	.89	9.25	1,850	200,000	.....
Black gum.....	165,000	.74	9.00	1,485	165,000	.....
Spruce pine.....	100,000	.45	10.00	1,000	100,000	.....
White elm.....	60,000	.27	14.00	840	60,000	.....
Sweet magnolia.....	50,000	.22	10.00	500	50,000	.....
White ash.....	25,000	.11	14.00	350	25,000	.....
Black walnut.....	10,000	.04	18.00	180	10,000	.....
Sycamore.....	5,000	.02	10.00	50	5,000	.....
Totals.....	22,442,000	100.00	\$10.89	\$244,430	21,510,000	932,000

Car Construction.

Several railroads have repair shops in the vicinity of Birmingham and much of the wood shown in Table 5 is employed in car repair, and much is used for street-car building. In car construction, a large part of the lumber employed is in the rough form, that is, it has not been run through planers and other machines; but some of the material is carefully dressed and finished by skilled workmen. Eleven woods are employed in this industry, but two of them—black walnut and cherry—are in quite small amounts and are used as finish for passenger coaches. A large part of the white ash reported is for street-car finish and some of it for finish of passenger cars. Longleaf and shortleaf pine meet demand in many parts of car construction; sills, siding, decking, braces, and the like. White and red oak are employed for sills and other rough work where strength is required, and they also give good service as coach finish. Yellow poplar is an all-round car wood, but the best of it goes into finish, particularly into broad panels for passenger coaches. It may be successfully stained to imitate other woods. The excellent finish which it is capable of taking gives it a place which few other woods can fill, and for many years it has been considered one of the best woods for certain parts of car construction. Mahogany was the most expensive wood used, and it was made into finish for coaches.

Vehicles and Vehicle Parts.

Hickory is the most important wood in the vehicle manufacturing business in Alabama, as it is in all other parts of the United States. Half a dozen species of hickory are employed, but one name applies to all without distinction. A hickory log consists of thick, white sapwood and dark colored heart wood. Common opinion has long held that the sapwood is superior to the heartwood for vehicle construction. Tests made by the United States Forest Service a few years ago, however, demonstrated that the difference in quality between hickory heartwood and sapwood is less than had been generally supposed, and that, for certain purposes, the heartwood is as satisfactory as the sap. The wooden parts of small vehicles are often entirely of hickory, with the exception of the body or box; but such is less often the case with heavy wagons. For shafts, poles, spokes, rims, axles, double trees and single trees, hickory has no superior in the manufacture of buggies and carriages. Large wagons and carts substitute oak for some of these parts, and several oaks are suitable. The Alabama manufacturers reported white oak, red oak, Texan oak, post oak, pin oak and willow oak. The bodies of carriages and buggies and the beds of farm and business wagons are made of woods which are reasonably light, will take paint readily, will not split easily or warp badly in changes of temperature and weather, and which are not excessive in cost. Those most generally used in Alabama are yellow poplar, red gum, shortleaf and longleaf pine, and cottonwood. White ash, which is the most expensive wood reported in this industry, is made into bolsters, poles, sills, frames, and felloes. It is a strong, stiff wood. A large part of the total of more than 7,500,000 feet of vehicle wood reported in Alabama is used for repairs in small shops in all parts of the state. Some vehicles are made in shops of that kind. The larger establishments usually make semi-finished, rough-turned vehicle stock, and pass it on (generally sending it out of the state) to be finished and made into vehicles.

The discussion under Table 1 of cost of woods when bought in small amounts or for special purposes will apply to some of the woods of Table 6. Three oaks, at the bottom of the table, cost more per thousand than the average would have shown, had they been purchased in larger amounts. White ash at \$45.94 is the costliest wood reported in the vehicle industry. It is not usual for ash to be the most expensive wood in the vehicle industry, and in order to make comparisons between its cost in Alabama and in certain other states where similar studies have been made, the following average costs are given:

North Carolina.....	\$27.88
Illinois.....	36.23
Kentucky.....	37.00
Massachusetts.....	42.00
Alabama.....	45.94
Wisconsin.....	47.66
Maryland.....	51.00

This comparison conveys the impression that there is no regular price for ash. Maryland vehicle makers pay nearly twice as much as those of North Carolina, while Alabama and Wisconsin pay nearly the same. Nevertheless, there is usually a reason back of every price, but it is not always easy to find. It is pretty sure to depend on grades and dimensions a good deal more than on distances of transportation. For instance the Illinois makers of heavy wagons paid \$36.23 for their ash and the light wagon makers paid \$51.85.

TABLE 5.
CAR CONSTRUCTION.

Kinds of wood—	Quantity used annually.		Av. cost % per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.					
Longleaf pine.....	7,094,000	38.10	\$16.72	\$118,586	7,022,000	72,000
White oak.....	4,826,300	25.92	20.94	101,072	4,826,300	.....
Yellow poplar.....	2,471,000	13.27	20.97	51,805	2,411,000	60,000
Red oak.....	1,450,000	7.79	19.22	27,875	1,450,000	.....
Shortleaf pine.....	1,100,000	5.91	16.82	18,500	1,100,000	.....
White ash.....	963,000	5.18	23.29	22,425	910,000	53,000
Loblolly pine.....	450,000	2.42	17.67	7,950	450,000	.....
Mahogany.....	138,600	.74	129.62	17,965	.....	138,600
Cuban pine.....	125,000	.67	17.70	2,212	125,000	.....
Cherry.....	500	*	100.00	50	.....	500
Black walnut.....	500	*	100.00	50	.....	500
Totals.....	18,618,900	100.00	\$19.79	\$368,490	18,294,300	324,600

*Less than 1/100 of 1 per cent.

TABLE 6.
VEHICLES AND VEHICLE PARTS.

Kinds of wood—	Quantity used annually.		Av. cost % per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.					
Hickory.....	3,060,000	40.34	\$22.53	\$68,930	3,060,000	.....
White oak.....	1,405,000	18.52	26.60	37,370	1,279,000	126,000
Post oak.....	760,000	10.02	20.00	15,200	754,000	6,000
White elm.....	500,000	6.59	15.00	7,500	500,000	.....
Red oak.....	450,000	5.93	22.00	9,900	450,000	.....
Yellow poplar.....	320,000	4.22	35.31	11,300	320,000	.....
Red gum.....	250,000	3.30	25.00	6,250	250,000	.....
Shortleaf pine.....	200,000	2.64	17.00	3,400	200,000	.....
White ash.....	160,000	2.11	45.94	7,350	160,000	.....
Cottonwood.....	150,000	1.98	35.00	5,250	150,000	.....
Longleaf pine.....	149,900	1.98	16.34	2,450	149,900	.....
Willow oak.....	60,200	.79	43.19	2,600	54,200	6,000
Pin oak.....	60,000	.79	40.00	2,400	.....	60,000
Texan oak.....	59,900	.79	38.40	2,300	54,000	5,900
Totals.....	7,585,000	100.00	\$24.02	\$182,200	7,381,100	203,900

Excelsior.

The raw material for this industry is nearly all in the form of cordwood and longleaf pine constitutes nearly ninety per cent. of the total. There are only a few plants in the state; but their output is increasing and the manufacturers consider the

prospects very good for further development. As furniture and other industries increase, the excelsior output will be augmented. The excelsior makers use cheaper material than any of the wood users of the state which employ wood as a raw material. There is comparatively little waste.

TABLE 7.
EXCELSIOR.

Kinds of wood—	Quantity used annually.		Av. cost % per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.					
Longleaf pine.....	5,100,000	89.47	\$8.00	\$40,800	5,100,000	.....
Loblolly pine.....	500,000	8.77	7.50	3,750	500,000	.....
Cottonwood.....	100,000	1.76	9.00	900	100,000	.....
Totals.....	5,700,000	100.00	\$7.97	\$45,450	5,700,000	.....

Chairs.

The manufacturers of chairs are not usually makers of furniture in general, and for that reason chair making is often considered a separate industry. There are, of course, many kinds of chairs, and the processes and customs followed in manufacturing all are not the same; but in making stock for chairs standard sizes are more common than with other branches of furniture making. Some mills saw chair stock exclusively, such as backs,

bottoms, legs, and other parts. These parts are then shipped to the chair factory to be finished and the chairs completed. Oak, consisting principally of white and red, are reported in Alabama more largely than all other woods together—in fact, they amount to four times as much as all the others. It is probable that much of the wood reported as red oak is really yellow, Texan, and willow oak, since it all is state-grown, and the true red oak is very scarce in Alabama.

TABLE 8.
CHAIRS.

Kinds of wood—	Quantity used annually.		Av. cost % per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.					
White oak.....	2,000,000	39.91	\$14.99	\$30,000	2,000,000	.....
Red oak.....	1,999,800	39.91	15.00	30,000	1,999,800	.....
Hickory.....	210,000	4.19	11.67	2,450	200,000	10,000
White ash.....	201,000	4.01	10.05	2,020	201,000	.....
Red gum.....	200,300	4.00	10.00	2,000	200,300	.....
Beech.....	200,000	3.99	10.00	2,000	200,000	.....
Birch.....	199,900	3.99	10.01	2,000	.....	199,900
Totals.....	5,011,000	100.00	\$14.06	\$70,470	4,801,100	209,900

Boxes, Tobacco.

The material shown in Table 9 was used in the manufacture of cigar boxes. In most parts of this country the makers of such boxes draw largely from Spanish cedar brought from Cuba and other countries south of us, but in Alabama no Spanish cedar was reported. The red cedar in the table is the same as that used in making lead pencils, cedar chests, etc. Tupelo, the principal wood used, may be stained to imitate cedar, but the odor which is a valuable property of the cedar is not easily imitated when other woods are used. Tupelo, being a white wood, shows stenciling well.

Agricultural Implements.

A large amount of cotton ginning machinery is manufactured in Alabama, but other agricultural implements are made in a small way only. Considerable wood is used, however, in shops in all parts of the state where farm machinery is repaired. Blacksmith and wheelwright shops do most of the work of that kind. In the manufacture of ginning machinery, certain woods are preferred for specific purposes. White pine at \$40 a thousand is used for brushes; red gum and cottonwood are made into brush heads; yellow poplar is for pressers and feeders; white ash, white oak, and shortleaf pine

for pressers; and longleaf pine for frames and other parts.

The hickory which appears in Table 10 was demanded by shops which make repairs, but turn out little or no new machinery. Shortleaf pine and white oak also are used in repair work. The abundance of coal and iron in Northern Alabama, and the supply of suitable woods in many parts of the state would suggest that Alabama might profitably manufacture much of the farm machinery annually demanded in the state; but it does not appear that a serious beginning in that direction has yet been made.

Furniture.

Less than 2,000,000 feet of wood is made into furniture in Alabama yearly. That is a small amount for a state so rich in timber. There are single towns in Illinois, Michigan and Wisconsin that use more. Two million feet lacks much of being sufficient to supply Alabama's home market with plain furniture. The column in Table 11 which shows the average cost of the furniture woods used in the state is worthy of more than passing notice because the prices are remarkably low, not of one or two woods only, but of every one of the fourteen in the table. It is worthy of note, also, that ten of the fourteen woods and eighty per cent of the total quantity reported were cut in Alabama. The conclusion is logical that if furniture wood can be had in Alabama at an average cost at the factory of only \$13.90 per 1,000 feet, it ought to be possible to build up a large business in manufacturing furniture in that state. The prices paid for material by furniture makers in some of the other states, where furniture is manufactured in large amounts, show that Alabama offers decided advantages in the matter of cost of material. It ought to offer inducements in the matter of cheap and abundant power equal to those of any other state or region. Following are average prices paid for rough lumber by furniture manufacturers in some of the states:

North Carolina.....	\$18.23
Wisconsin.....	27.17
Massachusetts.....	28.36
Maryland.....	29.32
Kentucky.....	30.73
Illinois.....	34.49

A comparatively large amount of the raw material shown in Table 11 was bought in log form, which accounts in part for the low cost; but if the sawmill charges are added the cost is still below that in any of the states above listed. It would appear, therefore, that Table 11 suggests opportunities for the development of large business in furniture making in Alabama—cheap material to which should be added cheap power.

The woods listed in the table are all substantial. Four are oaks, all suitable for outside, visible parts of good furniture; longleaf pine is serviceable for all interiors of furniture and for cheaper kinds of outside work. Red gum, if skilfully worked, is one of the best furniture woods in the United States, and a great future is promised for it. Some of the species listed in the table belong in the class of cabinet woods, provided their beauties are brought out by skilled workmen and modern methods. Persimmon (the heartwood), and the two magnolias, particularly sweet magnolia, deserve places as such.

Handles.

White ash is the leading handle wood in Alabama, followed closely by hickory. The latter goes largely into ax, hammer, and pick handles; the former into handles for farm tools, such as hoes, shovels, rakes, and pitchforks. Yellow poplar, shortleaf pine, and red gum are reported as hoe-handle material, but the small quantity of each used seems to indicate that these woods are not entirely satisfactory for such handles. The cheapness of all the woods reported in this industry is due to purchases in the log form. No cause is shown why yellow poplar is the cheapest of the list, as it usually is an expensive wood.

Sporting and Athletic Goods.

The raw material for this industry is generally received at the factory in the form of bolts. Nearly all of the manufacturing output is semi-finished stock for golf sticks. The hickory goes principally into shafts, while the persimmon is generally turned into rough blocks for golf-stick heads. Only two or three individuals attempt to turn out a finished product and they only aim to supply local golf clubs. The hickory and persimmon stock is in great demand both at home and abroad and a large amount is shipped out of the state.

Shuttles, Spools and Bobbins.

The raw material for shuttles, spools, and bobbins is received at the factories in the form of bolts, and is often bought and sold by the cord. Dogwood and persimmon are manufactured into rough shuttle

blocks to be finished later and fitted for service in cotton and woolen mills. Formerly nearly all shuttles were made of Turkish boxwood, as it is the best known material for this service, but for more than twenty years the price of boxwood has been so high that the buyers of shuttles cannot afford it. The sapwood of dogwood and persimmon are the most satisfactory substitutes that have yet been found, though trials have been made of numerous other woods. The shuttle used in the power looms must stand violent jars as it is thrown back and forth in the process of weaving. Many woods which have been tried have splintered in a short time. Others wear rough and become useless. Still oth-

ers, because of softness, wear out too quickly and are rejected on that account. The usual shuttle is about seventeen inches long, and it is expected to give 2,000 hours of actual service. The shuttles are used in pairs and both must have nearly or exactly the same weight, or they can not do the work required. They must not be too heavy or excessively light. It is, therefore, not an easy matter to find all the required qualities in one wood. Though shuttles, spools, and bobbins are usually grouped as one industry, no spools and bobbins were reported in Alabama; but 50,000 feet of hickory was made into picker sticks which are employed in weaving to assist in throwing the shuttles back and forth.

TABLE 9.

BOXES, TOBACCO.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Tupelo	3,100,000	96.87	\$9.10	\$28,200	3,100,000	.....
Red cedar	100,000	3.13	20.00	2,000	50,000	50,000
Totals	3,200,000	100.00	\$9.44	\$30,200	3,150,000	50,000

TABLE 10.

AGRICULTURAL IMPLEMENTS.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Longleaf pine	1,100,000	43.65	\$20.00	\$22,000	1,100,000	.....
Shortleaf pine	1,000,000	39.68	16.90	16,900	1,000,000	.....
Yellow poplar	180,000	7.14	25.00	4,500	180,000	.....
Red gum	100,000	3.97	22.10	2,210	100,000	.....
White oak	60,000	2.38	35.00	2,100	20,000	40,000
White pine	30,000	1.19	40.00	1,200	.....	30,000
Cottonwood	20,000	.80	31.00	620	20,000	.....
Hickory	20,000	.79	40.00	800	20,000	.....
White ash	10,000	.40	35.00	350	10,000	.....
Totals	2,520,000	100.00	\$20.11	\$50,680	2,450,000	70,000

TABLE 11.

FURNITURE.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Longleaf pine	625,000	33.35	\$12.22	\$7,640	597,500	27,500
White oak	340,000	18.14	15.96	5,426	199,000	141,000
Yellow poplar	251,000	13.39	16.51	4,145	251,000	.....
Red oak	167,200	8.92	13.98	2,338	56,200	111,000
Willow oak	165,800	8.85	14.02	2,324	54,800	111,000
Post oak	100,000	5.34	12.00	1,200	100,000	.....
Red gum	55,000	2.94	11.36	625	55,000	.....
Hackberry	50,000	2.67	15.00	750	50,000	.....
Tupelo	50,000	2.67	11.00	550	50,000	.....
Persimmon	25,000	1.33	15.00	375	25,000	.....
Evergreen magnolia	15,000	.80	15.00	225	15,000	.....
Sweet magnolia	10,100	.54	14.85	150	10,100	.....
White elm	10,000	.53	15.00	150	10,000	.....
Green haw	9,900	.53	15.15	150	9,900	.....
Totals	1,874,000	100.00	\$13.90	\$26,048	1,483,500	390,500

TABLE 12.

HANDLES.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
White ash	915,000	53.04	\$17.87	\$16,350	465,000	450,000
Hickory	765,000	44.35	13.86	10,600	765,000	.....
Yellow poplar	15,300	.89	9.80	150	15,300	.....
Shortleaf pine	15,000	.87	10.00	150	15,000	.....
Red gum	14,700	.85	10.20	150	14,700	.....
Totals	1,725,000	100.00	\$15.88	\$27,400	1,275,000	450,000

TABLE 13.

SPORTING AND ATHLETIC GOODS.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Hickory	1,151,000	99.91	\$23.26	\$26,775	1,151,000	.....
Persimmon	1,000	.09	25.00	25	1,000	.....
Totals	1,152,000	100.00	\$23.26	\$26,800	1,152,000	.....

TABLE 14.

SHUTTLES, SPOOLS, BOBBINS, ETC.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost f. o. b. factory.	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Dogwood	750,000	68.18	\$14.20	\$10,650	450,000	300,000
Persimmon	300,000	27.27	15.00	4,500	300,000	.....
Hickory	50,000	4.55	20.00	1,000	25,000	25,000
Totals	1,100,000	100.00	\$14.68	\$16,150	775,000	325,000

Fixtures.

The manufacturers of fixtures pay more for the rough material which passes through their wood-working machines than is paid by any other manufacturers of wood commodities in Alabama. High-class lumber is demanded and much of it must be in extra wide pieces. Fixtures, as considered in this report, consist of counters and showcases for stores, bars for saloons, desks and counters for banks, cabinets and shelving for stores, partitions for offices, and certain kinds of furniture built in place and not intended to be moved about as ordinary furniture may be. The wood for counter and desk tops and for panels being frequently of unusual width, is often worked into the desired form by hand. It usually reaches the manufacturer in the rough form, but it has been carefully kiln-dried. Large cabinets, perhaps occupying the entire side of a store, are built by measure and in sections in the factory, and in that form they are taken to the place intended for them and are there set in position. They are too large to handle except in sections. No very cheap wood was reported in this industry in Alabama, but some, as black walnut, birch, and mahogany, cost much more than red gum, chestnut and pine. The beautiful and expensive woods are outside material that is visible in the finished articles, while cheaper and plainer woods go into braces, shelving, drawer bottoms, and other interior parts which ordinarily are not visible. Nearly one-third of the wood reported was not grown in Alabama.

Refrigerators and Kitchen Cabinets.

A few refrigerators are made, but nearly all of the material shown in Table 16 goes into equipment for the kitchen, the principal commodities being safes, tables, and shelving, and half of all the wood used is longleaf pine. Many articles are wholly made of this wood, but in others the shelving and other interior parts are of red gum, yellow poplar, and tupelo. The three oaks listed in the table were employed for outside parts in some of the better class articles made. Some of the red gum and yellow poplar was made into panels, and in some instances such panels were built up of thin sheets of veneer. The table shows that nearly all the wood employed in this industry was grown in Alabama, and that it was all purchased at a low price. It may be noted that ash is not reported in this industry. In most states it is an important wood in the manufacture of refrigerators and kitchen and pantry furniture.

Caskets and Coffins.

Few coffins and caskets are manufactured in Alabama, particularly the better and expensive kinds, but are shipped into the state from outside factories. The rough lumber listed in Table 17 was nearly all manufactured into boxes in which caskets are placed. Without this explanation, the table is misleading. The only woods made into coffins and caskets were longleaf and shortleaf pine, and cypress, the total amount being only 70,000 feet, not ten per cent of the whole quantity shown in the table. Woods reported in the coffin and casket industry are generally expensive, and their cheapness in Alabama is explained by the fact that most of that reported was manufactured into rough boxes. In rural communities many of the coffins in which the dead are buried are made by local carpenters and cabinet makers, and statistics covering that part of the business can not be collected and included in a report like this. In quantity chestnut is the leading wood in Table 17. It is the leading casket wood in many regions, for custom has given it the place, though there is no reason other than the demand of custom why chestnut should hold that position.

Ship and Boat Building.

The boat-building industry in Alabama is not large, considering the abundance of good timber that may be drawn upon, and the long lines of navigation which the rivers afford (about 1,500 miles). Mobile, with its fine harbor, is favored by nature as a ship-building point. The wild China which is reported in this industry in a small amount, is recommended as finish for yachts. It is not, however, a tree that promises any great development for its form is poor, and comparatively few trunks are of sufficient size to make even an indifferent saw log. The wood of different trees varies much in color and also in grain, the difference probably being due to the rate of growth. Wood of light color has much the appearance of ash, though if the growth has been slow the texture of the grain is not so coarse as that of ash. The popular belief that the tree came originally from China and has spread in this country does not appear well founded, for the species grows in a wild state from Georgia and Florida westward to Arizona and Northern Mexico. The tree is sometimes confused with the China tree (*Melia azedarach*), to which it bears as much resemblance in appearance as in name. All the wood used by Alabama boat builders grew in the state.

TABLE 15.
FIXTURES.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
White oak.....	500,000	49.02	\$25.00	\$12,500	450,000	50,000
Longleaf pine.....	200,000	19.61	22.50	4,500	200,000	.....
Birch.....	100,000	9.81	50.00	5,000	.....	100,000
Red gum.....	50,300	4.93	20.00	1,000	10,300	40,000
Chestnut.....	50,200	4.92	19.92	1,000	.....	50,200
Black walnut.....	50,000	4.90	40.00	2,000	.....	50,000
Yellow poplar.....	49,700	4.87	25.15	1,250	49,700	.....
Mahogany.....	10,000	.98	125.00	1,250	.....	10,000
Shortleaf pine.....	9,800	.96	18.06	177	9,800	.....
Totals.....	1,020,000	100.00	\$28.11	\$28,677	719,800	300,200

TABLE 16.
REFRIGERATORS AND KITCHEN CABINETS.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Longleaf pine.....	500,000	49.85	\$13.00	\$6,500	500,000	.....
Red gum.....	205,000	20.44	12.62	2,588	205,000	.....
White oak.....	156,000	15.55	14.38	2,244	134,000	22,000
Yellow poplar.....	50,000	4.99	20.00	1,000	50,000	.....
Red oak.....	34,000	3.39	14.00	476	12,000	22,000
Willow oak.....	33,000	3.29	14.00	462	11,000	22,000
Tupelo.....	25,000	2.49	11.00	275	25,000	.....
Totals.....	1,003,000	100.00	\$13.50	\$13,545	937,000	66,000

TABLE 17.
CASKETS AND COFFINS.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Chestnut.....	349,800	39.30	\$16.01	\$5,600	.....	349,800
Longleaf pine.....	225,200	25.30	13.14	2,960	225,200	.....
Cypress.....	225,000	25.28	14.44	3,250	25,000	200,000
White pine.....	40,000	4.50	20.00	800	.....	40,000
Red cedar.....	30,000	3.37	35.00	1,050	30,000	.....
Shortleaf pine.....	20,000	2.25	15.00	300	20,000	.....
Totals.....	890,000	100.00	\$15.69	\$13,960	300,200	589,800

TABLE 18.
SHIP AND BOAT BUILDING.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Cypress.....	210,000	41.10	\$15.24	\$3,200	210,000	.....
Longleaf pine.....	200,000	39.14	15.00	3,000	200,000	.....
White oak.....	100,000	19.57	15.00	1,500	100,000	.....
Wild china.....	1,000	.19	15.00	15	1,000	.....
Totals.....	511,000	100.00	\$15.10	\$7,715	511,000	.....

Woodenware and Novelties.

Table 19 represents the smallest industry in Alabama separately reported and tabulated. The output consists chiefly of pails and tubs made of black gum. A number of small commodities, grouped under the name "novelties" and made of longleaf pine complete the industry. In most states where wood-

using has been studied, woodenware includes washboards, ironing boards, bread boards, chopping bowls, vegetable cutters, pie platters, and many more, but in Alabama these articles are not reported. The state has much timber that might be worked into commodities which are widely used. The industry is in its first stages, but no reason is apparent why it may not expand to large proportions.

TABLE 19.
WOODENWARE AND NOVELTIES.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Black gum.....	200,000	65.57	\$10.00	\$2,000	200,000	.....
Longleaf pine.....	105,000	34.43	14.19	1,490	102,500	2,500
Totals.....	305,000	100.00	\$11.44	\$3,490	302,500	2,500

Miscellaneous.

Table 20 represents odd commodities in quantities too small to deserve mention as separate industries, but they are important and some of the items which are now small may in the future grow to represent valuable industries. The table includes the manufacture of mine rollers, tanks, mirror and picture

backs, patterns, picture frames and picture-frame molding, trunks and sample cases, show-window material, and street-sweeping compounds. White pine at \$100 per 1,000 feet is one of the highest-priced woods reported in the state. It is carefully selected from the best stock and is thoroughly seasoned. The cottonwood reported was in the veneer form and was used by trunk makers.

TABLE 20.
MISCELLANEOUS.

Kinds of wood—	Quantity used annually.		Av. cost per 1000 ft. f. o. b. factory.	Total cost	Grown in Ala., ft. B. M.	Grown out of Ala., ft. B. M.
	Feet B. M.	%				
Yellow poplar.....	53,500	41.80	\$17.66	\$945	53,500	.....
Hickory.....	25,000	19.53	20.00	500	25,000	.....
Black gum.....	15,000	11.72	25.00	375	15,000	.....
Cottonwood.....	11,500	8.99	42.43	488	11,500	.....
Red gum.....	10,100	7.89	24.75	250	10,100	.....
Longleaf pine.....	9,900	7.73	20.20	200	9,900	.....
White pine.....	3,000	2.34	100.00	300	.....	3,000
Totals.....	128,000	100.00	\$23.89	\$3,058	125,000	3,000

SUMMARY.

Table 21 is a recapitulation of the nineteen industry tables. It represents the same woods that are presented in Table 1, and the amounts are the same in both tables, but the presentation is different in tables 1 and 21. In the former table each one of the woods is put down according to species and the amount of that species is shown; in table 21 the figures are made out for the industries and without regard to species.

Percentage of Woods Used by Industries.

Some industries use much more of one wood than of another; no one uses all and some demand only two or three. Twenty-one species are found in planing-mill products, and no other industry demands that many. Occasionally an industry takes the whole quantity of a wood used in the state; for example, all of the basswood manufactured in Alabama went into planing-mill products; all the cherry in car construction; all the hackberry and green haw in furniture; and all the wild China in the construction of boats. Table 22 shows how the various woods demanded by manufacturers in Alabama are distributed among the industries.

Cost of Woods by Industries.

Table 23 is the companion or counterpart of table 22. The first shows how the species are apportioned among the industries, the second gives the cost of each wood to the industry that uses it. It is apparent from a glance at the table that all industries do not pay the same price for the same species. One may pay twice as much as another, but the cost is not governed by chance, for in all cases where great difference exists in the cost of a certain wood, satisfactory reasons may be found for it. One may buy the wood in the log; the other may demand it in the form of carefully selected kiln-dried lumber. One may want very high-grade material, another very low-grade. Red gum in the table shows ten average prices among as many industries, and yellow poplar eleven. Basswood, hackberry, green haw and wild china, which are used by only one industry each, have only one price each. A study of the table should make it clear that the prices of lumber in Alabama are not arbitrarily fixed by any man or set of men, but that every buyer purchases the kind he needs at the lowest price he can, and every seller disposes of the kind he has to the buyer who will pay most for it. The totals show nineteen average prices, no two industries paying the same.

Lessening Waste.

Of late years the problem of lessening waste has attracted serious attention in all industries that use wood as raw material for manufacturing. Considerable progress has been made toward the problem's solution, but much yet remains. While collecting statistics in Alabama for this report, all manufacturers who furnished information were asked to give their experience in reducing waste about their establishments. The replies made it plain that manufacturers are interested in this matter and that it is no new problem to them. Most of them have made progress toward its solution.

There are four general classes of wood waste:

First, that which occurs in the woods, and consists chiefly of tops of trees for which logs have been cut. Unnecessarily high stumps are in this class, also the needless destruction of small timber in getting out the merchantable sizes, and the abandoning of small and defective logs.

Second: The waste about the sawmill, consisting for the most part of slabs and sawdust. To this may be added the ends cut from boards to make them of even length.

Third: Waste at the factory. This consists of sawdust, shavings and small blocks and edgings cut from lumber in process of manufacture into finished commodities.

Fourth: The waste which results from the wrong use of wood—using more than need be or a better grade or more costly kind than is necessary.

Some of these wastes are unavoidable at times and under certain circumstances. No business man can be reasonably expected to save when saving costs more than wasting. As much as can be expected of any operator in the lumber business or in any line of manufacturing is to save whatever can be made to pay, and to study the situation to make sure that no opportunity to save is allowed to pass.

Woods Waste.—In favored localities in some of the northern states, hardwood distillation plants make a profit from defective logs and tree tops abandoned in the woods by lumbermen. What would otherwise be left to rot is converted into salable commodities, such as charcoal, acids, etc. This cannot be done in all places. Conditions must be favorable. Alabama's woods waste is largely pine, but it might be saved in the same way as hardwoods in the North. Reports, however, do not indicate that much progress has been made in saving it. Large

AVERAGE COST OF THE DIFFERENT KINDS OF WOOD USED BY EACH INDUSTRY.—TABLE 23.

Kinds of Wood—	Agricultural Implements	Boxes and crates	Boxes tobacco	Car construction	Caskets and coffins	Chairs	Excelsior	Fixtures	Furniture	Handles	Miscellaneous	Planing mill products	Refrigerators and kitchen cabinets	Sash, doors, blinds & genl millwork	Ship and boat building	Shuttles, spools, bobbins, etc	Sporting and Athletic goods	Vehicle & vehicle parts	Woodenware and Novelties
Basswood	10.00											10.00							
Beech						10.00						13.25		10.50					
Birch						10.01		50.00				34.48		48.17					
Black gum		9.00									25.00	12.00		10.00					10.00
Black walnut		18.00		100.00				40.00						30.00					
Cherry				100.00															
Chestnut					16.01			19.92				11.06							
Cottonwood	31.00	9.25					9.00				42.43							35.00	
Cuban pine		9.00		17.70								10.83							
Cypress					14.44							15.09		15.20	15.24				
Dogwood									15.00							14.20			
Evergreen magnolia		10.00							15.15										
Green haw									15.00										
Hackberry										13.86	20.00								
Hickory	40.00					11.67										20.00	23.26	22.53	
Loblolly pine				17.67			7.50					11.63							
Longleaf pine	20.00	10.00		16.72	13.14		8.00	22.50	12.22		20.20	11.77	13.00	12.94	15.00			16.34	14.19
Mahogany				129.62				125.00						160.00					
Persimmon									15.00							15.00	25.00		
Pin oak									12.00									40.00	
Post oak																		20.00	
Red Cedar			20.00	36.00															
Red gum	22.10	11.80				10.00		20.00	11.36	10.20	24.75	10.87	12.62	12.62				25.00	
Red oak				19.22		15.00			13.98			16.08	14.00	16.34				22.00	
Shortleaf pine	16.90	10.05		16.82	15.00			18.06		10.00		11.42		12.33				17.00	
Spruce pine		10.00										15.26							
Sugar maple												24.49		14.88					
Sweet magnolia		10.00							14.85			11.52		10.00					
Sycamore		10.00										10.00							
Texas oak																		38.40	
Tupelo		10.94	9.10						11.00			10.00	11.00	11.48					
White ash	35.00	14.00		23.29		10.05				17.87		12.38		15.00				45.94	
White elm		14.00							15.00									15.00	
White oak	35.00			20.94		14.99		25.00	15.96			17.79	14.38	21.01	15.00			26.60	
White pine	40.00				20.00						100.00	45.00		65.00					
Wild china															15.00				
Willow oak									14.02				14.00					43.19	
Yellow poplar	25.00	12.16		20.97				25.15	16.51	9.80	17.66	12.83	20.00	15.37				35.31	
Average cost	\$20.11	\$10.89	\$ 9.44	\$19.79	\$15.69	\$14.06	\$ 7.97	\$28.11	\$13.90	\$15.88	\$23.89	\$11.72	\$13.50	\$13.10	\$15.10	\$14.68	\$23.26	\$24.02	\$11.44

ference. It may also be finished to resemble oak, cherry, birch, maple and black walnut; and it is as durable and as handsome. The use of the substitute, which is plentiful and cheap, saves the small supply of woods scarce and costly. No one who is able and willing to buy the genuine is prevented from doing so; yet, if substitutes did not conserve the supply, the scarce woods would soon disappear, and no one could buy them. Substitution is in this case, therefore, a measure of conservation, for it puts plentiful woods into use and prolongs the small supply of costly woods; and it also brings fine articles within reach of the many and saves money for both the manufacturer and the buyer. In most cases the chief difference between a plain plentiful wood and a figured costly and scarce one, is beauty. In the costly wood, nature did the figuring, but man has learned the art of staining, shading, and graining some of the plain woods until he has equaled the best that nature has done in that line, and this has led to a wider use for some of the woods which we have in abundance, and is contributing much to the solution of one of our most vexatious waste problems. It never has been difficult to curtail the waste of costly woods, for men will save when there is money in it; but the hard problem has been and is to save the cheap and plentiful. If buyers cannot be found for them in their natural condition, it is economy to change and beautify them by science and art until they can enter the markets which formerly belonged exclusively to costly cabinet woods. Create a demand for a wood and its waste problem will disappear.

Forest Conditions.

The plow generally follows the lumberman in Alabama; that is, when the merchantable timber has been removed from a tract the land is cleared for agricultural purposes. This rule has many exceptions, however, and more in the hardwood region than where pine is the prevailing timber. When land is cleared for farms, it is out of consideration as a future source of lumber supply. In past time much farm land was exhausted by tillage, was abandoned, and some sort of forest growth took possession. That is not likely to occur in the future. Farmers are learning better than to wear their land out and abandon it. The timber of the future will come from lands not suitable for agriculture, rough tracts, swamps and poor soil. Land of that kind will grow timber nearly as well as any other. It may be expected that the owners of such land will see to it that the best-paying kinds of timber will have pref-

erence over poor kinds. Fast-growing, well-shaped species will be encouraged, and small, ragged kinds will not be. By following that method the yield per acre will be much increased. Up to the present time little attention has been given to matters of forestry in Alabama. The old stands have been cut, and if young trees can gain a foothold they have been permitted to do so; but not much has been done to assist the best species. A gradual change in this matter may be expected. One of the first and most needed steps will consist in better fire control so that vigorous seedlings will not be destroyed, and scrub growth enabled to take their place. All kinds of pine in Alabama grow from seeds only, not from sprouts; and if seedlings are destroyed and large trees have been removed, there can be no renewal of the pine forest and hardwoods—too often of a poor quality—will gradually take possession of the ground.

The establishment of woodlots has not yet taken much hold in Alabama. The woodlot is a piece of ground set apart on the farm for growing trees. Sometimes the trees are planted, but usually a natural stand is protected and allowed to grow. Such lots are an important source of lumber supply in some of the older states where the forests have been largely cut. It may be expected that Alabama farmers will soon give their attention to this matter and will see that the rough corners of their farms are set to work growing timber. Each must decide for himself what kinds will do best on his lands. In most cases loblolly pine will do well. It grows rapidly, and thrives in dense stands. Several of the oaks will pay. The willow oak is probably the fastest grower on land that suits it. Cottonwood increases in size rapidly and makes good lumber. On thin, rocky land, red cedar is probably the best tree to grow for fence posts; but on fertile land catalpa, osage orange (called mock orange) and locust might pay better.

DIRECTORY.

Below is a list of Alabama wood-using manufacturers who supplied the data contained in this report. Those manufacturing several products classified under different industries will appear in the list, with their addresses, under more than one industry.

Agricultural Implements.

Continental Gin Company, Birmingham.
W. T. Sisson, Tallahassee.

Boxes and Crates, Packing.

Randolph Lumber Company, Birmingham.
Keego Veneer Company, Brewton.
Martin Veneer Company, Brewton.
Bridgeport Woodenware Manufacturing Company, Bridgeport.
N. B. Hail & Sons, Decatur.
Jervis Lumber Company, Decatur.
Beavens-Jackson Lumber & Veneer Company, Evergreen.
Huntsville Fiber & Veneer Works, Huntsville.
Jerome H. Sheip, Mobile.
D. M. Wheeler, Mobile.
Southern Sash & Door Company, Montgomery.
J. H. Hibbie & Son, Piedmont.
Sylacauga Planing & Lumber Company, Sylacauga
Southern Climax Basket Company, Troy.
Troy Veneer & Crate Company, Troy.

Boxes, Tobacco.

Martin Veneer Company, Brewton.
Jerome H. Sheip, Mobile.
Jerome H. Sheip, Montgomery.

Car Construction.

Alabama Great Southern Railway, Birmingham.
Birmingham Railway, Light & Power Company, Birmingham.
Louisville & Nashville Railway, Birmingham.
Southern Railway, Birmingham.
T. H. Blake, Cortelyou.
W. R. Flowers Lumber Company, Dothan.
Twin Tree Lumber Company, Maplesville.
Western Railway of Alabama, Montgomery.
Lindsey Lumber Company, Poilard.

Caskets and Coffins.

Alabama Coffin & Casket Company, Birmingham.
Mobile Casket Company, Mobile.
Montgomery Coffin Company, Montgomery.

Chairs.

Block Spring Bed Company, Mobile.
Corinth Chair Company, Mobile.
I. B. Crowe & Sons, Wadley.

Dressed Stock.

Youngblood & Co., Adville.
James Moore, Aldrich.
Empire Lumber Company, Andalusia.

Allison Lumber Company, Bellamy.
Birmingham Railway, Light & Power Company,
Birmingham.
Kaul Lumber Company, Birmingham.
Lathrop Lumber Company, Birmingham.
Bridgeport Woodenware Manufacturing Company,
Bridgeport.

J. A. McKinney, Centerville.
Alexander & Simmons, China.
A. A. Jones, Columbia.
C. Arnold & Son, Cullman.
J. A. Blackwell, Deatsville.
A. D. Mills, Deatsville.
Enterprise Lumber Company, Dothan.
W. B. Perdue, Elba.
Florida & Alabama Land Company, Falco.
Himrod-McKay Lumber Company, Flatwood.
Coosa Lumber Company, Gadsden.
Tatom-Bonham Lumber Company, Geneva.
Star Lumber Company, Gordo.
Black Warrior Lumber Company, Knoxville.
Jackson Lumber Company, Lockhart.
Melrose Lumber Company, McShan.
Manchester Lumber Company, Manchester.
Durden Lumber Company, Maplesville.
The Robinson Land & Lumber Company, Mobile.
Elrod Lumber Company, Montgomery.
W. B. Coats, Myrtlewood.
Geo. M. Crump, Ohatchie.
Bay Point Lumber Company, Pinewood.
Lindsey Lumber Company, Pollard.
Henderson-Boyd Lumber Company, Richburg.
Simpson & Harper, Samson.
Jackson-Tinney Company, Talladega.
Roland G. Spearman & Co., Talladega.
Geo. Edgeworth & Sons, Vernon.
Vida Lumber Company, Vida.
Vinegar Bend Lumber Company, Vinegar Bend.

Excelsior.

Mobile Excelsior Works, Mobile.
D. M. Wheeler, Mobile.
J. F. George & M. C. Thomas, Webb.

Fixtures.

Hill & Horton, Mobile.
Cramton Lumber Company, Montgomery.
Montgomery Show Case Company, Montgomery.

Furniture.

Evans Bros., Birmingham.
The Southern Manufacturing Company, Birmingham.
Keego Veneer Company, Brewton.
Austin & Gentry Lumber Company, Coffee Springs.
The Dreher Manufacturing Company, Cullman.
W. R. Flowers Lumber Company, Dothan.
Stralton Bros., Greensboro.
Block Spring Bed Co., Mobile.
Hill & Horton, Mobile.
Opelika Lumber Company, Opelika.
Jackson-Tinney Company, Talladega.
W. E. Hanchey, Troy.
I. B. Crowe & Sons, Wadley.

Handles.

William Geisen Handle Mfrs., Cullman.
Alabama Hardwood Company, Montgomery.
E. S. Wittel & Son, Shortleaf.
S. J. Caldwell, Jr., Union Springs.

Miscellaneous.

Birmingham Railway, Light & Power Company,
Birmingham.
Birmingham Trunk Factory, Birmingham.
Keego Veneer Company, Brewton.
Evergreen Decorating Company, Evergreen.
Huntsville Fiber & Veneer Works, Huntsville.
Gilbert Trunk Company, Montgomery.
W. H. Cox, Stanton.

Planing-Mill Products.

James Moore, Aldrich.
John Moore, Aldrich.
Herzfeld Lumber Company, Alexander City.
Andalusia Manufacturing Company, Andalusia.
Empire Lumber Company, Andalusia.
A. Dishmon, Anniston.
L. N. & E. T. Downing, Anniston.
Houser Lumber Company, Anniston.
W. L. Little, Anniston.
H. C. Lynch, Anniston.
R. A. Berry, Arab.
The Athens Planing Mill Company, Athens.
Miller Ice & Lumber Company, Athens.
W. M. Carney Mill Company, Atmore.
J. A. Cullors, Auburn.
Whitewater Lumber Company, Autaugaville.
A. P. Wiggins, Babbie.
Central Lumber Company, Bessemer.
Acme Coal & Lumber Company, Birmingham.
Evans Bros., Birmingham.
Jenkins Lumber Company, Birmingham.

T. H. Johnston & Co., Birmingham.
Kaul Lumber Company, Birmingham.
Lathrop Lumber Company, Birmingham.
Peerless Lumber & Manufacturing Company, Birmingham.

Randolph Lumber Company, Birmingham.
Bentley Lumber Company, Brantley.
Cedar Creek Mill Company, Brewton.
Lovelace Lumber Company, Brewton.
J. A. McKinney, Centerville.
W. T. Smith Lumber Company, Chapman.
Alexander & Simmons, China.
R. S. McWilliams, Clairmount Springs.
J. W. Stanfield Lumber Company, Clanton.
Smith & Herlong, Clayton.
Austin & Gentry Lumber Company, Coffee Springs.
Kelly Planing Mill, Coffee Springs.
A. A. Jones, Columbia.
T. H. Blake, Cortelyou.
A. D. Mills, Deatsville.
Jervis Lumber Company, Decatur.
W. R. Flowers Lumber Company, Dothan.
A. D. Donaldson, Elba.
W. B. Perdue, Elba.
W. P. Windham, Elba.
Neal & Beatty, Elmore.
Arnold Lumber Company, Ensley.
Ensley Woodworking Company, Ensley.
W. W. A. Lumber Company, Ethridge.
Eufaula Lumber Company, Eufaula.
F. M. Deer, Evergreen.
Florida & Alabama Land Company, Falco.
H. H. Hitt Lumber Company, Falkville.
Himrod-McKay Lumber Company, Flatwood.
Acme Lumber & Manufacturing Company, Florence.

Richardson Lumber Company, Florence.
The Alger-Sullivan Lumber Company, Foshee.
Independent Lumber Company, Fremont.
The Scotch Lumber Company, Fulton.
D. B. Gantt & Bro., Gantt.
Garden City Hickory Company, Garden City.
Tatom Bonham Lumber Company, Geneva.
N. M. Rhodes Mill & Mercantile Company, Georgia.

J. R. Carr, Gordo.
G. B. Howard, Goshen.
Willcox Mill Company, Greggville.
Henry Kraeke, Guntersville.
Lammon & Sons, Hartford.
C. D. Martin, Jacksonville.
Bell & Hollman, Kennedy.
Black Warrior Lumber Company, Knoxville.
Frost-Sibley Lumber Company, Lamison.
Klondyke Lumber Company, Livingston.
Jackson Lumber Company, Lockhart.
Halladay Lumber Company, McShan.
Melrose Lumber Company, McShan.
Blacksher Company, Magazine.
Smith-McGowin Mill Company, Magazine.
Manchester Lumber Company, Manchester.
Twin Tree Lumber Company, Maplesville.
The Marbury Lumber Company, Marbury.
L. G. Cameron, Mobile.
Crichton Lumber Company, Mobile.
Dauphin Lumber Company, Mobile.
Dixie Lumber Company, Mobile.
The Robinson Land & Lumber Company, Mobile.
Verona Lumber Company, Mobile.
Cramton Lumber Company, Montgomery.
Elrod Lumber Company, Montgomery.
Enterprise Planing Mill Company, Montgomery.
Highland Park Lumber Company, Montgomery.
Mutual Lumber Company, Montgomery.
Hall-Leftwich Lumber Company, Murrison.
L. A. Stewart & Son, Moulton.
W. B. Coats, Myrtlewood.
Dickard Mill Company, New Brocton.
E. C. Payne Lumber Company, New Decatur.
C. P. Ward, Odenville.
Geo. M. Crump, Ohatchie.
Griffin Bros., Ohatchie.
Opelika Lumber Company, Opelika.
Paint Rock Planing Mill, Paint Rock.
Backey Creek Lumber Company, Pansey.
J. H. Hibble & Son, Piedmont.
Vredenburg Saw Mill Company, Pine Hill.
Bay Point Lumber Company, Pinewood.
T. M. Holley, Pink.
Miller-Brent Lumber Company, Poley.
Lindsey Lumber Company, Pollard.
The King Lumber Company, Prentice.
S. M. Long, Range.
N. J. Barton, Red Bay.
Geo. Binck, Red Bay.
L. F. Gober, Red Bay.
Manchester Lumber Company, Red Bay.
H. M. Pugh, Red Bay.
Henderson-Boyd Lumber Company, Richburg.
E. E. Jackson Lumber Company, Rlderville.
Horseshoe Lumber Company, River Falls.
Lathrop-Hatten Lumber Company, Riverside.
Frank Andrews, Samson.
Ewing Pine Lumber Company, Samson.
McGowin & Robbins Lumber Company, Samson.
Simpson & Harper, Samson.
Henderson Lumber Company, Sanford.

Scottsboro Planing Mill, Scottsboro.
Batterson & Plumley, Selma.
E. M. Byrne, Selma.
W. C. Dyer, Stanton.
Hauser & Wheeler, Stevenson.
Laubenthal Lumber Company, Sunflower.
Robert Edwards, Sylacauga.
R. L. Rumsey, Sylacauga.
Sylacauga Planing & Lumber Company, Sylacauga.
Jackson-Tinney Company, Talladega.
Roland G. Spearman & Co., Talladega.
J. V. Wallis & Co., Talladega.
D. W. Boatright, Tallassee.
Thomaston Lumber Company, Thomaston.
Thomasville Manufacturing, Electric Light & Power Company, Thomasville.
Cochran Lumber Company, Toinette.
W. E. Hanchey, Troy.
Strickland Bros. Machine Company, Tuscaloosa.
Tuscaloosa Lumber Company, Tuscaloosa.
Turner & Baker, Vernon.
Vida Lumber Company, Vida.
Vinegar Bend Lumber Company, Vinegar Bend.
I. B. Crowe & Sons, Wadley.
McClure Lumber Company, Wagar.
Tinney Lumber Company, Waldo.
I. P. O. Wharton, Wilsonville.
Geo. N. & J. M. McDonald, Winfield.
E. W. Gates Lumber Company, Yellow Pine.

Refrigerators and Kitchen Cabinets.

The Southern Manufacturing Company, Birmingham.
The Dreher Manufacturing Company, Cullman.
Stralton Bros., Greensboro.

Sash, Doors, Blinds and General Millwork.

Lindsey & Shiffet, Adamsville.
Herzfeld Lumber Company, Alexander City.
Houser Lumber Company, Anniston.
The Athens Planing Mill Company, Athens.
Attalla Lumber Company, Attalla.
J. A. Cullors, Auburn.
Whitewater Lumber Company, Autaugaville.
Evans Bros., Birmingham.
Jenkins Lumber Company, Birmingham.
Kingston Planing Mill Company, Birmingham.
Peerless Lumber & Manufacturing Company, Birmingham.
Randolph Lumber Company, Birmingham.
Cedar Creek Mill Company, Brewton.
Austin & Gentry Lumber Company, Coffee Springs.
Cullman Lumber Company, Cullman.
Jervis Lumber Company, Decatur.
Cureton Sash & Door Company, Dothan.
W. R. Flowers Lumber Company, Dothan.
Arnold Lumber Company, Ensley.
F. M. Deer, Evergreen.
Acme Lumber & Manufacturing Company, Florence.
Houghton Column Company, Florence.
Richardson Lumber Company, Florence.
Garden City Hickory Company, Garden City.
Stralton Bros., Greensboro.
G. A. Plummer, Huntsville.
C. D. Martin, Jacksonville.
Bell & Hollman, Kennedy.
Dauphin Lumber Company, Mobile.
Hieronymous Dock & Lumber Company, Mobile.
Hill & Horton, Mobile.
Mobile Column Company, Mobile.
F. C. Turner & Co., Mobile.
Verona Lumber Company, Mobile.
S. Y. Bocacki, Montgomery.
Cramton Lumber Company, Montgomery.
Enterprise Planing Mill Company, Montgomery.
Highland Park Lumber Company, Montgomery.
J. H. Brewer, Moulton.
W. A. Andrews, Opelika.
Opelika Lumber Company, Opelika.
Ozark Hardware & Lumber Company, Ozark.
Paint Rock Planing Mill, Paint Rock.
Butts Lumber Company, Phoenix.
S. M. Long, Range.
J. C. Hannah & Sons, Reform.
Lathrop-Hatten Lumber Company, Riverside.
Batterson & Plumley, Selma.
Dallas Lumber Company, Selma.
A. E. Reimer, Selma.
Schuh-Mason Lumber Company, Selma.
Sheffield Hub & Column Company, Sheffield.
N. C. Dyer, Stanton.
Hauser & Wheeler, Stevenson.
W. T. Sisson, Tallassee.
Thomasville Manufacturing, Electric Light & Power Company, Thomasville.
W. E. Hanchey, Troy.
Tuscaloosa Column Company, Tuscaloosa.
Tinney Lumber Company, Waldo.

Shuttles, Spools, Bobbins, Etc.

J. W. Reece, Decatur.
Hallett Manufacturing Company, Mobile.
Alabama Hardwood Company, Montgomery.

Sporting and Athletic Goods.

J. W. Reece, Decatur.
Hallett Manufacturing Company, Mobile.
Innis Golf Club Company, Montgomery.

Vehicles and Vehicle Parts.

Hale Buggy Company, Anniston.
Cruse & Coleman, Birmingham.
Jervls Lumber Company, Decatur.
H. H. Hitt Lumber Company, Falkville.
Florence Wagon Works, Florence.
Garden City Hickory Company, Garden City.
Globe Carriage Works, Montgomery.
J. H. Hibble & Son, Piedmont.
The Selma Spoke Company, Selma.
Sheffield Hub & Column Company, Sheffield.
M. R. Campbell, Stevenson.
J. F. Mitchell, Stevenson.
D. W. Boatright, Tallassee.

Woodenware and Novelties.

Andalusia Manufacturing Company, Andalusia.
Randolph Lumber Company, Birmingham.
W. R. Flowers Lumber Company, Dothan.

USES OF WOOD.

Manufacturers and others in Alabama report uses for the different woods as follows:

Basswood.

Balusters, blinds, cabinets, casing, doors, interior finish, mantels, sash, shelving, stairwork, trams.

Beech.

Chairs, door frames, drawer slides and bottoms, finish, flooring, interior finish, siding, window frames.

Birch.

Ceiling, chairs, doors, fixtures, flooring, interior finish, magazine racks, music cabinets, partition, sash.

Black Cherry.

Baseboards, bookcases, ceiling, coaches (passenger), furniture, hat racks, interior finish, molding, partition, stands, tables.

Black Gum.

Boxes (packing), crates (berry), finish, grape baskets, interior trim, mine rollers, novelties, palls, tubs, woodenware.

Black Walnut.

Chests, china closets, drug cabinets, fancy boxes, finish, fixtures, kitchen cupboards, showcases, stairwork.

Chestnut.

Cars (freight), ceiling, coaches (passenger), doors, interior trim, mantels, molding, partition, sash.

Cottonwood.

Baskets, box covers, boxes (packing), brush heads, excelsior, ginning machinery, sample cases, trays, trunks, vehicle parts.

Cuban Pine.

Boxes, cars (freight), ceiling, coaches (passenger), flooring, interior finish, peach crates, siding.

Cypress.

Boats, boxes (packing), caskets, chair rounds, coffin boxes, columns, interior finish, chips (outside trim), silos, tanks, vats.

Dogwood.

Bobbins, golfshaft heads, shuttles, splndles, spools.

Evergreen Magnolia.

Bookcases, chairs, desks, furniture, hat racks, stands, tabourets, umbrella stands.

Green Haw.

Chair rounds, furniture stock, lawn furniture, racks, rustic chairs, stands, table legs.

Hackberry.

Furniture backs, lawn furniture, racks, rakes, rustic chairs, stands.

Hickory.

Axles, buggy poles, chairs, doubletrees, farm implements, felloes, gearing, golfstick shafts, handles, pickersticks, reaches, rims, singletrees, spokes, sucker rods, sweeping fiber, tool handles, vehicle stock.

Loblolly Pine.

Agricultural implements, boxes, cars (freight), cars (railroad), ceiling, coaches (railway), excel-

sior, finish, flooring, interior trim, kitchen safes, molding, newels, porch posts, sash, shiplap, siding, wagon boxes.

Longleaf Pine.

Boats, boxes, buffets, cabinets, cars (railroad), china closets, coaches (railway), coffins, columns, crates, doors, engine parts, excelsior, fixtures, flooring, furniture, gin machinery, interior finish, kitchen safes, mantels, medicine cabinets, novelties, sash, school desks, ships, sideboards, siding, tables, turned stock, wagon boxes, woodenware.

Mahogany.

Cabinets, coaches (passenger), finish, fixtures, interior trim, magazine racks, music cabinets, street cars.

Persimmon.

Bobbins, golfstick heads, shuttles, spindles, spools.

Pin Oak.

Bolsters, felloes, gearing, poles (wagon), spokes, vehicle stock.

Post Oak.

Buggies, chairs, furniture, hubs, vehicle stock, wagon poles.

Red Cedar.

Boxes (clothes), boxes (fancy), boxes (tobacco), cabinets, chests, china closets, faucets, novelties, sideboards, wardrobe shelves.

Red Gum.

Agricultural implements, baskets, beds, boxes, brush heads, bureaus, ceiling, chairs, crates, desks, dressers, egg crates (tops and ends), finish, fixtures, flooring, furniture, gin brush ribs, gins, grape baskets (tops and ends), hampers (clothes), handles, kitchen safes, mine rollers, partition, shooks, siding, tables, wagon boxes.

Red Oak.

Car construction, ceiling, coaches, counters (store), engine repairs, flooring, interior finish, newels, porch posts, siding, vehicles.

Shortleaf Pine.

Boxes (packing), cars (railroad), caskets, ceiling, coaches (railway), columns, cornices, cotton gins, crates (tops and bottoms), doors, fixtures, flooring, handles, interior finish, molding, partition, sash, siding, turned stock, vehicles, wagon boxboards.

Spruce Pine.

Baskets, boxes, ceiling, crates, flooring, interior finish, panels, partition, siding.

Sugar Maple.

Baseboards, cabinets, ceiling, columns, finish (interior), flooring, handles, mantels, molding, panels, partition, siding.

Sweet Magnolia.

Boxes (berry), crates (berry), furniture, grape baskets, interior finish, racks.

Sycamore.

Boxes (packing), crates, flooring, interior finish, shooks.

Texan Oak.

Felloes, gearing, hubs, wagon poles.

Tupelo.

Beds, boxes (packing), boxes (tobacco), columns, dressers, egg crates (sides and bottoms), finish, flooring, furniture backs, kitchen cabinets, mantels, novelties, panels, refrigerators, safes, tramways.

White Ash.

Box ends, cars, chair legs, engine parts, gin machinery, handles, poles, vehicle stock.

White Elm.

Baskets, boxes, crates, furniture stock, hampers (clothes), hubs, packing (fruit), trunk slats, vehicle stock.

White Oak.

Agricultural implements, axles, bank fixtures, beds, boats, bolsters (wagon), brackets, cabinets, cars, casing, ceiling, chairs, coaches (railway), columns, cornices, cots, desks, doors, doubletrees, dressers, felloes, finish fixtures (office) fixtures (store), flooring, gearing, gin machinery, mission furniture, panels, partition, poles (wagon), safes, sash, ships, siding, single trees, spokes, stands, tables, vehicle stock.

White Pine.

Agricultural implements, blinds, cabinets, caskets, columns, doors, flooring, interior finish, sash, turned stock.

Wild China.

Boat finish, interior trim, laundries, lawn furniture, novelties.

Willow Oak.

Furniture, kitchen safes, panels, partitions, stands, tables.

Yellow Poplar.

Agricultural implements, bed slats, box ends (fruit), boxes (packing), brackets, cabinets, cars, ceiling, china closets, coaches (railway), colonial columns, cots, desks (drawer bottoms), doors, finish, fixtures, flooring, furniture, gins (feeders and pressers), handles, kitchen safes, mirror backs, molding, partition, pins, sash, scrolls, shelves, stairs, trunk trays, wagon (boxboards).

APPENDIX.

The Bureau of the Census, in co-operation with the Forest Service, collects and publishes year by year statistics showing the output of lumber, lath, shingles, cooperage, veneer, and certain other forest products in the United States and in the separate states. That work is independent of the studies of the manufactures which the Forest Service has made in several of the states. The latter supplements the former, and care is taken that work done by the Bureau of the Census, is not duplicated. The Forest Service begins where the Census leaves off—after lumber leaves the sawmill. There are certain products which are in their finished form when they appear in the Census figures, and for that reason they are outside the scope of the Forest Service's study, because they are not subject to further manufacture. If, however, a state's wood-using industries are to be fully presented, it becomes necessary to include some of the census statistics. Such is one of the purposes of this appendix. The figures which the census gives are for all states, but such only as relate to Alabama are here presented and in condensed form.

The statistics are for the year 1910, which are the latest available.

Alabama's cut of shingles for that year was 142,810,000, principally of cypress and pine, and of an average value of \$2.86 per thousand at the mill.

Lath were manufactured to the number of 40,982,000 and of the value of \$1.88 per thousand at the mill. Waste, consisting of slabs and defective logs, is largely worked into lath, and various woods are taken, but in Alabama the yellow pines constitute most of this material.

Nearly 27,000,000 feet (log measure) of veneer is made yearly in Alabama, for various species of wood, but most of it is yellow pine, red gum, tupelo, magnolia and cottonwood. Expensive hardwoods, such as white and red oak, black walnut and mahogany, are the materials of which the highest classes of veneers are made. There are three methods of manufacturing the commodity: rotary-cut, sawed and sliced. Most of it in Alabama is rotary-cut. A log a few feet long is placed in a lathe and is turned rapidly against a strong knife which peels off a thin ribbon of wood the length of the log, round and round until the log is cut down to a small central piece called the core. The part sliced off may consist of one piece probably one hundred feet long, resembling a bolt of cloth. It is usually about as thick as a sheet of pasteboard. The veneer thus cut is made into small boxes, crates and baskets for shipping fruits and vegetables; or, if it goes to a furniture factory, it is made into panels or other pieces by gluing several sheets one upon another until the desired thickness is obtained. Sometimes a thin sheet of veneer is glued upon a thick piece of some other wood, and the veneer becomes the visible outer part. Much furniture and interior finish is made in that way. The finished article appears to be solid wood, but it really is a thin layer of outside veneer upon some cheaper wood. This cheaper wood, which is concealed by the veneer glued upon it, is called "backing" or "core." The word "core" has, therefore, two meanings when used in connection with veneer. It may mean the wood upon which the veneer is glued, or it may mean the central remnant of a log from which veneer has been cut by the rotary process.

Some veneers are sawed much as ordinary lumber is cut on a sawmill, but special machinery is used. The most important part is the extra thin saw which cuts the veneer with the least possible waste in sawdust. Veneer of this kind is generally made from valuable, well-seasoned hardwoods, while rotary-cut veneer is made from logs, generally in the green state, and usually steamed to soften them. The rotary-cut veneer is often in sheets several feet wide and many yards long; but the sawed veneer is generally less than a foot in width, and runs about like ordinary lumber in length. The sawed product

often shows the grain of the wood—quarter-sawed if the wood permits it. Sliced veneer is cut from the side of the log, like that which is sawed, but a knife is used in place of a saw, and the machine by which the slicing is done is very strong and rigid. One of the advantages of slicing over sawing is that the slice wastes no sawdust.

Annual Lumber Cut.

The cut of lumber in Alabama, by species, in 1910, was as follows:

Yellow pines	1,322,950,000
Oaks	67,485,000
Yellow poplar	26,701,000
Red cedar	13,693,000
Red gum	10,541,000
Tupelo	6,227,000
Hickory	5,079,000
Cypress	3,340,000
Maple	2,231,000
Ash	2,146,000
Cottonwood	1,683,000
Chestnut	637,000
Elm	561,000
Beech	497,000
Basswood	461,000
Black walnut	332,000
Sycamore	207,000
Birch	7,000
All others	870,000

Softwood Distillation.

One-third of all the softwood distillation in the United States in 1910 was in Alabama. Four large plants consumed 64,963 cords of wood. This does not include a little charcoal burning in old-style pits in various parts of the state. Pits of that kind make charcoal only and other products are wasted. The modern distillation plant saves a number of products. Two processes are in use, known as "steam distillation" and "destructive distillation." In the former, the turpentine and heavy oils of pine are forced from the wood by subjecting it to the action of hot steam. The wood is not converted into charcoal by that process. "Destructive distillation" is so called because it destroys the wood, and converts it into turpentine, tar and charcoal. Dry heat is the agent of destruction. In Alabama the longleaf pine is most used in distillation, but shortleaf and Cuban pines are profitable in this industry. There is much difference in the yield of different woods. Only one-half of the material employed in the distillation processes is "body wood" logs. The rest is what otherwise would be wasted, such material as sawdust and edgings.

The collection of resin from standing trees is not included in the statistics of wood distillation. The resin is drawn from the trees by wounding the bark and outer layers of wood while the tree stands. The old way—still largely in use—was to cut a deep notch in the tree (often two or more notches) called a box; the bark and some of the wood was then cut away above, and the resin exuded from the wounded

wood and ran down into the box, from which it was collected from time to time. A new method is coming into use, by which the tree is less severely injured. No box is cut in the trunk, but the bark is removed over a small space, and a tin "gutter" or "apron" is applied to collect the resin and lead it to a tin or other receptacle. At the present time in Alabama about five trees are worked by the old process to one by the new. In 1909 the state produced 2,840,000 gallons of spirits of turpentine, and 310,000 barrels of rosin. The rosin is what is left over, when the spirits of turpentine have been separated by distillation. The substance as it exudes from the tree is resin. The stills ordinarily used are simple apparatus, and no special scientific knowledge is needed to operate them. In the whole United States the output in 1909 of spirits of turpentine was 28,989,000 gallons, and of rosin 3,264,000 barrels. Most of it is produced in the southern states. Alabama's output both of spirits of turpentine and of rosin is declining. Other states are declining also, owing to the depletion of large areas of longleaf pine forests.

Cooperage.

Alabama in 1909 produced 12,978,000 tight cooperage staves; that is, staves for barrels and kegs which are meant to contain liquids. Its output of staves for slack cooperage (barrels and kegs not meant to contain liquids) was 14,977,000, all of which were pine. Four million sets of pine heading were produced, and an equal number of hoops.

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UNIVERSITY OF CALIFORNIA

The Wood-Using Industries of Mississippi

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The Wood Using Industries of Mississippi.

Bureau of Wood Utilization of Forest Service Makes Complete Report Showing Wonderful Resources of State and Necessity for Additional Lumber Consuming Factories Near to Sources of Raw Material.

NOTE.

The following report was compiled by C. W. Gould, Forest Agent, and Hu Maxwell, Expert, under the direction of H. S. Sackett, Chief, Office of Wood Utilization, Forest Service, United States Department of Agriculture. It is published and thus made available to the public through the courtesy of the LUMBER TRADE JOURNAL, New Orleans, Louisiana.

CONTENTS.

	Page
Introduction	19
Kinds of wood used.....	20
The pines	20
Longleaf pine	20
Shortleaf pine	20
Loblolly pine	20
Cuban pine	20
Cypress	21
The oaks	21
White oaks	21
Post oak	21
Cow oak	21
Overcup oak	21
Chinquapin oak	21
Durand oak	21
Live oak	21
Red oaks	21
Red oak	21
Texan oak	21
Yellow oak	21
Turkey oak	21
Spanish oak	21
Water oak	21
Willow oak	21
Black jack and blue jack.....	22
The hickories	22
Pecan	22
Bitternut hickory	22
Nutmeg hickory	22
Water hickory	22
Mockernut hickory	22
Shagbark hickory	22
The gums	22
Black gum	22
Red gum	22
The elms	22
White elm	22
Slippery elm	22
Cedar elm	22
Wing elm	22
Other woods	22
Industries	22
Planing-mill products	23
Boxes and crates.....	23
Furniture	24
Vehicle and vehicle parts.....	24
Sash, doors, blinds, and general millwork..	24
Handles	25
Agricultural implements	25
Fixtures	25
Miscellaneous	26
Summary by industries.....	26
Future supply of timber.....	26
Woods apportioned among industries.....	27
Average cost of woods in the industries....	27
Additional statistics	27
Mississippi's lumber cut.....	27
Cooperage	27
Veneer	27
Turpentine	28

INTRODUCTION.

The greatest length of Mississippi is 332 miles, greatest width 189, and area 46,810 square miles, of which 470 square miles are water. Its width along the gulf coast is eighty-five miles.

The state's surface consists of swamp land, prairie, and hills, but at no point is the elevation much above 800 feet, and a considerable portion of it is only a few feet above sea level. The most elevated region lies in the northeastern part of the state, and the lowest along the gulf coast. The central and the northeastern regions contain the prairie; along the Mississippi river are bluffs ranging in height up to 500 feet, but usually not so high; while in what is known as the Delta region is much land subject to occasional overflow when the Mississippi reaches flood stage in the early spring. The general surface of the state, however, is undulating and

hilly. In some parts of it the soil is very deep, sandy and loose, and where ravines cut into it, washing and erosion are apt to be great. One of the problems which the people are called upon to meet is the checking of this erosion. It seems to be worse in abandoned lands which were long cultivated and then left comparatively bare and unprotected against the impact of heavy rains and the cutting power of torrents. This trouble is not serious in the low, flat, swamp regions. The small amount of clay in much of the soil causes a lack of binding material and increases the liability of the surface to wash. This disadvantage concerns agricultural interests more than forestry, but it also has much to do with the growing of trees on waste land. At any rate, a tree cover on such land has the effect of lessening erosion by breaking the impact of heavy rains and also by binding the soil with interlacing roots. Thick sod serves that purpose as well as trees.

The principal low-lying region of the state is included in the Yazoo delta, in the western part, along the Mississippi. It embraces about 7,000 square miles, extending from near the Tennessee line southward. It is a tract of great fertility—one of the richest in the United States, and its soil is of great depth. The surface is diversified with swamps, lakes, bayous, rivers, sloughs, cane brakes, forests, prairies, but it all averages very low. Geological agencies for ages have been raising the bed of the Mississippi by depositing sediment in the channel and upon the banks, thus elevating the river above the level of its flood plain, and causing much stagnant or sluggish water in the region. Extensive systems of dikes or levees have been built to confine rivers to their channels, and much of the land once so often subject to overflow as to be of little use for agriculture, has been reclaimed, and only in periods of excessive floods is it now inundated. The Delta region has had and still has great forest resources.

Bordering immediately on the gulf, or rather on Mississippi Sound, which is a body of comparatively shallow water separated from the Gulf by a chain of low islands ten or twenty miles off the coast, is a narrow strip of flat marsh, only a few feet above high tide, and much of it subject to overflow when strong winds are on shore. This area represents the encroachment of land on the sea by the washing in and deposit of sediment from the higher country. In prehistoric times, according to the opinions of geologists, the Gulf of Mexico extended hundreds of miles inland, along the low plain of the Mississippi valley, and covered the Delta of the Yazoo. The process of filling the gulf has gone on during ages and still continues, though very slowly, and the land just rising out of the water is covered with grass and rushes. When this land is sufficiently dry, forests take possession of it.

For a long time Mississippi was greatly handicapped in a commercial way because it had no deep-water harbor on its eighty-five miles of coast. The slow and long-continued process of the land sediment encroaching upon the water has filled the sounds and bays and made them shallow, destroying deep harbors if they once existed. On the coast of Ship Island, about twelve miles off the mainland, a deep harbor has many times been put to use; but in loading lumber, and other commodities, it was formerly necessary to carry the cargo in small vessels from the shallow bays on the coast to Ship Island harbor and there trans-ship to seagoing vessels. That was expensive and caused delay. In recent years, however, the United States Government has dredged a channel six miles long connecting Gulfport with Ship Island, to the great advantage of the commerce of Mississippi, especially the lumber export trade. The deep harbor at Ship Island possesses historical interest from the fact that it was made headquarters for the Gulf Blockading Squadron during the Civil War, and important naval and military expeditions started from that point.

A large part of Mississippi's lumber shipments by water are sent from Mobile in Alabama; but the construction of important trunk-line railroads through the state with numerous branch lines and feeders, has placed the principal forest resources of the state within reach of various and excellent markets. The Mississippi is navigable for small vessels all the time and for the largest much of the time, and other

streams carry boats and rafts and supply means for reaching many markets.

The Commissioner of the Bureau of Corporations reported in 1911 that privately-owned timber in Mississippi, including both hard and soft woods, aggregated 95,300,000,000 board feet. As there is little timber belonging to the state or to the government, the figures given represent practically the whole amount. The annual cut of forest products of all kinds in Mississippi indicates that the state's timber supply will last about thirty years at the present rate of cutting. The estimated forested area is about seventy per cent of the whole, or 32,000 square miles. Generally, the shortleaf pine is in the north, the longleaf and Cuban pine in the south, the loblolly in nearly all of the state, except the swampy regions, and the minor species of pine in a few localities. The hardwoods are scattered in nearly all regions. Red gum and cypress are most abundant in the Delta region; both are of much value, the cypress being a soft wood and red gum hard. In the southern part, particularly in the vicinity of the gulf coast, much of the pine has been cut. From that region, however, a rather large amount of cordwood and charcoal are shipped to New Orleans.

The dense stand of timber in the Delta region makes it an important source of supply, and it promises to long continue so. Though the land possesses great fertility, much of it is so wet, and such large tracts are covered with water, that farming will be a long time in taking possession. In 1880 it was estimated that only one-sixth of the Delta was under cultivation, the rest chiefly in timber.

In 1909 Mississippi stood third among the states in the production of lumber. Washington was first and Louisiana second. Ten years earlier Mississippi was in the tenth rank, and during that interval (1899 to 1909) it increased its lumber output 113 per cent, or nearly a billion and a quarter feet, and took the rank held in 1899 by Michigan. Louisiana and Virginia are the only southern states which increased their per cent of lumber output more than Mississippi in the ten-year period between 1899 and 1909; and Louisiana, only, increased more in actual amount. The growth of the lumber industry was exceedingly slow in Mississippi for a long period after the settlement of the state. The old-time planters devoted to growing cotton, thought little of forest resources, and what areas were cut over were cleared for plantation purposes, and the logs were destroyed, except a small percentage used for fencing and building material. The diary of a planter, written about 1840 and recently published by the Mississippi Historical Society, records in a monotonous series of entries extending over some years, the process of clearing land. Fire was always depended upon to do the chief work; while one or two slaves are often mentioned as spending the days in the clearings "mauling," and the women and children in "burning." These specific instances given by a single planter were doubtless typical of general conditions in the state at that time and during many preceding decades. The forests, which grew on the best land and were of the finest types, were thought of only as hindrances to be removed and destroyed. Fire was, unfortunately, not confined to the clearings. As early as 1817 William Darby, in a book treating of the geography and various resources of Louisiana, southern Mississippi, and Alabama (which was then a territory) says that fire and the tramping of domestic animals had so largely destroyed the cane brakes that wild cane was becoming rare in Mississippi. If cane was being destroyed then, it is evident that much greater destruction was going on among the forests outside the deep wet swamps.

Up to the Civil War the mills were small and few. They devoted their rather feeble energies to sawing building and fence lumber for the plantations. The lumber industry at that time was much more highly developed on the Atlantic coast, in Georgia and the Carolinas, though the excellent timber on the eastern coast was no better than that in Mississippi. Fine hewed timbers for shipment to the North and export to Europe were rafted down the Savannah, Altamaha, and other eastern rivers, while Mississippi's splendid yellow pine was mentioned chiefly for "mauling" and "burning." In 1860, according to B. M. Hilgard's "The New South," published in 1887, there were 277 sawmills in Mississippi, and only one planing mill. Doubtless much

lumber used in building was planed by hand. Carpenters could dress two or three hundred feet a day; but the condition then prevailing shows an almost total absence of wood manufacturers as the term is now understood. Doors, sash, flooring, ceiling, siding and vehicle-making were practically all hand work, and some of it was done by slave labor. The absence, in the first place, of good harbors, and in the next place, the want of large cities or towns as centers of surrounding populations, discouraged manufacture in that state before railroads had greatly modified industrial conditions. The want of mineral resources was also a serious drawback, and the state was, largely by force of circumstances, forced to become almost exclusively agricultural to the neglect of its phenomenal wealth of timber. There was not much improvement, as far as forest products were concerned, up to 1880, when there were 295 sawmills and six planing mills. In 1900 the sawmills had increased to 481, and the planing mills to twenty-eight. Modern manufacturing conditions began to take a firm hold about that time. The United States census in 1909 gives the number of mills at 1,470 cutting yellow pine alone. Many of these were large, complete and up-to-date plants, and perhaps the largest of them turns out as much in one day as was cut daily by the entire 277 mills in the state in 1860. Instead of counting planing mills on the fingers of two hands, as could be done up to 1880, they now number hundreds, and probably a single one of the most complete now dresses as much lumber in one day as the single mill in the state turned out in the year 1860. The lesson to be learned from this development is that old things in manufacturing have passed away to make room for new.

In taking up this study of the wood-using industries of Mississippi, the Forest Service purposed to supply information not available in any public or private report. The Bureau of the Census co-operating with the Forest Service, collects and compiles annually statistics showing what the country's total sawmill output is; what the output in each state is; what is the mill value for each kind of wood in the several states; what kinds of wood and how much of each one are manufactured into lumber in each state, and in all the states. But this stops short of giving all needed information on the subject. It does not go beyond the rough lumber, and presents no statistics to show what becomes of the lumber after the sawmills turn it out in the rough state. The present report takes up the subject where the census leaves off; that is, it considers rough lumber as raw material for further manufacture, and shows what becomes of it, what it is used for, and what products are manufactured from it. For instance, the census statistics give figures showing how much white oak the sawmills cut into rough lumber, but that is all. This report follows that lumber until it has been made into finished commodities, such as furniture, vehicles, finish for houses, ships and boats, musical instruments, and whatever it goes into. It is thus shown what becomes of the wood which sawmills convert into lumber and stack in their yards. This report, however, does not take up the wood which is not further manufactured after it leaves the sawmills. If oak or any other wood goes into rough construction, or railroad ties, or bridge timbers, or is taken for any other purpose which uses it in the rough, it is not considered as raw material for further manufacture. A state's sawmills may turn out a large quantity of a certain wood, and little of it may be further manufactured. In that case, if no explanation were offered, it might appear that the difference between what the mills cut and what the factories account for is unreasonable. To illustrate, Mississippi's mills cut about 168,000,000 feet of oak yearly, yet the state industries further manufacture only about 13,000,000, which is less than eight per cent. This means that ninety-two per cent. of the oak is either used in the rough or is shipped out of the state to be further manufactured elsewhere. Bearing this explanation in mind, the tables of uses in this report, and the amounts of the several species demanded, will be easily understood and will furnish a basis for ready comparison between the rough lumber produced in the state and the amount further manufactured. There are, nevertheless, modifying conditions which should be held in view, particularly in a general study of wood-manufacturing in states. Manufacturers in some states import lumber from other regions and actually manufacture more than their own sawmills cut. Except in the case of foreign woods, the Southern states do not import much lumber, but some of the Central and Northern states do. Mississippi brings in almost no wood to supply her factories—less than one per cent.; but it ships to other states, chiefly to the Middle West, hundreds of millions of feet. It is, therefore, a state which pours its wealth of raw material into other regions to build up their industries, while its own are growing with comparative slowness.

To some extent, that condition is due to local circumstances. Nature was not quite as liberal with

Mississippi as with many other regions in supplying it with water power. The absence of rivers of large volume and steep gradients prevents the erection of vast water-power plants as in the Appalachian region. Coal is wanting in the state, though abundance is available within moderate distances of the state's borders. Thus, while it possesses resources of the highest value, it lacks others, from the manufacturing standpoint. If a balancing of accounts were made, however, it would show to Mississippi's credit wealth which places it among the most fortunate states of the whole country.

KINDS OF WOOD USED.

Eighty or ninety kinds of wood grow in the forests of Mississippi, not counting a number that are too small or too scarce to be of commercial value. About half of that number are now of sufficient importance to find a place in the list of woods put to use in the state, and with closer utilization in the future a number of other woods will take their place among the region's resources. It is a rule which appears to hold nearly everywhere that while wood is abundant only that which is best and most convenient is put to use, but when the pressure of scarcity begins to be felt, neglected woods are pressed into service.

The timber which grows in Mississippi is of two classes or kinds—hardwood and softwood. In a general way these terms describe the characters of the woods, but not absolutely so; for some trees in the hardwood class have wood actually softer than some in the softwood class. For example, basswood, willow, and cottonwood are never considered anything but hardwoods, yet they are softer than long leaf pine, which is in the softwood class. The separation of all woods into the two classes is, for that reason, a somewhat artificial arrangement, and is accepted only by mutual consent. There is an easily understood line separating the two classes of wood. Broad-leaf trees are usually classed with hardwoods. Among such are the oaks, hickories, maples, gums, cottonwoods, and trees of that kind. The needle-leaf trees are softwoods. Such are the pines, spruces, hemlocks, cedars, and cypresses. In a general way, the evergreen trees are softwoods, the deciduous species hardwoods; but there are so many exceptions to this rule that confusion is liable to result. Cypress in the South and tamarack in the North are needle-leaf species which shed their leaves yearly; and live oaks, and some of the magnollas and hollies, are broad-leaved, yet they are evergreen. It is thus apparent that the simple fact that a tree is or is not an evergreen is not sufficient reason for calling it a softwood or a hardwood. Some persons would call a cone-bearing tree a softwood, and all others hardwood. This distinction holds good in most cases. The United States, when it collects statistics of lumber cut, and the Forest Service in discussing the country's timbers in a practical way, recognize a clear division between hardwoods and softwoods, and base the distinction upon broad-leaf and needle-leaf trees. Confusion is apt to follow an attempt to call a tree a softwood because it bears cones. Some trees bear what look like cones, but they are not. Among trees of that kind are some of the birches, hophornbeam, cucumber, and yellow poplar. Neither is it safe to base a division into hard and soft woods upon the annual fall of leaf alone. As already said, there are several exceptions, but in addition to that, every living tree sheds its leaves sooner or later, although the evergreens do not cast them all down at once, but grow a new crop before the old falls. Anyone walking through a pine, spruce, hemlock, cedar, or live oak forest, and noting that the ground is covered with dead leaves or needles, has undoubted evidence before him that even the leaves of evergreens fall in larger numbers. In Mississippi the long leaf pine's needles fall at the end of the second year; the loblolly pine's fall the third year; the shortleaf pine's at the end of the second and beginning of the third year, while the sand pine carries its needles to the third and fourth years. Some of the evergreen trees on the high Western mountains carry their needles much longer than the Southern pines retain theirs. The foxtail pine, growing at the perpetual snowline in the Sierra Nevada mountains, may cling to its needles as long as twelve years; for in its barren soil and bleak climate that tree can grow new leaves only very slowly, and it keeps what it has as long as possible; but pines in the warm and friendly climate of the South find it no hardship to part with their needles every second or third year.

The Pines.

In quantity, the pines in Mississippi much exceed the hardwoods. Seven or eight kinds of pine are cut for lumber, but three or four are scarce, and even when they are distinguished from other pines with which they are associated, it is not customary for lumbermen to keep separate the lumber cut from each kind. The census reports from year to year call it all "yellow pine." It is evident to any one

that it is not all the same kind of lumber when it comes out of the mill. Some of it has narrow rings of annual growth, some has wide rings; some of the lumber is comparatively free from sapwood, other is largely sap. The wide-ringed thick-sapped wood is usually classed a little softer than the wood of narrow rings and little sap, and not quite so strong. There are other differences well known even to those who are satisfied to call it all yellow pine. The same observation holds for the appearance of the standing trees as for lumber in logs. Some of them have long needles, others are short, and this difference serves to distinguish the trees nearly as far away as their appearance can be made out. There are four species of pine usually cut for lumber in Mississippi, and it is proper that a short account be given of each, together with references to the parts of the state where they are most abundant.

Longleaf Pine (*Pinus palustris*).

Much of the yellow pine lumber in Mississippi is cut from this tree, which is found in greatest abundance in the southern half of the state. It has longer needles than any other Southern pine, and they range from eight to eighteen inches in length, and are arranged three needles in a little bundle or sheath (white pines have five needles in a bundle). The longleaf pine has thinner sapwood than any other Southern pine. This sapwood generally forms a thin ring round the darker colored heartwood. The rings of annual growth are narrow, due to the tree's slow growth. Thus there are three visible features which usually serve to distinguish this tree from others in the woods, and the logs or lumber from other pine lumber in the lumber yard. The three points are: longer needles than other pines, thinner sapwood, and narrow annual rings. Being a tree of slow growth, a new stand does not quickly come on to take the place of a forest cut down. A period of eighty to 150 years is necessary to grow a longleaf pine tree to merchantable size. The lumber of this species is often known as hard pine, and certain trees that are rich in resin are occasionally called "pitch pine." That name, however, is among the pines what the name "rock elm" is among elms in some regions; it is applied to any one of several species, and, except as far as local custom extends, it does not mean any species in particular.

Shortleaf Pine (*Pinus echinata*).

The shortness of this pine's needles gives name to it and serves to distinguish it at once from the longleaf pine. There is little likelihood that any one will mistake one for the other while the trees are standing, for the difference in the appearance of the needles attracts immediate attention; but when shortleaf pine trees are compared with two other pines growing in the same region—loblolly and Cuban—the differences in the appearance of the needles is not quite so apparent, though it is not usually difficult to separate the shortleaf species from the others. Shortleaf lumber has certain characteristics which differentiate it from longleaf. The sapwood is much thicker, and the annual rings near the heart of the tree are generally wider than those of longleaf; but the outer rings of both are much alike. Longleaf is heavier and stronger than shortleaf, and is generally preferred for structural timbers which are expected to carry heavy loads, but the softness and the attractive grain of shortleaf pine lead to its extensive use for doors and interior finish. The two pines are found growing near together in many parts of Mississippi, but generally the longleaf is in the southern half, and the shortleaf northward.

Loblolly Pine (*Pinus taeda*).

The needles of the loblolly pine are in length nearly double those of shortleaf, but much shorter than longleaf. The loblolly and the shortleaf pines are often cut and sent to market as one. There are differences in the wood of the two trees, but they might not be noticed by a casual observer. The shortleaf trunk grows rapidly during its first quarter or third of a century and more slowly later in life, and the record of the growth is shown by the annual rings; but the loblolly grows rapidly and at a fairly uniform rate its whole life, and the rings are wide from heart to bark. This generally serves to distinguish loblolly logs from shortleaf, but it is not an unerring guide, because accidents may befall trees and interfere with their growth. The loblolly pine is liable to be met with in all of the pine regions of Mississippi. It has not, nevertheless, developed in the Mississippi valley states as vigorously as in Virginia and North Carolina, where it has taken possession of large areas to the exclusion of almost all other pines. Its wood serves practically the same purposes as that of the shortleaf pine.

Cuban Pine (*Pinus heterophylla*).

The Cuban pine is occasionally confused with loblolly. There are a number of differences which may

be noted. The Cuban pine's needles are generally longer, the wood is heavier, stiffer, stronger, harder, and is much more resinous. Turpentine operators orchard the Cuban and the longleaf pines, but seldom the loblolly or the shortleaf. The Cuban grows rapidly and has wide rings and thick sap. Seedlings spread readily into areas left vacant by lumbering or by fire. In this habit it resembles loblolly. The Cuban pine has apparently worked its way northward through the Florida Peninsula, although there is no historical record that it has done so. It seems to have crossed from Cuba ages ago. It is now the only pine in South Florida. At about one-third of the distance up the Peninsula it meets longleaf pine, and the two mingle together. Loblolly is encountered at about the same time, but shortleaf is not met until the northern part of Florida is reached. There the four southern yellow pines, longleaf, shortleaf, loblolly and Cuban, mingle, and all four grow in southern Mississippi. The Cuban pine has not yet advanced much further north or west than the southern part of that state, though it is probable that it will continue to advance and take possession of land where longleaf once grew, provided the agricultural interests of the people permit it to do so. It holds out much promise to become one of the most profitable pines of the South. It is not known how far north this tree can endure the climate.

The four pines listed above constitute the group from which the southern yellow pine lumber is cut, but two or three other pines are occasionally lumbered in Mississippi, though the amounts are small. One of these is the spruce or cedar pine (*pinus glabra*). It has very short leaves and thin bark, and the wood is somewhat like the northern white pine, light, soft and easily worked. It is not abundant. The sand pine, occasionally called spruce pine (*pinus clausa*) is found in the state, but the tree is usually small.

Cypress.

Except pines, cypress is the most important softwood found in Mississippi. Botanists recognize two species of this tree, *Taxodium distichum* and *Taxodium imbricarium*, but lumbermen do not distinguish them apart. The heaviest stands are in the Delta region, along the banks of the rivers, ponds, and lagoons, and on the flat lands subject to frequent overflow. The tree is able to maintain itself on ground which is under water much of the time. It has been generally observed by persons familiar with the region that young cypresses are not coming on in sufficient numbers to take the places of old, mature trees which are ready to fall by natural decay or before the lumberman's ax. It is pretty generally understood that when the present cypress forests have been cut, there will be little prospect of a future cutting. The sunlight let in by lumber operations seems to be fatal to small seedlings. In some localities and in restricted areas young cypresses are getting started, but such is the exception rather than the rule.

There is a little red cedar (*Juniperus virginiana*) in Mississippi, but not enough to cut much figure in the state's timber resources. It is a tree of rather slow growth, and unless seedlings come in out-of-the-way places, they are not apt to be encouraged by farmers who may need the land.

The Oaks.

The Bureau of the Census in compiling yearly statistics of lumber cut does not distinguish between different species or kinds of oak. There are in the United States several dozen species of oak, not all in one region, but scattered from Canada to Mexico and from ocean to ocean. Almost every species is made into lumber to a larger or smaller extent, yet statistics group all of them as if they were a single wood, like yellow poplar. Sawmill men in their own yards usually recognize at least two classes of oak lumber, white oak and red oak. There is a particular tree whose proper name is red oak (*Quercus rubra*), and another whose name is white oak (*Quercus alba*), but sawmill men usually group several similar oaks and call the lumber from one whole group white oak, or a group of another kind is called red oak. Just what this "white oak" or "red oak" lumber is actually composed of depends upon the region where it is cut. If produced in New York, for example, it would contain species somewhat different than that cut in Mississippi, because the two regions do not produce exactly identical species of oaks. It is not very difficult to determine what constitutes white oak or red oak lumber in a single state. There are seven white oaks in the forests of Mississippi, if the live oak is counted as a white oak, and there are nine red oaks, sixteen oaks in all, cut for lumber, though some of them in quite small quantities.

Certain characteristics help to distinguish white oaks from red oaks. The leaves of the former usually have rounded lobes, but those of red oaks are

sharp pointed. These features do not hold in all cases. The live oak's leaves are unlobed in Mississippi, and the black jack (a red oak) does not have sharp-lobed leaves, and the willow oak's leaves have no lobes. The shape of the leaf, therefore, is a useful guide in determining whether an oak belongs to the white oak or the red oak group, but something more than that is necessary to make sure in most cases.

The white oaks ripen their acorns in one season; the red oaks require two. That is a pretty safe test, but in practice it is sometimes difficult to apply. It is not always convenient to watch a tree two years to see when the acorns fall. By noting the leaves and the acorns, and likewise the general appearance of the trees, one can usually determine whether a tree belongs in the white oak or the red oak group. A third test is found in an examination of the wood itself. The structure of the wood of no two species of oak is exactly the same. A study of these differences will make it possible for an observer to determine the exact species of oak to which a piece of wood belongs, though the study is somewhat technical, and care and experience are necessary to work out satisfactory results. The United States Forest Service has prepared a manual and a key to assist those who desire to identify oaks from an examination of the wood. (Bulletin 102 U. S. Forest Service.)

White Oaks.

The common white oak (*Quercus alba*) is a valuable forest resource of Mississippi. This tree holds an important place in more than half of the states of the Union, and the lumber is shipped to every state. The standing tree is not apt to be mistaken for any other if it is closely observed; besides, in most localities, it is the commonest of the white oaks.

Post Oak (*Quercus minor*).

This tree receives its highest praise when it is declared to be as good as white oak. Many lumbermen cut it and suppose they are cutting common white oak, though they recognize a slight difference in the leaves and frequently in the shape of the tree. A few manufacturers who buy different species of white oak insist on post oak being kept separate from others. They consider it a little better than the others, or, at least, it meets their particular requirements a little better.

Cow Oak (*Quercus michauxii*).

The only reason offered for the name of this oak is that cattle eat the acorns. It is occasionally known as basket oak, because the wood separates readily into long, thin splints useful in making baskets.

Overcup Oak (*Quercus lyrata*).

In some parts of Mississippi this tree is called water white oak. The cup nearly encloses the acorn, and because of that, the tree is usually easy to identify.

Chinquapin Oak (*Quercus acuminata*).

This should not be confounded with the chinquapin, which is a little chestnut. The acorn of the chinquapin oak is sometimes eaten as a nut. The tree is smaller than most other white oaks, but is occasionally cut for lumber.

Durand Oak (*Quercus breviloba*).

This white oak is so scarce in Mississippi that it hardly deserves a place as a timber tree, though the wood is of excellent quality. It is found near Columbus and in Moon's Valley.

Live Oak (*Quercus virginiana*).

This is the common live oak tree of the Southern states. It is scattered from the Atlantic to the Pacific. Its chief value once was for ship-building, when large vessels were of wood. Live oak knees were hewed from the junction of roots or large limbs with the trunk, but at the present time this extraordinarily strong, hard wood serves few purposes. The trunks are generally too short and misshapen for saw-logs. The fact that its acorns ripen in one season, as among the white oaks, is the principal reason for calling this tree a white oak. Otherwise, it bears greater resemblance to the red oaks.

Red Oaks.

Nine or more of Mississippi's oaks belong to the red oak group. Some of them are of much importance in the lumber supply, while others occupy minor places. At least five different species are called red oak at the sawmills before they are cut into lumber, and others are given that name in the lumber yard. There is rather more difference between the woods of the different species of red oak than

between the white oaks. Most of the latter show very good grain when quarter sawed; some of the red oaks show good grain, others do not.

Red Oak (*Quercus rubra*).

This tree is not plentiful in any part of Mississippi and is not believed to exist at all in the southern part. The extreme southern limit of the tree's range barely enters the state, while its best development is found in Kentucky, West Virginia and Pennsylvania. In most cases when a lumberman as far south as Mississippi speaks of red oak he has in mind one of the other oaks of the group, and not the *Quercus rubra* or the genuine red oak. He most likely means the yellow oak or the Texan oak, perhaps the water or the willow oak.

Texan Oak (*Quercus texana*).

This species is very common in Mississippi, and is occasionally called spotted or Spanish oak, though it is most commonly known simply as red oak. Probably no oak in Mississippi supplies more lumber than this, but it is impossible to produce statistics to substantiate this statement, because of the custom of lumping together several oaks in the mill yards as one. Some of the best Texan oaks show grain and color which very nearly approach choice northern red oak.

Yellow Oak (*Quercus velutina*).

This is an easy specie to identify in the woods. The inner bark, a thin layer next the wood, is yellow, and it may be exposed to view with a stroke of an ax, or even by boring through with the point of a pocket knife. Old settlers used this substance in dyeing cloth. The yellow oak tree as it grows in the forest is an uncertain quality from the lumberman's standpoint. Very good stuff may be cut from it, or the output may be poor. Few kinds of trees are more dependent upon the soil in which they grow. Good ground grows good timber, poor soil, the reverse. It is true that most trees are influenced by the quality of the soil, and by the climate in which they grow, but yellow oak is more responsive than most others. Trees on rich, well-drained ground may produce wood fit for tight cooperage which is a very exacting use; while others in poor, dry situations are scarcely worth cutting, so worm-eaten, wind-shaken and doty are they.

Turkey Oak (*Quercus catesbaei*).

Turkey oak has never been of much importance in Mississippi and is not likely to become so. Choice trees make good lumber, but are met with only occasionally. Some call it "forked-leaf oak," and the name is due to the leaf's somewhat fanciful resemblance to a turkey foot.

Spanish Oak (*Quercus digitata*).

Attempts to identify this oak by its leaves alone sometimes leads to confusion, for leaves differ greatly. Some have well-developed lobes, others have none. The same tree often produces leaves of very different forms. In this respect it is like sassafras. The bark and general appearance of this oak resemble the water and the willow oaks. The three, in fact, look so much alike that they seem to belong in a class by themselves.

Water Oak (*Quercus nigra*).

Water oak is not generally well liked by lumbermen. They complain that the wood is difficult to season, and that it has no beauty of grain to commend it for high-grade furniture and finish. It seems to be slowly working its way into use, and it will ultimately win, for the wood, in spite of some drawbacks, has good qualities. One point in its favor is that it grows rapidly, and though it may not measure up to the cypress in good appearance of the lumber, the tree may be expected to increase in size nearly ten times as rapidly. When the leaves are young, in the early spring, they show a soft, delicate, velvety green unsurpassed in beauty by any other oak. It is well fitted for parks and street shade, and the people of Mississippi are showing their appreciation of it for those purposes.

Willow Oak (*Quercus phellos*).

This tree owes its name to its willow-like leaves. Its wood is probably never known in the lumber yard or factory as willow oak but always as red oak. The tree, while standing, bears so little resemblance to the true red oak that no one could possibly mistake one for the other; but when the lumber of the two has been seasoned and dressed and laid side by side, it would often puzzle a good lumberman to tell which was which; but willow oak, if it is to be compared with red oak, should be well selected from choice trees, for the run of it is probably not quite equal in appearance to Northern red oak, being a little paler in color. The willow oak grows rapidly, and the wide annual rings show well in finished lum-

ber. There rings are occasionally three-fourths of an inch wide, though usually much narrower. So vigorously does the willow oak increase in size that a man might live to cut large saw-logs from trees he had planted in his youth.

Black Jack (*Quercus marilandica*) and Blue Jack (*Quercus brevifolia*).

These two species are well established among the Mississippi oaks, the latter in the southern part, and the former in all parts where the soil is suitable; but they are more frequently looked upon as weed trees than as resources with which to augment the state's wealth. They are seldom found large enough for saw-logs, and the grain of the wood is figureless and dull. In point of usefulness they are doubtless lowest in the scale of all the oaks of Mississippi, yet there are a few places which they fill very well. Though neither is large, the black jack is the larger and more abundant. Its exceedingly rough bark, and its broad, round-cornered fan-shaped leaves, modeled somewhat after a pear, usually are sufficient to identify this tree wherever seen.

The Hickories.

It is not unusual for persons to speak of hickory as though there were only one kind. Timbermen are aware of the fact that the trees are not all the same, and sometimes the differences are duly considered; but sawmills which cut hickory seldom list more than one kind of species. Yet there is more apparent difference between species of hickory than between some of the species of oak. Mississippi has seven kinds of hickory in its forests, if pecan is counted as one, and yet it has no forest of hickory, for it never produces pure forests, but the trees are scattered singly among other species, a few occasionally standing near together. Operators who make a business of logging hickory must pick out the trees where they are found here and there. In favorable regions the stand of hickory seldom averages more than 200 feet per acre. Following are the species of hickory native to Mississippi.

Pecan (*Hicoria pecan*).

Pecan is usually considered the least valuable of the hickories where strength, elasticity, and toughness are essential. It gives satisfactory service only where it is not required to sustain great loads or stand sudden twists and strains.

Bitternut Hickory (*Hicoria minima*) and Pignut (*Hicoria glabra*).

These two hickories are pretty generally recognized as distinct from the hickories whose nuts are edible. The wood is high class for handles and parts of small vehicles.

Nutmeg Hickory (*Hicoria myristicaeformis*).

Nutmeg hickory is rather scarce, and next to pecan is probably of less importance as a forest product in Mississippi than any other of the seven species.

Water Hickory (*Hicoria aquatica*).

Water hickory reaches its best development in western Mississippi and the neighboring regions of Louisiana and Arkansas. As its name indicates, it is a water tree and flourishes on ground subject to frequent overflow.

Mockernut Hickory (*Hicoria alba*).

The powerful and pleasant resinous odor of the leaves of this species assists in its identification. The tree is not usually large, but the wood is of excellent quality.

Shagbark Hickory (*Hicoria ovata*).

Probably most persons have this tree in mind when they speak of hickory, and its fruit is the common hickory nut of commerce. The wood is of the highest class.

The sapwood of hickory is usually considered superior to the heartwood. The sap is white, the heart red or dark. Tests have shown, however, that for certain purposes the red wood serves as well as the white.

The Gums.

Three gum trees in Mississippi contribute to the lumber supply, but one of them is of rather small importance. It is the black gum (*Nyssa sylvatica*), and should not be confused with tupelo which is sometimes also called black gum. The true black gum is quite a different tree and stands alone among American trees because of its remarkably interlocked fibers which render the wood almost unwedgeable, except when frozen, in which state the fibers break across and seem to split. The black gum is less a swamp tree than the tupelo; its fruit which is dark blue, is about half an inch long, while tupelo's is dark purple, and is at least twice as

large. When black gum lumber goes to market it probably never carries its true name with it; but tupelo keeps its name, except when it passes as bay or bay poplar. It grows like cypress on ground flooded much of the year.

Red Gum (*Liquidambar styraciflua*).

This species bears some general resemblance to the others, but it stands on its own merits, although it often loses its identity in factories and passes for Circassian walnut, cherry, birch, or oak. The claim was made nearly a century ago that the largest body of red gum timber in the world was in the Yazoo delta in Mississippi. At that time the timber was made way with in the usual manner—the ax and fire. The land was so valuable that the timber was considered an incumbrance. The long-staple cotton grown there attracted attention in most parts of the world where cotton was an article of trade, and every planter who could clear more of the extraordinary soil for cotton did so. Though much red gum was sacrificed, a large quantity was spared and has become an important source of wealth. Some lumbermen specify two kinds of red gum, the heart and the sap. It is all the same tree, but the wood appears different—some of it white, other red. The sapwood of a gum, as in trees of other kinds, gradually turns dark and changes to heart as the trunk grows older. Some red gums change from sap to heart much more rapidly than others; and sometimes a large trunk is nearly all sap. The “sap” gum of commerce is cut from such trees. If the same tree is permitted to stand half a century longer it is not improbable that most of the sapwood will become heart.

Red gum is more used for veneer than any other American wood, and much of it is rotary cut from what is known as sap gum logs. If the material is selected for its figure, sap veneer closely resembles Circassian walnut, and some of it is made into fine furniture and interior finish, musical instruments, sewing-machine tables, and other articles where beauty of the wood is essential. The seasoning of red gum stood for a long time in its way, but better methods are now employed and early troubles are being forgotten.

The Elms.

Four elms constitute a group in Mississippi, and in the lumber business little effort is made to distinguish one species from another. They are known by various names, and not infrequently the same name does service in pointing out different species. The name “rock elm” is given in one locality to one species, in another region it is applied to another. This is true in other states than Mississippi, where the term “rock elm” is applied without regard to any particular species.

The most important elm in Mississippi, and likewise the most important in nearly all parts of the United States where elm grows, is the common white elm (*Ulmus americana*). The tree assumes appearances somewhat different, depending upon the soil where it grows, but it is usually an easy matter to distinguish it from other trees of the same genus associated with it.

Slippery Elm (*Ulmus pubescens*).

This tree is not often mistaken for any other, because the mucilaginous inner bark furnishes a ready means of identification. No other elm possesses this peculiar bark. Slippery elm is frequently called red elm, but the name is no guide to identification, because two other elms in Mississippi are often called by that name.

Cedar Elm (*Ulmus crassifolia*).

This elm is not abundant, but is occasionally found in lumber yards. It grows on Sunflower river and at other points in the state. The small twigs may or may not be equipped with flat, corky brown wings, one on either side, and about a quarter of an inch wide.

Wing Elm (*Ulmus alata*).

That which occasionally occurs in the cedar elm, wings on the twigs, is a characteristic of this species, and the wings are much broader. It is usually not difficult to identify this elm by its winged twigs, though certain other characteristics should be taken into consideration. It thrives best on gravelly soil.

Other Woods.

It is not the purpose to give in this place a list of all the woods which may become of commercial importance in Mississippi. On preceding pages groups are presented of several species which are often spoken of as if they were a single one, or only two or three species. On page 75 of this report will be found a list of all woods reported in use by manufacturers in Mississippi. Doubtless many others are in use but were not reported in a way to bring them into this report.

INDUSTRIES.

Manufacturers in Mississippi consume yearly about 618 million feet of wood, consisting of twenty-five species which are shown in Table I, following. It is worthy of remark that not one foot of foreign wood is reported used in Mississippi. The Forest Service has already carried out studies of wood uses in nearly half of the States, and in no other than Mississippi are foreign woods absolutely lacking. Every other State thus far investigated uses mahogany at least, and some of them have lists of a dozen or more foreign woods employed in manufacturing. It is, therefore, remarkable that Mississippi, which demand more wood than is demanded by North Carolina, Maryland, Massachusetts, Oregon, Missouri, or Washington, should import no foreign wood. The State depends almost wholly upon its own forests to supply its manufacturers, for it draws very little from neighboring States, though regions abounding in forest wealth lie on every side. Of the twenty-five woods reported by the manufacturers, white pine is the only one which is not native to the State, and only ten thousand feet of that was brought in. Less than one per cent of all the wood came from the outside, while twelve species were entirely supplied from within, and only four from other States.

It is of interest to note what proportion of the wood further manufactured in Mississippi was pine. The five pines which supplied it made up eighty-nine per cent of the whole, and twenty other woods, nineteen of them being hardwoods, furnished eleven per cent. It is evident that Mississippi is yet a pine State, not only in the output of its sawmills but also in the demands of its manufacturers who use wood. Nine industries are recognized. Table I which follows is intended to show at a glance the woods demanded, the quantity of each, the average price of each, the proportion grown in the State, and that which came in from elsewhere. The other tables which follow show one industry each and give details necessary to proper understanding of the relative rank of the industries in the State. The average cost of the wood used, as shown in Table I, makes it apparent that cheap material lies at the hand of the manufacturer in the State. An average of only \$12.22 per thousand for all kinds of woods is shown.

THE USE OF WOOD IN MISSISSIPPI.

Table 1.

SUMMARY OF KINDS OF WOOD USED IN MISSISSIPPI.

Table with 8 columns: Common Name, Botanical Name, Quantity (feet B. M. and Per cent), Average cost per 1,000 ft. factory, Total cost f. o. b., Grown in Miss. Per ct., and Grown out of Miss. Per ct. Rows include species like Longleaf pine, Shortleaf pine, Loblolly pine, Cottonwood, Red gum, Hickory, White oak, Pond pine, Yellow poplar, Red oak, White ash, Tupelo, Cypress, Black willow, Water oak, White elm, Sweet birch, and Evergreen magnolia.

Pin oak.....	Quercus palustris.....	50,000	.01	15.00	750	100.00	....
Sycamore	Platanus occidentalis...	20,000	*	35.00	700	100.00	....
White pine.....	Pinus strobus.....	10,000	*	80.00	800	....	100.00
Black gum.....	Nyssa sylvatica.....	7,000	*	15.00	105	100.00	....
Post oak.....	Quercus minor.....	5,000	*	18.00	90	100.00	....
Yellow oak.....	Quercus velutina.....	5,000	*	18.00	90	100.00	....
Black walnut.....	Juglans nigra.....	3,000	*	38.33	115	100.00	....
Total.....		618,270,030	100.00	\$12.22	\$7,554,531	99.35	.65

*Less than 1/100 of 1 per cent.

PLANING-MILL PRODUCTS.

The eleven woods which contribute the material shown in Table II aggregate more than half a billion feet, but nearly three-fourths of it is longleaf pine, and most of the other is shortleaf and loblolly. The hardwoods aggregate little more than a million feet, or about one-five-hundredth part of the whole. The softwoods are so preponderant in this industry that the hardwoods are scarcely worth mentioning. The significance of the fact is apparent when it is borne in mind that this is the principal wood-using industry in Mississippi, from the viewpoint of quantity demanded. The principal items which make up this industry are flooring, ceiling, siding, and such finish as is turned out by planing mills which dress stock for the general trade. Such planers are usually run in connection with sawmills, and they plane the lumber which the sawmills cut, both mills being generally under the same management. This serves to distinguish these planing mills from a class which do general mill work and make other kinds of products, such as sash, frames, and doors. Manufacturers of that class are shown in Table VI.

Longleaf Pine.

The largest item among those constituting planing mill products is flooring, and longleaf pine is the chief contributor. The wood is admirably fitted for the manufacture of that commodity. It is hard, insuring long wear; strong, which is a guarantee against failure through breakage; stiff, which enables it to hold its place under trying circumstances; it resists decay under conditions where many other woods speedily disintegrate; and it presents an attractive appearance because of its positive color and the clearly marked grain. Flooring of two patterns are turned out from the longleaf pine. The common kind is worked without a purpose of conforming to any particular run of the grain—some of it flat, some quarter-sawed, and some edge grain. There is a select kind, however, known as edge flooring. The sawing is done in a way to bring the edges of the grain upward for a wearing surface. Flooring of that kind is generally narrow and extra thick, sometimes two inches, and is more expensive, but it is better, stronger, wears longer, is less liable to splinter, and most persons consider it more attractive. It is often used to floor stores, halls, schools and warehouses. No softwood is superior to longleaf pine for that kind of flooring. Ceiling and siding are made of longleaf pine to a large extent; but shortleaf and loblolly are preferred by some. These pines being of more rapid growth than longleaf, the grain shows more variety in figure, and its general tone is a little lighter. The wood is softer than longleaf and lends itself a little more readily to the carpenter's tools.

Six and three-quarter million feet of pond pine are listed in Table II. Manufacturers who reported this wood generally called it pitch pine, which appears to be the commonly accepted local name for it. The wood whose official name is recognized by the U. S. Forest Service as pitch pine is a different tree (*Pinus rigida*) and is not found in Mississippi, and it is not

PLANING MILL PRODUCTS.

Table 2.

PLANING-MILL PRODUCTS.

KINDS OF WOOD	Quantity used annually.		Average cost per 1,000 ft.	Total cost f. o. b. factory.	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.	
	feet B. M.	Per cent.					
Longleaf pine.....	399,491,066	74.11	\$11.63	\$4,644,695	399,291,066	200,000	
Shortleaf pine.....	113,313,000	21.02	11.65	1,320,654	113,213,000	100,000	
Loblolly pine.....	18,000,000	3.34	11.42	205,500	18,000,000	.....
Pond pine.....	6,751,371	1.25	12.97	87,587	6,751,371	.....
White oak.....	860,000	.16	32.62	28,050	775,000	85,000	
Cypress	212,000	.04	26.70	5,660	50,000	162,000	
Yellow poplar.....	170,000	.03	24.91	4,235	170,000	.....
Red oak.....	110,000	.02	33.18	3,650	70,000	40,000	
Red gum.....	100,000	.01	11.00	1,100	100,000	.....
White ash.....	6,000	*	35.00	210	6,000	.....
Black walnut.....	3,000	*	38.33	115	3,000	.....
Total.....		539,016,437	100.00	\$11.69	\$6,301,456	538,429,437	587,000

*Less than 1/100 of 1 per cent.

BOXES AND CRATES.

The second largest industry in Mississippi is box-making. It is not unusual for a state's largest or second largest wood-using industry to be the manufacture of boxes and crates. Containers in which to ship commercial commodities constitute a heavy, but necessary tax upon the other industries of a region. Fortunately, the wood of which the containers are made is generally of cheap grades. Much that goes to the box factories could find no sale elsewhere, and if it were not serviceable there it would go into the waste heap. It happens, however, that the principal wood demanded by Mississippi box-makers is cottonwood, and not of cheap grade, as the average price (Table III) indicates. Boxes of very many kinds are produced, but when the makers pay an average price of \$17.32 per thousand for box material, it is evidence that boxes above the average are being turned out. Cottonwood is known as a clean wood. That is, it has no offensive odor, and imparts no stain to articles shipped in boxes made of it. That fits it for provisions, particularly for meats, butter, lard, fruits and confectionery. So well is cottonwood liked for boxes in which to ship cured meats, that willow is sometimes sold as cottonwood, though it is not easy to deceive persons acquainted with both woods, for willow has not the clean color of cottonwood. Some manufacturers prefer boxes of cottonwood, though no provisions or other commodities that can be damaged by stain are to be shipped in them. The attractive appearance of a crate sometimes helps to sell the articles packed within. For instance, makers of screen doors, wash boards, and brooms, buy nice white lumber for crates which will show off their wares to good advantage while in transit or on exhibition. Soap-makers have been known to pay extra for white wood because the letters stenciled on the top or sides show to so much better advantage. The nearly sixteen million feet of cottonwood bought by Mississippi box-makers yearly doubtless receives innumerable stencillings or letterings with paint brushes before the boxes have run their courses and have gone to the final scrap pile of kindling wood.

Cottonwood is one of the native timbers of Mississippi which may be expected to hold its place when cypress, pine, tupelo and red gum have become scarce. Cottonwood will pay for planting, when the time for tree planting comes to Mississippi. It grows rapidly; large amounts will thrive on small tracts; it is satisfied with waste land, provided it is neither too wet nor too poor. It is one of the easiest trees to plant and make grow. It is not improbable that there is as much cottonwood in the state now as there ever was, though large trees may not be as abundant as formerly. Small ones are coming on everywhere. They are quick to seize on vacant places left when farm land is abandoned or when lumbermen cut the forests. A writer who traveled through Mississippi nearly a hundred years ago said there was little cottonwood in the state. He either did not see all there was, or much has since come on.

Next after cottonwood, red gum holds chief place among box and crate makers in the state. Fruit, berry and vegetable crates demand large amounts of wood, frequently made into rotary-cut veneer. Early gardens and truck patches in the state contribute largely to northern markets, and some sort of wooden container is needed for practically everything of that kind that grows. Red gum and the pines are the largest contributors to the supply of truck-garden crates and berry baskets and cups. The box material furnished by longleaf, shortleaf and loblolly pine seems to be fairly well apportioned to the relative abundance of these species, since makers seldom express a preference, but take what is most convenient or cheapest. The average costs for the three pines show only a difference of nine cents per thousand feet, and for practical purposes they may be regarded as of equal cost.

One-fourth of all the yellow poplar reported in the state went into boxes and crates, and it was highest in price of the nine woods shown in Table III. It was used for the best grades of boxes, on which stenciling, painting and printing were to be done. Magnolia was the cheapest wood in the industry.

believed that any of it was reported during the progress of this investigation.

Cypress.

Cypress makes a rather poor showing in this industry. For some reason, the people of Mississippi do not seem to be making much flooring, ceiling and siding of this wood. It is good for flooring, though not as hard as longleaf pine; suitable for ceiling, though it lacks the distinct grain which loblolly and shortleaf pine exhibit; but for outside work, particularly as siding or weather boarding, it is doubtful if it has any superior among the woods of this country. Well-selected cypress lasts so long when used in the form of weather boarding that enthusiasts have called it the "everlasting wood." It would perhaps be unwarranted to claim for it longer service in exposed situations than may be had from California redwood, western red cedar, southern red cedar, and eastern white cedar, but it is well up in the front rank of that remarkable list of woods. For that reason it is noteworthy that the people of Mississippi use so little of it, out of the abundance which their state affords. It has been said that a prophet is not without honor save in his own country. All the wood-using industries of Mississippi combined use less than a million and a half feet of cypress yearly. They use that much longleaf pine daily. White oak contributes four times as much as cypress to planing mill products, and about five times as much to the wood-using industries of the whole state.

Yellow Poplar.

Yellow poplar supplied a small amount of lumber to the industry, and all of it was state grown. The yellow poplar here is near the southern limit of its range, the tree reaching its best development in Tennessee, Kentucky, North Carolina and West Virginia. There is reason to believe that this splendid wood was once more abundant in Mississippi than it now is. Its large, shapely trunk was calculated to attract attention in the early periods of settlement, and it would be one of the first trees to fall to meet the settlers' demand for lumber. William Darby wrote that Baton Rouge was a rather important local market for yellow poplar a century ago; but that was before the days of railroads, and timber was not then taken far to market unless it could be floated. Lack of navigable streams then closed markets against a considerable part of the interior of Mississippi. Some white oak and a smaller amount of red oak was reported in this industry. It has been remarked that there exists considerable difference of opinion in Mississippi as to what red oak is. Some have always called the Texas oak red oak, while others give that name to the yellow oak when it grows on rich, well-drained soil where it develops a large trunk and choice wood.

All of the black walnut reported by manufacturers in the state is found in this industry, and the amount could all be procured from two or three medium-sized trees. Its cost per thousand feet is higher than that of any other wood in this industry.

BOXES AND CRATES.

Table 3.

BOXES AND CRATES, PACKING.

KINDS OF WOOD	Quantity used annually.		Average cost per 1,000 ft. f. o. b. factory.	Total cost	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.
	feet B. M.	Per cent.				
Cottonwood	15,940,000	40.56	\$17.32	\$276,030	15,940,000	.....
Red gum	10,320,616	26.26	9.88	101,987	10,270,616	50,000
Longleaf pine	5,425,000	13.81	9.96	54,025	5,425,000	.....
Shortleaf pine	2,737,397	6.97	10.05	27,523	2,737,397	.....
Loblolly	2,500,000	6.36	10.00	25,000	2,500,000	.....
Yellow poplar	1,257,080	3.20	22.88	28,765	1,257,080	.....
Black willow	1,000,000	2.54	14.00	14,000	.....	1,000,000
White elm	65,000	.17	13.49	877	.....	65,000
Evergreen magnolia	50,000	.13	8.00	400	50,000	.....
Total	39,295,093	100.00	\$13.45	\$528,607	38,180,093	1,115,000

FURNITURE.

Red gum leads the list of furniture woods in Mississippi, and supplies nearly twice as much as any other, but it is third from the bottom in average price. A man does not need a long memory to carry him beyond the time when red gum was not considered suitable material for furniture, or for much of anything else. If thrown upon a lumber pile in the mill yard, as was the custom once, and left to season in sun, wind, and rain, red gum boards warped so persistently that they became a discouraging proposition. Artificial heat in an old-style kiln was not much better; but mill men knew that red gum had the stuff in it that makes good lumber, and they began experimenting with it, and gradually the secrets of seasoning it were found out, although experienced lumbermen say there is something to be found out yet. When seasoning is done according to the latest approved methods, it sometimes falls a little short of expectations. The test frequently comes in working veneer glued upon a backing of some other wood. It appears that three things must work together to make success sure: the red gum must be in proper condition, the wood upon which it is to be glued must be just right, and the glue must lack nothing. If one of these factors is wanting, the job may fall short of success. That is true, of course, for all woods to some extent, but since it occurs a little oftener when the veneer is red gum than when it is mahogany, oak, or walnut, the conclusion has been reached that red gum has some peculiarities which must be carefully studied if success is to be attained in high-grade work. On a former page of this report something was said of the manner of making red gum veneer and of the characteristic figure of the wood. Furniture makers study these matters carefully. They not only use the gum under its own name, but they finish it in imitation of several other woods, among those most frequently imitated being Circassian walnut, mahogany, cherry, birch, maple and oak. Some of these imitations are produced almost wholly by the application of stains to give proper color; others have grain and figure printed upon the wood. That is the usual method of imitating oak. A certain manufacturer (not in Mississippi) suggested the process when he said: "We bring nothing but red gum into our mill and send nothing but oak out."

It should not be supposed that all red gum in the furniture business is choice figured veneer for outside use. Much common lumber and cheap veneer are employed for inside. It goes into frames, slides, drawer bottoms and backs, shelves, partitions, pigeonholes and boxes. Some cheap furniture for kitchen or pantry use is solid red gum, though many other cheap woods are as good or even better for that purpose. In England they make furniture of red gum and call it "satin walnut." That is only a trade name, as there is no such wood as "satin walnut." It has been said—though specific instances have not been cited—that red gum from the southern states is exported to Italy and France, is there made into furniture of artistic patterns, is reshipped to this country and sold under the name of French and Italian walnut. At any rate, there is a good market in Italy and France for red gum, and its identity seems to be lost when it reaches these countries, and at least some of it must be manufactured under the name of some other wood. Exporters of the wood say that foreign countries have been very successful in handling this wood and it is popular there. The field for the development of the red gum industry in this country, the making of high-grade commodities, appears to be only opening. The prediction has been made that the wood in a few years will sell for as much as good white oak.

The second wood on the furniture list, shown in Table 4, is red oak. That is the name under which it was reported, but the low average cost casts doubt on the wood's identity. It was probably Texan oak, yellow oak and others, with some genuine red oak;

for the latter cannot be bought in Mississippi in grades suitable for furniture, for \$15.23 per thousand feet. The low cost of yellow poplar was due to the

low grades used which went into drawer bottoms, sides and other unexposed parts. The average low cost of all the furniture woods in the table is surprising, except for cypress, white ash and longleaf pine. The table shows that the average cost of the 10,278,000 feet of material was only \$13.44. That indicates a remarkable opportunity for building up a furniture manufacturing business in Mississippi. Cheap material ought to more than offset high freight rates in carrying the finished products to market. If northern manufacturers can buy lumber in Mississippi, freight it north, make furniture of it, ship the furniture back and sell it in the region where the timber grew, there ought to be business for somebody in making and selling the finished article near the source of the raw material. The amount of furniture now made in Mississippi is a fair beginning only. There are possibilities of enormous expansion. Every foot of the wood used in the furniture factories of the state grew in Mississippi. It is doubtful if another state in the Union can make that showing.

FURNITURE.

Table 4.

FURNITURE.

KINDS OF WOOD	Quantity used annually.		Average cost per 1,000 ft. f. o. b. factory.	Total cost	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.
	feet B. M.	Per cent.				
Red gum	4,260,000	41.45	\$12.80	\$54,525	4,260,000	.....
Red oak	2,305,000	22.43	15.23	35,100	2,305,000	.....
Yellow poplar	1,853,000	18.03	9.11	16,875	1,853,000	.....
White oak	1,655,000	16.10	17.40	28,800	1,655,000	.....
Tupelo	100,000	.97	7.00	700	100,000	.....
Cottonwood	60,000	.58	15.00	900	60,000	.....
White ash	25,000	.24	20.40	510	25,000	.....
Cypress	10,000	.10	40.00	400	10,000	.....
Longleaf	10,000	.10	30.00	300	10,000	.....
Total	10,278,000	100.00	\$13.44	\$138,110	10,278,000	.....

VEHICLE AND VEHICLE PARTS.

Statistics of the vehicle industry are given in Table 5. The investigation is two-fold, in a measure; that is, the making of finished vehicles constitutes only part of it, while the manufacture of parts of vehicles ranks almost as a separate industry. Conditions are peculiar. Some shops take raw material and turn out the finished wagon or buggy ready for hitching the horses, but that is not the customary way of doing it. A portion of the work is done in one shop, and another shop finished it. Perhaps one factory makes wheels only, ready for the irons and the paint; it may be that hubs are the sole product of another. Some rough-turn spokes; some make poles and shafts; others assemble the parts, put the irons on and apply the paint. Occasionally a shop confines its operations to producing carriage bodies. Thus a number of factories may have a hand in the production of a single vehicle, and the report of no operator will give complete statistics. The finished product of one factory may become the raw material of another. The job must be followed through all the operations to get the first and last of it. Vehicle making is one of the most difficult of all the wood-using industries for the statistician to handle. There is constant danger of counting the same material twice, as it passes from factory to factory, or of missing it altogether. The difficulty is often much increased by the fact that parts of the work may be done in different states. The assembler of a carriage may buy the unpainted wheels in Arkansas, the pole or shafts in Kentucky, the body in Tennessee, and put on the irons and the paint in Mississippi. How can each of the states, in a case like that, receive its proper credit for the part it

makes of the carriage? The only practicable course for the statistician in a case of that kind is to check and recheck as carefully as possible, and offer the result as the best approximation obtainable under the circumstances.

White oak, hickory and yellow poplar are the three chief vehicle woods in Mississippi, and constitute more than ninety-seven per cent of all. The hickory and the oak are made into wheels and other running gear, while the poplar is converted into bodies. Beds for farm wagons take some of the best. Poplar has always been a favorite material for wagon beds in this country, but the advance in its cost within the past twenty or thirty years has opened the way for substitutes, and cottonwood, willow, and some of the pines have taken much of the wagon-bed trade. Yellow poplar, however, is still large in spite of high price. The same wood has long filled a place of equal importance in the manufacture of fine carriage bodies, particularly broad-panels and curved parts. Yellow poplar finishes with a fine, smooth surface, and it receives and displays paint better than any other wood. It is much used for the tops of light business wagons, for butchers, bakers, grocers, milkmen and others.

The only water oak and pin oak listed in the state are found in this industry, and they are the cheapest in Table 5. Most of the longleaf pine was made into wagon bottoms, and the small amount of cottonwood listed was converted into farm-wagon beds.

In addition to wagons, this industry includes carts, trucks, sleds, wheelbarrows and push carts. A good many hand trucks are used at wharfs and landings on the banks of navigable rivers where bulky commodities are loaded on boats or unloaded.

VEHICLES AND VEHICLE PARTS.

Table 5.

VEHICLE AND VEHICLE PARTS.

KINDS OF WOOD	Quantity used annually.		Average cost per 1,000 ft. f. o. b. factory.	Total cost	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.
	feet B. M.	Per cent.				
White oak	4,636,000	45.11	\$21.89	\$101,490	4,636,000	.....
Hickory	4,326,000	42.09	28.10	121,555	3,826,000	500,000
Yellow poplar	1,042,000	10.14	44.27	46,130	1,042,000	.....
White ash	115,000	1.12	37.61	4,325	40,000	75,000
Water oak	75,000	.73	10.00	750	75,000	.....
Pin oak	50,000	.49	15.00	750	50,000	.....
Longleaf pine	30,000	.29	28.00	840	30,000	.....
Cottonwood	3,000	.03	40.00	120	3,000	.....
Total	10,277,000	100.00	\$26.85	\$275,960	9,702,000	575,000

SASH, DOORS, BLINDS AND GENERAL MILL-WORK.

Ten woods contribute to this industry, but four of them aggregate ninety-eight per cent of all, and three-fourths are longleaf and shortleaf pine. Window and door frames are important commodities be-

longing here, as are stair work, railing, balustrades and posts. Among the woods listed, sweet birch is highest in price, and of course comes wholly from without the state, as it does not grow in commercial quantities in Mississippi. Most of the 40,000 feet was made into doors. In only one other industry,

fixtures, was this wood used in the state. The quantity of cypress scarcely comes up to expectation.

Tupelo is second in the table, with a million and a quarter feet. This wood was late in receiving recognition, and lumbermen once were in the habit of passing it by. It was subject to seasoning troubles the same as red gum, or perhaps the troubles were worse. Partial seasoning is sometimes effected by girdling the standing trees six months or a year before they are felled. That step is generally taken to facilitate the handling of the logs. Tupelo is a deep swamp tree, and frequently stands in water from one to ten feet deep. In that case it is difficult to transport the logs to the mill unless they can be floated. Green logs are too heavy to float easily, but six months after deadening they have dried sufficiently to keep on the surface.

The wood of tupelo more nearly resembles yellow poplar in appearance than any other wood with which it is apt to be compared. It is often called bay poplar, and sometimes the name is shortened to bay. The name is said to have been applied originally to this timber cut on the lower Chesapeake Bay, the intention being to pass it as yellow poplar growing near the bay. Though the standing trunk bears some resemblance to yellow poplar, and the wood

also suggests poplar, the latter wood possesses several properties which tupelo does not. In the present industry, Table 6, the yellow poplar cost about \$42 per thousand, and the tupelo cost \$11. That is sufficient to show that manufacturers who use both

woods recognize considerable difference between them. Nearly three-fourths of all the tupelo reported by the wood-using industries in the state was made into sash, doors, blinds and general millwork. It is sometimes called cotton gum.

SASH, DOORS, BLINDS AND GENERAL MILLWORK.

Table 6.

SASH, DOORS, BLINDS AND GENERAL MILLWORK.

KINDS OF WOOD	Quantity used annually.		Average cost per 1,000 ft. f. o. b. factory.	Total cost	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.
	feet B. M.	Per cent.				
Longleaf pine.....	5,157,000	63.81	\$15.36	\$79,231	5,157,000	.....
Tupelo	1,250,000	15.47	11.00	13,750	1,250,000	.....
Shortleaf pine.....	1,088,000	13.46	18.45	20,069	1,088,000	.....
Cypress	490,000	6.06	36.28	17,775	140,000	350,000
Yellow poplar.....	42,000	.52	41.98	1,763	22,000	20,000
Sweet birch.....	40,000	.50	60.00	2,400	.....	40,000
Red oak.....	8,000	.10	36.50	292	8,000	.....
White oak.....	4,000	.05	33.00	132	4,000	.....
Red gum.....	2,000	.02	11.50	23	2,000	.....
Evergreen magnolia....	1,000	.01	12.00	12	1,000	.....
Total.....	8,082,000	100.00	\$16.76	\$135,447	7,672,000	410,000

HANDLES.

Hickory is the chief handle wood in Mississippi, and as Table 7 shows, supplies more than eighty-nine per cent of the material. For certain kinds of handles it has no superior among the world's known woods. Its best qualities are seen in slender handles where strength, toughness and resiliency are required. The ax handle and the long hammer handle are typical. Though hickory may be greatly bent and deflected, it will spring back and regain its original position, and continue to do this for a long period, and times almost innumerable. Other woods may do it for a short time, but they are apt to lose their resiliency, and set permanently out of shape. All hickories do not give similar results when made into handles. Different parts of the same tree show different results, and the qualities of the wood change with age. The butt of a young tree is tougher than the same wood when the trunk is old; and the part of the trunk near the ground is better than that toward the top. Handles test the quality of hickory more thoroughly than any other commodity, not even excepting buggy spokes.

It is well known that hickory wood is of two colors, white and red. The white is the sapwood, the red is the heart. The proportion between the heartwood and the sapwood varies greatly in different trees, in different ages of the same tree, and between different species. Sometimes young trees growing in the open are nearly all white wood; some large trunks have comparatively thin shells of sapwood.

Prejudice has long existed against the use of the red heartwood for handles. Better acquaintance with the properties of the red wood of hickory has somewhat lessened the prejudice against it, at least for some kinds of handles. If resiliency is not insisted upon, as when a thick pick handle is wanted, the red hickory answers very well. There is a general tendency to work into use more and more of the heartwood. Scarcity and the desire to utilize more closely are powerful influences operating to give the heartwood a place.

Much of the hickory-handle wood never passes through an ordinary sawmill. The bolts are cut in the woods, and are often split into billets and in that form go to the handle factories. Many sizes are made, the largest being the cant-hook handles, and

from that the sizes range down to chisel and gimlet handles. A fourth of a million feet of white oak is employed in this industry and a rather large quantity of red gum also. The ash on the list is used for hoe, rake and pitch-fork handles. Most of the poplar and gum was made into small handles, such as are employed for hand grips on wire balls and on bundle carriers. Some of them are used for fireiron handles, and as the wooden part of pan and cooking pot handles. Neither a tough nor a hard wood is required for this service. Some handles of this kind are painted black; intended for cheap imitations of ebony. Handle woods average low in cost in Mississippi, about \$12 a thousand feet. That is because a large part of the material reaches the factory before much labor has been expended on it.

HANDLES.

Table 7.

HANDLES.

KINDS OF WOOD	Quantity used annually.		Average cost per 1,000 ft. f. o. b. factory.	Total cost	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.
	feet B. M.	Per cent.				
Hickory	3,604,000	89.30	\$12.25	\$44,140	3,604,000	.....
White oak.....	250,000	6.19	10.00	2,500	250,000	.....
Red gum.....	107,000	2.65	8.00	856	107,000	.....
Yellow poplar.....	50,000	1.24	10.00	500	50,000	.....
White ash.....	25,000	.62	16.00	400	25,000	.....
Total.....	4,036,000	100.00	\$11.99	\$48,396	4,036,000	.....

AGRICULTURAL IMPLEMENTS.

The most important commodities of this industry are machine and appliances for growing, ginning and handling the cotton crop. The state supplies all the woods demanded by the manufacturers, and

nearly three-fourths of all is longleaf pine. It possesses the requisite hardness and strength for cotton presses and gins. The figures shown in Table 8 do not indicate that general plantation machinery is extensively manufactured in the state.

Itself readily to quarter sawing, and has a characteristic appearance. When most woods, as white oak, are quarter sawed, the medullary, or silver-like rays of wood, are cut obliquely across, exposing bright patches, streaks and flecks. The medullary rays of sycamore are cut across in the same way when that wood is quarter sawed, but the rays, instead of being the brightest parts of the wood, are the darkest, and the result is that quarter sawed sycamore is darker than plain sawed. Its peculiar appearance is much admired.

The high price of evergreen magnolia in this industry is notable, for it is usually quite cheap. It is one of the southern woods which is coming into favor. It was formerly left standing in the swamps when the other woods were cut out, and the heavy, intensely-green, laurel-like foliage attracted the attention of travelers who were often led to ask why such fine-appearing timber was left when other was taken. The reply was almost invariably that it was not worth marketing. That answer was of long-standing in Mississippi. Nearly a century ago William Darby, who has been several times quoted in this report, dismissed magnolia in his forest survey of the state, with the short and decisive remark: "Magnolia abounds, but is too useless to deserve mention."

It is better thought of now, but it is a variable wood. Some is of high grade, other is poor; one piece may be nearly as white as holly, another black enough to compare with ebony. The wood may be interspersed with very hard streaks which make it a difficult material to pass through wood-working machines. The colors are not permanent, the light grow darker, the dark lighter. In spite of these disadvantages, magnolia is liked for many purposes. It is substituted for holly in brush backs, for yellow poplar for panels, for various woods in boxes, for cottonwood and basswood in some kinds of woodenware, and it has a place of its own as general lumber. There are two species in use, the evergreen which is largest, and the sweet which is scarce and not so frequently used.

AGRICULTURAL IMPLEMENTS.

Table 8.

AGRICULTURAL IMPLEMENTS.

KINDS OF WOOD	Quantity used annually.		Average cost per 1,000 ft. f. o. b. factory.	Total cost	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.
	feet B. M.	Per cent.				
Longleaf pine.....	575,000	71.88	\$17.39	\$10,000	575,000	.....
Shortleaf pine.....	65,000	8.13	15.00	975	65,000	.....
White oak.....	65,000	8.12	27.38	1,780	65,000	.....
Red oak.....	55,000	6.87	24.36	1,340	55,000	.....
Red gum.....	30,000	3.75	12.00	360	30,000	.....
Yellow oak.....	5,000	.63	18.00	90	5,000	.....
Post oak.....	5,000	.62	18.00	90	5,000	.....
Total.....	800,000	100.00	\$18.29	\$14,635	800,000	.....

FIXTURES.

Fixtures are akin on the one hand to furniture and on the other to interior finish. They are not as movable as furniture or as fixed as finish. They are made for banks, stores, offices, saloons and halls, and consist of showcases, cabinets, shelving, specially-made desks and tables, partitions, counters, bars, railings and many other appliance of like kind. The wood used was of higher average cost than for any other industry in Mississippi. That was not so much on account of the demand for rare or costly kinds as to the fact that high grades and large pieces were demanded. Extra wide boards are demanded for counter tops and broad panels in partitions, tables, desks and cabinets. These panels are usually built

up of veneers laid upon cores or backing of other woods to lessen the liability to warp, check and split. More than half was longleaf pine, but it went largely into frames and concealed parts while the surface material was some wood more expensive, and was in most cases applied in the form of veneer. The prices paid for the white oak, yellow poplar, cypress, sweet birch, sycamore, red gum and magnolia listed in Table 9 indicates that good grades were used. Longleaf and shortleaf pine are the cheapest woods in the table. Some of the red gum was finished in imitation of other woods. Part of the sycamore was made into shelving and interior parts of cabinets and counters; but part was of high grade and was selected for the exposed surfaces. This wood may be sawed in a way to show attractive grain. It lends

FIXTURES.

Table 9.

FIXTURES.

KINDS OF WOOD	Quantity used annually.		Average cost per 1,000 ft.	Total cost f. o. b. factory.	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.
	feet B. M.	Per cent.				
Longleaf pine.....	225,000	51.31	\$18.00	\$4,050	225,000	.....
White oak.....	64,000	14.60	42.42	2,715	64,000	.....
Yellow poplar.....	32,000	7.30	30.00	960	32,000	.....
Cypress.....	30,000	6.84	45.00	1,350	.....	30,000
Shortleaf pine.....	25,000	5.70	18.00	450	25,000	.....
Sweet birch.....	22,000	5.02	58.64	1,290	.....	22,000
Sycamore.....	20,000	4.56	35.00	700	20,000	.....
Red gum.....	17,500	3.99	37.71	660	17,500	.....
Evergreen magnolia...	3,000	.68	25.00	75	3,000	.....
Total.....	438,500	100.00	\$27.94	\$12,250	386,500	52,000

MISCELLANEOUS.

Table 10 presents statistics of manufactures which are not of sufficient importance in Mississippi to be classed as separate industries. The chief lines covered by statistics in this table are pumps, patterns,

saddles, harness, laundry appliances, paving blocks, mill machinery, woodenware, novelties, boats and ships, coffins, caskets and excelsior. The cheapest wood reported in the state is in this table, shortleaf pine for excelsior and the most expensive is white pine bought by pattern makers.

MISCELLANEOUS.

Table 10.

MISCELLANEOUS.

KINDS OF WOOD	Quantity used annually.		Average cost per 1,000 ft.	Total cost f. o. b. factory.	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.
	feet B. M.	Per cent.				
White ash.....	2,000,000	33.08	\$20.00	\$40,000	1,000,000	1,000,000
Red gum.....	1,105,000	18.27	19.87	21,960	1,105,000	.....
Cypress.....	600,000	9.92	12.00	7,200	300,000	300,000
Longleaf pine.....	510,000	8.43	11.17	5,695	510,000	.....
Cottonwood.....	510,000	8.43	10.20	5,200	510,000	.....
Shortleaf pine.....	500,000	8.27	6.50	3,250	500,000	.....
Tupelo.....	450,000	7.44	15.11	6,800	450,000	.....
Yellow poplar.....	350,000	5.79	24.57	8,600	350,000	.....
White pine.....	10,000	.17	80.00	800	.....	10,000
Black gum.....	7,000	.12	15.00	105	7,000	.....
Red oak.....	5,000	.08	12.00	60	5,000	.....
Total.....	6,047,000	100.00	\$16.48	\$99,670	4,737,000	1,310,000

SUMMARY BY INDUSTRIES.

Wood-using industries in Mississippi, as presented in this report, are arranged in eight tables, with a miscellaneous group shown in a separate table.

Table 11, which follows, shows these industries, the total quantity of wood demanded by each, the average cost per thousand feet, and the total cost. The per cent of the wood grown in and out of the state is shown also.

SUMMARY OF WOODS USED BY INDUSTRIES IN MISSISSIPPI.

Table 11.

SUMMARY OF WOODS USED BY INDUSTRIES IN MISSISSIPPI.

INDUSTRY.	Quantity used annually.		Average cost per 1,000 ft.	Total cost f. o. b. factory.	Grown in Mississippi, feet B. M.	Grown out of Miss., feet B. M.
	feet B. M.	Per cent.				
Planing-mill products..	539,016,437	87.18	\$11.69	\$6,301,456	99.89	.11
Boxes and crates.....	39,295,093	6.36	13.45	528,607	97.16	2.84
Furniture.....	10,278,000	1.66	13.44	138,110	100.00	.....
Vehicle & vehicle parts.	10,277,000	1.66	26.85	275,960	94.40	5.60
Sash, doors, blinds and general millwork....	8,082,000	1.31	16.76	135,447	94.93	5.07
Miscellaneous.....	6,047,000	.98	16.48	99,670	78.34	21.66
Handles.....	4,036,000	.65	11.99	48,396	100.00	.....
Agricultural implements	800,000	.13	18.29	14,635	100.00	.....
Fixtures.....	438,500	.07	27.94	12,250	88.14	11.86
Total.....	618,270,030	100.00	\$12.22	\$7,554,531	99.35	.65

FUTURE SUPPLY OF TIMBER.

It was formerly not customary in this country for people to trouble themselves to look ahead to see where the future supply of timber was to come from. The evidence of this is seen in the fact that large regions which were once heavily timbered now have little. The tree cutter and tree planter were strangers to each other. A slight tendency toward a change in policy is noticeable in many parts of the United States. It has been learned that it not only is possible to grow timber for commercial purposes, but if done with judgment and patience, it may be carried out with profit.

The people of Mississippi are now passing over a road on their industrial journey which some other states traveled some years ago. They are harvesting the crop of trees which nature planted and brought to maturity unaided by man. Nature will not do it again, for conditions have changed. Growers of farm crops will not give up their rich land and wait two hundred years for nature to bring on another cutting of trees, but another way to procure needed timber must be found, and it is now time to begin seriously to think it over. Thinking alone will not suffice, but experiments and experience must be made use of.

Mississippi's future woods must grow on land which can be spared from agriculture; that is, on

thin, rugged, and wet land. When the present forests are cut off, which will be accomplished in the not distant future, the second and succeeding timber harvests will come from wood-lots which will belong with the farms and plantations; from thin lands where annual crops will not pay; from wet and partly submerged ground where trees will flourish, but corn, cane, rice and cotton will not. Drainage will doubtless reclaim large areas of swamp in Mississippi, but much will never be drained for many years, and that land's proper function will be to grow trees. Some of the soil of the uplands, owing to its great depth and its friable nature, gullies badly. Protecting cover and belts of trees will be planted to check erosion, and the timber so planted will serve the double purpose of protecting the ground and producing posts, fuel, and saw timber.

Timber planters will select species which will suit place and purpose best. Pine will not be relegated in swamps nor willow to uplands. Slow-growing species will not be favored in situations where trees of quick growth will flourish, for time is an important factor in forestry. Seven or eight pines are native in Mississippi, but if a man means to plant he will select the one or two which will grow fastest. The slow growth of longleaf pine would seem to be a pretty effective bar against much of a future for it; and shortleaf has only a little more hope. Loblolly and Cuban, neither of which occupies first place

In the state now as a source of supply, promise to strike up to the front, because a tree of either of these species can produce a saw-log while longleaf is growing a cross-tie. The spruce pine which is seldom mentioned now because it is scarce and its range is local, may have a surprise in store when tree planting comes into practice. The excellent quality of its soft, white wood, and its rapid growth, hold great promise for this tree. It has never been able to get much foothold under natural conditions. Neither did catalpa and osage orange which by man's help have now spread over a considerable part of the United States.

Nature was profuse in planting species of oak in Mississippi, but when men shall begin to do the planting it may be depended upon that some of the small, slowly-growing kinds will be relegated to the ravines and sterile ridges where natural methods will hold longest. The tendency in forestry is to reduce rather than increase the number of woods found under natural conditions. There are nearly five hundred tree species in the United States. If timber were grown from plantings and coplice (sprouts) in this country as in some European countries, probably not more than one species in ten would survive. The oaks in Mississippi may be expected to follow that rule, when the time of tree culture arrives. The best and most rapid growers will be chosen, the others will be rejected. It does not, however, necessarily follow that the trees which grow most rapidly will be the most profitable, for the fast grower may have wood of poor qualities, and in that case it will pay to wait longer for a better tree. White oak, post oak, Texan oak and willow oak will be strong candidates for favor. The first two, though not very rapid growers, have wood of sterling qualities, and with good grain and figure; and the planter can afford to wait a good while for them to reach marketable size, for the price will be high. The Texan oak accommodates itself to most soils, as it is one of the most vigorous trees of Mississippi. The willow oak may be a little off if beauty of grain is considered, but it lays on wood at such a rate that it has all the other oaks of the region beaten, except the water oak which appears to do about as well.

There are many kinds of trees which grow rapidly in wet ground, such as cottonwood, Carolina poplar and black willow; and others grow more slowly, like red gum, tupelo and cypress. So much swamp land is found in Mississippi that tree culture on such land may be expected to assume large proportions in future years. Enormous cuttings of cottonwood and willow may be made at intervals of thirty to fifty years, while cypress, tupelo and red gum will take longer to reach desirable size; but many tracts will doubtless be kept growing such species long after forests planted and cared for in nature's way cease to be looked upon as a profitable resource in that region.

Tree planters will always find profit in such species as yellow poplar and black walnut, hickory and persimmon, which possess qualities fitting them for special uses. The growing of fence posts, cross-ties, and telephone poles will be one of the first practical purposes to which forestry will be devoted in the region. The demand is ever present, the trees soon grow to proper size. Locust, catalpa, red cedar and osage orange will answer for posts and poles, and are long-lasting woods, but they are rather small for the material, unless permitted to stand a long time; and some more suitable species may be expected to meet the demand for ties.

ADDITIONAL STATISTICS.

Many sawmills in Mississippi plane timber primarily to reduce freight. Sometimes heavy timbers are so dressed. The weight removed in the process of planing may amount to 500 or more pounds per 1,000 feet, and the item is worth saving. The lumber or the timbers so dressed go into the general market, and much of it becomes the raw material for further manufacturers. Other is used in rough construction. This study did not regard lumber dressed in that way as a manufactured product entitled to a place in this report; but figures showing the annual quantity of such material turned out in Mississippi are presented as a matter of information. Table 15 which follows shows the kinds of wood planed and the quantity of each, with the total cost and the part grown in and out of the state. It is, of course, understood that it is in addition to the totals given in preceding tables.

The falling off in the output in recent years is attributed to the depletion of the pines which produce the turpentine, chiefly longleaf. Old turpentine regions become exhausted, and the operators move on to new areas. Georgia was once a much larger producer than it now is, while Louisiana and Texas furnished little. The center of supply has moved west, and old districts have declined more and more.

USES OF WOODS.

The following list shows the uses of each of the woods in Mississippi, so far as reported by the manufacturers; but it would be misleading to conclude that these are all the uses of the woods, or even all the uses to which they are put in the state. Manufacturers generally regard only the most important uses; the places where it has served them best, and this fact should be kept in mind when considering the uses given.

BLACK GUM—Bowls, boxes, broom handles, crates, egg cases, hopper boxes, kitchen utensils, ox yokes, woodenware.

BLACK WALNUT—Balusters, baseboards, casing, interior finish, mantels, moldings, panels, partition, newel posts, railings, starwork.

BLACK WILLOW—Baskets, boxes, crates, egg-cases, fruit dryers, trays.

COTTONWOOD—Boxes, crates, cupboards, egg cases, excelsior, furniture, ironing boards, kitchen cabinets, kitchen safes, stands, tables, wagon boxes.

CYPRESS—Balusters, blinds, boxes (packing), brackets, caskets, ceiling, coffins, closets, columns, doors, finish (interior), flooring, frames, kitchen cabinets, kitchen safes, kitchen tables, mantels, moldings, panels, pedestals, refrigerators, sash, shutters, sideboards, window frames.

EVERGREEN MAGNOLIA—Baskets, boats, boxes, counters, crates, excelsior, mantels, office fixtures, ox-yokes, shelving, showcases.

HICKORY—Axles, bent shafts, doubletrees, eveners, handles (ax, peavy, pick, tool), poles, reaches, rims, singletrees, spokes, spring bars.

LOBLOLLY PINE—Boxes, casing, ceiling, columns, crates, doors, flooring, interior finish, molding, partition, railing, sash, siding, window frames.

LONGLEAF PINE—Agricultural implements, blinds, boxes, brackets, cabinets, cars, ceiling, china closets, columns, crates, decking, door frames, drop siding, flooring, furniture, grain doors, interior finish, molding, partition, paving blocks, pine oils; pyroligneous acid, railing, sash, sawmill machinery, screen doors, siding, spindles, stepping, stair work, stove fixtures, tar, tar oil, turpentine, wagon tongues, wagon boxes, weather boards, window casing, window frames, woodenware.

PIN OAK—Bolsters, hounds, log trucks, spokes, wagon tongues.

POND PINE—Baseboards, casing, ceiling, flooring, interior trim, mantels, molding, railing, scroll work, partition, siding, window frames.

POST OAK—Cotton gins, cultivators, harrows, hay loaders, mowers, planters, plows, seeders.

RED GUM—Brushes, boxes (packing, and cigar), broom handles, caskets, chairs, church pews, crates, furniture, hopper boxes, interior finish, machinery parts, mantels, molding, pails, picture frames, porch columns, pump heads, stair work, tables, well curbing.

RED OAK—Agricultural implements, case goods, casing, doors, dressers, flooring, furniture, handles, harrows, interior finish, molding, plow beams, sash, stair work, tables.

SHORTLEAF PINE—Balusters, blinds, boats, bridges, boxes, cabinets, car siding, ceiling, cotton presses, doors, excelsior, flooring, frames, grain doors, interior finish, lath, molding, partition, sash, siding, school desks, store fixtures, wagon boxes, window casing.

SWEET BIRCH—Baskets, crates, fixtures, furniture, interior trim, show cases.

SYCAMORE—Baskets, boxes, core work, crates, egg cases, fixtures, pails, show cases, tubs.

TUPELO—Boxes, bowls, broom handles, drawer bottoms, flooring, hopper boxes, interior work, porch columns, pump heads, pump tubing.

WATER OAK—Axles, bolsters, double trees, hounds, poles, wagon beds.

WHITE ASH—Bent bows, boat oars, buggy bodies, felloes, fork handles, hoe handles, wagon bodies, wagon tongues, wheels.

WHITE ELM—Baskets, boxes, crates, egg cases, hoops, trunk slats.

WHITE PINE—Casket cases, clasks, general mill-work, models, machine snop patterns, turned stock, woodenware, novelties.

WHITE OAK—Agricultural implements, casing, ceiling, chairs, church pews, dressers, fixtures, flooring, furniture, gear work, handles, harrows, lounges, mantels, molding, picture frames, plow beams, sawmill machinery, show cases, spokes, tables, ten pins, wardrobes.

YELLOW OAK—Cotton gins, cultivators, harrows, hay rakes, mowers, planetrs, plows, seeders.

YELLOW POPLAR—Auto bodies, bevel siding, boxes, broom handles, caskets, drawer bottoms, excelsior, fixtures, furniture, interior work, porch col-

umns, pump heads, shelving, show cases, wagon-box boards.

The following woods were found in use in the state but were not separately reported by the manufacturers:

BASSWOOD—Boxes, excelsior, fixtures, molding.
BEECH—Boxes, flooring, furniture, wagon bolsters.

BUTTERNUT—Finish, fixtures, pews.
CUBAN PINE—Boxes, car siding, ceiling, crates, flooring, siding.

CHINQUAPIN OAK—Fixtures, handles, vehicles.
COW OAK—Furniture parts, handles, hubs, reaches, spokes, wagon bottoms.

LIVE OAK—Handles, wagon stocks.
RED CEDAR—Chests.

SHITTIMWOOD—Boxes, crates, fixtures, furniture.

SILVER MAPLE—Boxes, finish, flooring.
SPRUCE PINE—Doors, sash, screens, shop work.

DIRECTORY.

Below is a list of Mississippi wood-using manufacturers who supplied the data contained in this report. Those manufacturing several products classified under different industries will appear in the list, with their addresses, under more than one industry.

Agricultural Implements.

Southern Manufacturing Company, Columbus.
W. T. Adams Machine Company, Corinth.
Harrison-Cochran Lumber Company, Hattiesburg.
J. W. Hlett, Iuka.

Boxes and Crates, Packing.

W. A. Price, Carpenter.
A. H. Slegrist, Corinth.
Alford & Miller, Gallman.
Georgetown Manufacturing Company, Georgetown.
Paepcke-Leicht Lumber Company, Greenville.
J. J. Newman Lumber Company, Hattiesburg.
Hazlehurst Box Factory, Hazlehurst.
Little Creek Veneer Company, McLain.
Carrier Lumber & Manufacturing Company, Sardis.
Terry Manufacturing Company, Terry.
Toledo Carriage Woodwork Company, Toledo, O.
Anderson-Tully Company, Vicksburg.
W. F. Foxworth, W. Columbia.

Car Construction.

Harrison-Cochran Lumber Company, Hattiesburg.
Tartt Lumber Company, Lauderdale.
Batson-McGehee Company, Millard.
C. E. Mayerhoff, Pachuta.
Carrier Lumber & Manufacturing Company, Sardis.

Dressed Stock.

A. Brannin, Aberdeen.
Green County Lumber Company, Bexley.
Elder & Bradford, Biloxi.
W. Fountain & Co., Biloxi.
Cochran & Harrington, Bogda.
Adams Bros. Lumber Company, Brandon.
The Pine Belt Lumber Company, Braxton.
The Robinson Land & Lumber Company, Chicora.
Alexander Lumber Company, Clarksdale.
The Lamar Lumber Company, Clyde.
Falk & Stolzer, Columbus.
Hampton Lumber Company, Columbus.
Interstate Lumber Company, Columbus.
Deemer Manufacturing Company, Deemer.
Anchor Saw Mill Company, Ellisville.
Scogin Bros., Forest.
City Lumber Company, Gulfport.
Farnsworth Lumber Company, Gulfport.
Home Lumber Company, Gulfport.
Handsboro Lumber Company, Handsboro.
W. B. Birdyes, Harrisville.
Grantham Bros., Hopewell.
Native Lumber Company, Howison.
W. H. Wesley, Inda.
Southern Lumber & Manufacturing Company, Jackson.
Kola Lumber Company, Kola.
Gilchrist-Fordney Company, Laurel.
Ingram-Day Lumber Company, Lyman.
J. J. White Lumber Company, McComb.
City Lumber Company, Magnolia.
Cotton States Lumber Company, Meehan Junction.
Carter Lumber Company, Meridian.
Eureka Planing Mills, Meridian.
Meridian Planing Company, Meridian.
Cooley Bros., Mize.
Keystone Lumber & Brick Company, Monroe.
J. T. Kinney, Monticello.
P. M. Ikeler, Moselle.
L. N. Dantzier Lumber Company, Moss Point.
O'Leary Mill Company, Moss Point.
Robinson Land & Lumber Company, Moss Point.
Newton Lumber Company, Newton.
Butterfield Lumber Company, Norfield.
Oakvale Lumber Company, Oakvale.

F. C. Ott, Osyka.
Lockwood Lumber Company, Pelahatchie.
J. F. Wilder Lumber Company, Perkinston.
McInnes Lumber Company, Petal.
Tallahatchie Lumber Company, Phillip.
Louisell Lumber Company, Placayune.
James Hand & Bro., Purvis.
Richton Lumber Company, Rlehton.
Ship Island Lumber Company, Sanford.
Chas. Beagley, Seoba.
Brownlee Lumber Company, Shubuta.
Ten Mile Lumber Company, Ten Mile.
Finkton Lumber Company, Wiggins.

Fixtures.

Hattiesburg Cabinet Works, Hattiesburg.
Houston Lumber Company, Houston.
Cambre Bros., Jackson.
Westbrook Manufacturing Company, Jackson.

Furniture.

W. Q. McKenzie, Columbia.
W. A. Stewart, Corinth.
Georgetown Manufacturing Company, Georgetown.
Tallahatchie Furniture Manufacturing Company, Greenwood.
O. C. Bacon, Marks.
Meridian Furniture Factory, Meridian.
Mississippi Lumber Company, Qultman.
Mississippi Furniture Company, Vicksburg.
Delta Table & Chair Company, Yazoo City.

Handles.

S. A. Goodwin, Blue Mountain.
Mathlston Handle Company, Mathlston.
Hartzell Handle Company, New Albany.
Arthur Delapierre, Pyland.

Miscellaneous.

Emmons & Bullard, Basic.
W. T. Adams Machine Company, Corinth.
W. A. Stewart, Corinth.
Clarksdale Manufacturing Company, Clarksdale.
W. Q. McKenzie, Columbia.
Sneed & Jamison, Greenwood.
Gulfport Creosote Company, Gulfport.
Fetterman Bowl & Column Manufacturing Company, Ittabena.
Jackson Casket & Manufacturing Company, Jackson.
Cliff Williams Machine Company, Meridian.
Batson-McGehee Company, Millard.
Wilsey & Shaffer Manufacturing Company, Vicksburg.
Wetherbee Huggins Company, Waynesboro.

Planing Mill Products.

L. J. Alford Lumber Company, Ackerman.
Lumber-Mineral Company, Arbo.
Mrs. K. Edwards & Sons, Bay St. Louis.
C. C. Gray, Bay St. Louis.
R. J. Williams Lumber Company, Bay St. Louis.
Bay Springs Lumber Company, Bay Springs.
Green County Lumber Company, Bexley.
S. A. Goodwin, Blue Mountain.
Hodges Bros., Booneville.
Smith & Payne Lumber Company, Braxton.
Central Lumber Company, Brookhaven.
J. E. Clement, Burnsville.
Lacey Lumber Company, Carrlere.
Tallahatta Lumber Company, Chunky.
Clarksdale Manufacturing Company, Clarksdale.
The Lamar Lumber Company, Clyde.
W. C. Wood Lumber Company, Collins.
Whitfield Planing Mill Company, Columbia.
Bell Lumber & Manufacturing Company, Columbus.
Cheatham & Son, Columbus.
Hampton Lumber Company, Columbus.
J. R. Webster Lumber Company, Comeby.
Pocahontas Lumber Company, Corinth.
Brookpark Lumber Company, Enterprise.
J. H. Johnson, Enterprise.
Eureka Lumber Company, Estabutchle.
W. B. Lundy Lumber Company, Fenton.
J. W. Parsons, Gallman.
Robinson Lumber Company, Gloster.
W. B. Birdyes, Harrisville.
Firm Lumber Company, Hattiesburg.
Harrison-Cochran Lumber Company, Hattiesburg.
McInnis Lumber Company, Hattiesburg.
J. J. Newman Lumber Company, Hattiesburg.
Hazlehurst Lumber Company, Hazlehurst.
J. M. Hemphill Lumber Company, Hemphill.
Wickware Lumber Company, Hickory.
J. L. Crawford, Hickory Flat.
Houston Planing Mill Company, Houston.
Native Lumber Company, Howison.
W. H. Wesley, Inda.
Iuka Lumber Company, Iuka.
Cambre Bros., Jackson.
Enochs Lumber & Manufacturing Company, Jackson.
Austin Lumber Company, Jamestown.
G. B. Merrill & Bro., Lake.
Tartt Lumber Company, Lauderdale.

Eastman, Gardiner & Co., Laurel.
 Gilchrist-Fordney Company, Laurel.
 The H. Weston Lumber Company, Logtown.
 Longview Lumber & Timber Company, Longview.
 The K C Lumber Company, Lucedale.
 Hinton & Wells, Lumberton.
 Cotton State Lumber Company, Meehan Junction.
 Bostick Lumber Company, Meridian.
 Carter Lumber Company, Meridian.
 Eureka Planing Mills, Meridian.
 Meridian Furniture Factory, Meridian.
 Batson-McGehee Company, Millard.
 P. M. Ikeler, Moselle.
 L. N. Dantzler, Moss Point.
 E. A. Enochs, Natchez.
 R. F. Learned & Son, Natchez.
 C. E. Mayerhoff, Pachuta.
 Adams Bros. Lumber Company, Pelahatchie.
 Car Dal Lumber Company, Pinebur.
 Poplarville Saw Mill Company, Poplarville.
 Trexler Lumber Company, Prentiss.
 Mississippi Lumber Company, Quitman.
 Bentley & Emery, Richton.
 Ripley Lumber & Manufacturing Company, Ripley.
 Robinson Bros. Lumber Company, Robinwood.
 Harmon Lumber Company, Scooba.

Conner Lumber Company, Seminary.
 H. G. Doxsey & Co., Starkville.
 New Island Lumber Company, Union.
 Curphey & Mundy, Vicksburg.
 West Point Manufacturing Company, West Point.
 Lyndon Lumber Company, Wingate.

Sash, Doors, Blinds, and General Millwork.

C. C. Gray, Bay St. Louis.
 Bay Springs Lumber Company, Bay Springs.
 T. J. Rosell Manufacturing Company, Biloxi.
 W. Q. McKenzie, Columbia.
 W. A. Stewart, Corinth.
 Alexander Lumber Company, Greenville.
 Tallahatchie Furniture Manufacturing Company,
 Greenwood.
 Nevers Sash & Door Factory, Gulfport.
 Craft Cabinet Works, Hattiesburg.
 Harrison-Cochran Lumber Company, Hattiesburg.
 Hattiesburg Cabinet Works, Hattiesburg.
 Houston Lumber Company, Houston.
 Fetterman Bowl & Column Manufacturing Company,
 Ittabena.
 Cambre Bros., Jackson.
 Enochs Lumber & Manufacturing Company, Jackson

O. C. Bacon, Marks.
 Acme Supply Company, Meridian.
 Caldwell Manufacturing Company, Meridian.
 Curphey & Mundy, Vicksburg.
 Mississippi Furniture Company, Vicksburg.

Vehicles and Vehicle Parts.

L. J. Alford Lumber Company, Ackerman.
 W. Q. McKenzie, Columbia.
 W. E. Small Spoke Manufacturing Company, Corinth.
 Love Wagon Company, Durant.
 Georgetown Manufacturing Company, Georgetown.
 W. S. Higginbotham, Houston.
 McGuire Bro. & Small, Houston.
 Falk & Kenney, Jackson.
 Hoopes Bros. & Darlington, Jackson.
 Lindsay Wagon Company, Laurel.
 Louisville Spoke Company, Louisville.
 Whitaker Bros., Meridian.
 Cliff Williams Machine Company, Meridian.
 The Weis & Lesh Manufacturing Company, New Albany.
 Toledo Carriage Woodwork Company, Toledo, O.
 D. S. Biggs, Winborn.



Walter Mulford

The Wood-Using Industries of Louisiana

By
HU MAXWELL,
Expert United States Forest Service.

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NOTE.

The following report was prepared by Hu Maxwell, expert, under the direction of H. S. Sackett, chief, Office of Wood Utilization, United States Forest Service. It is published and thus made available to the public through the courtesy of the LUMBER TRADE JOURNAL, New Orleans, La.

TABLE OF CONTENTS.

	Page.
Preface	19
Woods used in Louisiana.....	20
Planing mill products.....	23
Boxes and crates.....	24
Sash, doors, blinds and general millwork.....	24
Furniture	25
Vehicles and vehicle parts.....	26
Tanks	26
Ship and boat building.....	27
Fixtures	27
Miscellaneous	27
Apportionment of woods among the Industries.....	29
Summary by industries.....	28
Spanish moss	30
Uses of various woods.....	31
List of manufacturers.....	32
Appendix	32

PREFACE.

Louisiana has 18,000,000 acres of forest land, the hardwoods being principally in the northern half, the softwoods in all parts. More than 100 kinds of trees make up the forest, about one-half of the species possessing commercial value, the others being too small or too scarce to count for much. Six or seven softwoods—the pines and cypresses—supply fourteen-fifteenths of the annual lumber output of the state. At this time the softwood forests are given much more attention than those of hardwoods; but it may be expected that a change will come in time, diversified manufacturing will increase, and the large sawmills will lessen in number as the primeval stands of pine and cypress are cut out. Plants which manufacture lumber into other commodities will take the place of mills which now sell their output in the rough, or sell it planed or surfaced. Diversified manufacturing of wood products has not progressed nearly as far in Louisiana as in the northern and eastern states. Many southern industries of that kind are still in their infancy, and there is room for many others which have not yet had a beginning. Development will come in time, for the raw material is abundant. The least encouraging phase in the outlook for Louisiana is found in the fact that it is selling immense quantities of its logs and lumber in the rough, to feed factories in other regions, and when the development of home wood-working industries shall be undertaken in the future, it may be found that the forests will be much depleted. It may thus happen that its forest resources will never reach their best development.

Uses are being found for every wood that grows large enough and symmetrical enough for economical working. Search for new woods is stimulated by the increasing scarcity of some of the well-known species. The Forest Service of the Department of Agriculture has been pushing this search for some years. It has studied many woods to find out what they are best fitted for, and has investigated the forests and factories of various states and regions to ascertain in what amounts the commercial species exist, and what use is being made of them. Constant attention is given to the discovery of new uses for well-known woods, and to bringing little-known woods—so-called "minor species"—to the attention of users. Many trees which were once looked upon as mere forest weeds, are now taking their place as valuable members of the American forest family. Red gum, hemlock, and tupelo, are examples. In the spring of 1911 the Forest Service undertook an investigation of Louisiana's wood-manufacturing industries, and this report embodies the result. Statistics collected by the Bureau of the Census show that, with the single exception of Washington, Louisiana produces more lumber than any other state. Interest would naturally attach to a study undertaken to ascertain how much and what kind of further manufacture is given this lumber in the region that produces it—whether it is sold in the rough and shipped to other regions, or whether furniture, machinery, boats, finish, vehicles, and other commodities are made of it at home. Similar studies had already been

made in seven states—Illinois, Kentucky, Maryland, Massachusetts, North Carolina, Oregon, and Wisconsin. These represent the eastern, central, northern and western parts of the United States, and Louisiana was chosen as a representative of the hardwood and softwood forests of the South. As a lumber region it is new in comparison with some others, and that fact was expected to add to the value of the investigation. Some of the states practically exhausted their primeval forests long ago and now depend on young growth; but not so with Louisiana. The cutting of its original forests is now in full swing, and new growth, either present or prospective, is given little attention by the people of the state. The same human characteristic—or human frailty—which showed so conspicuously while the Pennsylvania, Michigan, and New England forests were being cut, appears again in Louisiana where they are harvesting the present crop with no thought for the future. It was believed, therefore, by the Forest Service that a study of manufacturing conditions in Louisiana would result in good by calling attention of thoughtful business men of the state to the subject. If the people are not manufacturing as much of their rough lumber into finished products as they might, means may be found for improving the situation, and developing home industries while wood is yet plentiful. It was not a part of the plan of this investigation to make a silvical study of the state, to look into the condition of the forests, note the stand of timber, rate of depletion, quantity and character of reproduction, and the like; but, incidentally, some attention has been given to this phase of the question and the concluding paragraphs of this report present a few important facts which must be apparent to any one who travels through the various regions of Louisiana.

The investigation was conducted upon lines similar to those followed in other states where work of like kind has been done. Lists were obtained of manufacturers who were reported to be engaged in the conversion of rough lumber or wood into finished products. Blank forms for reports were sent them by mail with requests that the reports be filled out and returned. A second request was sent to such as failed to respond to the first. The salient points of the inquiry were: The kinds of wood used, the amounts required annually, the cost of each at the factory, the products manufactured, sizes and grades of lumber used, where it comes from, and the market for the products. After sufficient time had been given for all to reply who meant to do so, the field work began. This consisted in visiting those who had not replied, and also many who had but whose replies were not quite satisfactory.

One of the constant purposes of the field work was to note any new or little-used woods which were beginning to make their appearance in the mills and shops, and to observe any properties in them which seemed to commend them for wider use. One of the earliest discoveries made was that a number of woods were going into the sawmills as one species and coming out as another. This was not due to any purpose to palm off an inferior wood for a better, but was owing to the fact that Louisiana has more than a hundred species of forest trees, while the lumber yards recognize scarcely a score of species as lumber. For instance, three maples are cut as saw logs, but all appear in the lumber yard as "soft maple." Two species of ash are cut in the woods, and sugarberry and hackberry are loaded on the log truck with them; but in the lumber yard the whole four are often simply "ash." Turkey oak, post oak, overcup oak, cow oak, and white oak all come from the mill as "white oak." Texan oak, yellow oak, willow oak, and water oak blend in the yard as "red oak," and not one of them is the true red oak (*Quercus rubra*) which is a more northern tree. Three elms go to the saw mill; one comes out. The same method holds to some extent in the softwoods. The two cypresses are never distinguished apart, and in many lumber yards where three or four pines are stacked side by side, one or two may be recognized. Black gum and tupelo are never mistaken for each other in the woods; but black gum almost invariably becomes tupelo if sawed into lumber.

This method is not pointed out for criticism, nor is it peculiar to Louisiana. It exists as a matter of convenience, and because no one objects. The time is near at hand, however, when there will be less grouping and mixing of species in the lumber yards and shops. Each will go by its true name. Farmers once had simply "cattle;" but specializa-

tion has gone on until now there are many breeds which buyer and seller clearly distinguish. Species of wood are capable of being separated and distinguished equally as well, and it will be done when wood-using shall become as highly specialized as stock raising. During the progress of the field work of this investigation, 24 woods were found in use, though not one of them was listed by any manufacturer under its proper name. Some went under other names, others were unknown, and still others were used in amounts so small as to be thought not worth mentioning. In some instances, manufacturers were inclined to apologize for using a certain wood, not because it was not good, but because it was new and it was feared the public might not take kindly to innovations.

The use of some of the minor species which are just coming in, would not have been discovered had the reports of manufacturers alone been depended upon, for in many cases they do not know all the woods coming to their factories. Valuable information along that line was obtained from sawmill men, lumbermen, and woodsmen. They know the trees, and can often tell what industry buys the lumber. In this way, by carefully following lumber it may be traced to the shop or factory that uses it. In many instances, too, local uses of wood may be learned from people not in the lumber business at all.

It may be instructive to compare the number of wood-using industries in Louisiana with those in other states where similar studies have been made. An "industry," it should be explained, is not a definite term, and does not mean exactly the same everywhere. The comparison should, therefore, apply in a general way only. Following are the numbers of industries:

Illinois 51, Wisconsin 22, North Carolina 21, Massachusetts 20, Oregon 20, Kentucky 19, Maryland 13, Louisiana 9. This low place is held by Louisiana because its forests products, that is, its logs and lumber, are sold in the rough. Other states take these rough products and further manufacture them. It is the further manufacture, not the rough lumber, which is considered in this report. Take from Louisiana's total the one item, "planing mill products," and not much remains. Its total would be lower than that of any other state named above, not only in the number of industries but in the amount of wood used, and this in face of the fact that it is next to the highest state in lumber cut, and perhaps exceeds every state in the total output of forest products. (See Table 29 and accompanying footnote.) Much of the "planing mill products," Table 2, is really raw material for northern factories which buy it in Louisiana because they can procure it more cheaply there than elsewhere. In addition to more than a billion feet of planing mill products, much of which goes out of the state to be further worked up, Louisiana sends out perhaps half of its total mill output as rough lumber—not even planed at home.

In reaching some of the best markets in the United States—those from New York to the Rocky Mountains, and north of the Ohio River—the Louisiana manufacturers of wood commodities are at some disadvantage compared with makers of like articles more centrally located as regards those markets. Long hauls by rail make freight rates high. Compensating circumstances are found in the fact that Louisiana's only market does not lie at the terminus of long overland hauls. Take New Orleans as a point in the end of an ellipse and complete the figure by extending its enclosing line along the eastern coast of Mexico and Central America, the northern coast of South America to the mouth of the Orinoco River, thence northward through the West Indies back to New Orleans. That touches some of the foreign markets in which the forest products of Louisiana may be laid down so cheaply, because of low rates of water carriage, that competition with the great wood-manufacturing industries of central and northern states need not be feared. There is, however, a still wider foreign market open to Louisiana manufacturers—Europe, South Africa, and the eastern countries of South America. This market is not merely theoretical, or a future possibility, but is now being developed. An examination, industry by industry, of the reports of Louisiana manufacturers shows that commodities are now regularly sold in all those countries, and manufacturers are already planning for an enlargement of trade when the completion of the Panama Canal makes new ports accessible.

THE USE OF WOOD IN LOUISIANA.

Table 1.

SUMMARY OF KINDS OF WOOD USED IN LOUISIANA.

Table with columns: Common Name, Botanical Name, Quantity Used Annually (Feet B. M.), Average cost per 1000 ft., Total cost f. o. b. factory, Grown in La. Per cent., and Grown out of La. Per cent. Lists various wood species like Longleaf pine, Shortleaf pine, Cypress, etc.

*Less than 1/100 of 1 per cent.

‡This and the woods which follow were not separately reported but were found in use.

The cut of lumber in Louisiana in 1909 was 3,551,918,000 feet board measure. About 2,196,000,000 feet was disposed of in the rough, and the rest was further manufactured. The extent of further manufacture was not the same in all cases.

\$15,765,458, or \$11.64 per thousand feet. The total is made up of a large number of species, 72 appearing in the list shown in Table 1; but most of these supplied amounts so small that they could be neglected without materially affecting the total.

Longleaf pine supplies 50 per cent of it, shortleaf 28 per cent, and cypress 16 per cent. This is not the rough lumber, but such as is further manufactured.

The manufacturers of Louisiana brought in very little wood from other states and countries, only 15,014,102 feet, or a little over one per cent, and it cost \$270,304, or less than two per cent of the total cost.

SOUTHERN PINES.

Sawmill men of Louisiana, and of the South generally, do not distinguish between the different commercial pines of the region as carefully as botanists do. Lumbermen frequently recognize two kinds of pines, the one with much heartwood and thin sapwood, which is called "hard pine," "yellow pine," "heart pine," or some other of many names.

Among Louisiana mill men, any other names for standing pines than "long leaf" and "short leaf" are rather unusual. These terms fitly describe the trees as they stand, but botanists go farther than that, and lumbermen will also when the pines become scarcer and the uses for which each one is best fitted are more carefully considered.

Longleaf Pine.

The needles are longer than those of any other southern pine; the wood is heavier than any other, except Cuban pine, and is surpassed in stiffness only by Cuban pine. The sapwood is thin, the annual

rings narrow. It is the most abundant and the most widely used wood in Louisiana.

Shortleaf Pine.

This wood was reported second only to longleaf pine in amount used, and it goes for similar purposes. It is of more rapid growth than longleaf, consequently the annual rings are usually broader. As the tree approaches maturity the rate of growth is apt to lessen, thus producing rings narrower next the outside of the tree than near the center. The narrow outer rings may resemble those of longleaf pine, but the proportionally larger amount of sapwood is nearly always sufficient to distinguish it from longleaf. It has not the weight, strength, or stiffness of longleaf pine.

Loblolly Pine.

This tree has broad rings and usually little heartwood, and for that reason would seldom be mistaken for longleaf pine, though it might be for shortleaf or Cuban. It is stronger and stiffer than shortleaf, but is considerably lighter, and a cubic foot of it, well dried, is ten pounds lighter than a cubic foot of longleaf pine. It grows rapidly, and persistently pushes into abandoned fields or other vacant ground. In this respect it is much more vigorous than either longleaf or shortleaf. The two latter show a disposition to contract the areas which they once held, while loblolly is constantly extending its range. It will probably, therefore, become more important in Louisiana than it now is, and it will be well to reckon with it in figuring on a future wood supply for the state's industries.

Cuban Pine.

This is the heaviest and stiffest of southern pines, but in strength it is a little under longleaf. Its rings are wide and its sap thick. In this respect as well as in other respects, it so much resembles loblolly that it is frequently mistaken for it. It contains more resin than loblolly or shortleaf, and compares favorably with longleaf. It resembles loblolly in the vigor with which it fights for possession of vacant land. In some regions it is spreading over areas once occupied by longleaf pine. It has been suggested that the Cuban pine entered the United States by way of the Florida peninsula and has spread northward and westward. Its range is constantly extending. It is an excellent timber tree, and promises much for the future.

Spruce Pine.

This is one of the minor and little known species of Louisiana, but is a fine wood for doors and interior finish. Only 200,000 feet were reported in the state, and one factory had the whole amount, having procured it in the region of Pearl River in the southeastern part of the state. Its identity was unknown by the factory which was working it, and it was reported as "a cross between shortleaf and cypress." In softness and color it approaches nearer to white pine than any other southern wood. It is of interest to note that this is the only instance where this pine has been reported for manufacturing purposes. Some years ago a little of it was used as masts for small boats on the Florida coast.

Cypress.

This wood stands third in quantity manufactured in Louisiana, amounting to 16 per cent of all used by wood-working factories. There are few trees in the United States that will compare with cypress in extent and diversity of use. Nearly two-thirds of the cypress cut in Louisiana's sawmills is sent outside the state in the rough, and it goes into practically every market in this country, and into many elsewhere. It is one of the timbers destined to disappear, for when the swamps where it is now cut have been cleared, there will be no new growth. There is geologic evidence that it has occupied the swamps during an immense length of time, for logs have been dug from deep excavations, the strata of sediment upon them indicating a period of perhaps 30,000 years since they grew. It is remarkable that some of those logs were "pecky," the same as much of present-day cypress is. This disease is caused by a species of fungus (*Daedalia vorax*), which hollows out little pits in the wood. The cypress is the largest tree of Louisiana. For many years there was exhibited in South Peter street a cypress plank 71 feet long, 42 inches wide and 5 inches thick, with scarcely a blemish or defect visible. It was burned in 1890. An important use for cypress in early times was for dug-outs, a kind of canoe hewed from a single log. In late years boats have taken their place, but some old ones are still to be seen. One made in 1871 was still in service in 1911 on a northern Louisiana river.

Red Gum.

Nearly one-half of the red gum cut in Louisiana is further manufactured after it leaves the sawmill. Five states—Arkansas, Mississippi, Missouri, Tennessee, and Kentucky—cut more of this wood than Louisiana, which produces only five per cent of the total output. This tree is occasionally called "star-leaved gum," "sweet gum," and "sap gum." The last name applies to certain grades of the lumber rather than to the tree itself. The proportion of heartwood and sapwood varies greatly in different trees. Sometimes a large log is nearly all white sapwood; others are largely red or brown heartwood. Two quite distinct classes of lumber are produced, and each has its particular uses. This wood passes under several names. Furniture makers in England often call it "satin walnut," while makers of furniture and interior finish in this country frequently sell it as "Circassian Walnut." If grain and figure are carefully selected, the finished product so closely resembles Circassian Walnut that it is difficult to distinguish one from the other. Much of the "Circassian Walnut" furniture seen in show windows is red gum. Little staining or "doctoring" of the figures is necessary. Red gum may be stained, however, to imitate other woods, particularly white oak, cherry, and mahogany. It may be said with much truth of some furniture factories—not necessarily in Louisiana—that "red gum lumber goes in and white oak furniture comes out." It is one of the finest woods in this country. It is more highly appreciated in Europe than at home, for it is more skillfully handled there than here. Some dealers whose opinions are worthy of consideration believe that before many years red gum will equal or excel white oak in price.

Cottonwood.

This wood grows rapidly, and it has long been a staple article in Louisiana's lumber trade. Complaint is heard that the best grades are becoming scarce. One-fifth of the demand in the state is met by shipments from without. The scarcity of good grades is attributed by some to the large export to Germany and elsewhere of those grades some years ago. This trade is now much smaller. Another drain upon high grade cottonwood has been due to its demand by wagon factories. When yellow poplar a few years ago rose in price so high that its use for wagon beds diminished, cottonwood was found to be one of the best substitutes. The tree grows rapidly, and the soil and climate of Louisiana are suited to its best development, and it may be counted upon to fill an important place in the state's future forest policy.

Tupelo.

There does not seem to be any generally recognized name for the wood in Louisiana. Some call it "bay poplar," others "black gum," or simply "gum," "cotton gum," "tupelo," or some other name. It is a swamp tree, and is usually cut with cypress. The appearance of the tree, if judged by its bark, is like ash; if its leaves are considered, it looks like the true black gum; while in form, but in no other respect, it resembles cypress, as the bases of the trees are frequently much enlarged—a characteristic of swamp-grown trees. The logs have thick sapwood. Formerly much complaint was heard that the lumber was difficult to season; but improved methods have lessened the difficulty.

Black Willow.

There are many species of willow in this country, but practically all the lumber is cut from black willow, which is the common kind seen nearly everywhere. It is remarkable that the people of Louisiana manufacture into boxes and furniture seven times as much willow as the reported total cut of this wood for the whole United States, as given in the Census of Forest Products in 1909. The discrepancy is in part explained by the custom prevailing in Louisiana of marketing willow lumber and products as cottonwood. It is frequently listed as "brown cottonwood," and in the Census returns, much willow was doubtless listed as cottonwood. It is strong, tough, cheap and serviceable. The worst thing against it is its color, which is generally quite dark. It is one of the timber trees which will be heard of in the future, for its possibilities are great. It grows rapidly, and such is its tolerance of shade that trunks grow crowded together in such close stand that the like is seldom seen with any other timber. An instance is cited, and is apparently well authenticated, of a tract near the Mississippi River in Louisiana, which was growing cane during the Civil War, but was abandoned because of the frequency of overflow; and since that time more than 100,000 feet of willow per acre has been cut from it. The size of willow logs is often surprising. In the early spring, rafts of this wood may be seen tied up along the Mississippi, above Baton Rouge, the logs of which are two, three, and many four feet in diameter.

Small black willow osiers, one and two years old, are supplied to basket makers in New Orleans. Most of them are cut along the edges of streams and swamps in St. Bernard Parish, east of the Mississippi River. The industry is carried on after the most primitive fashion. The basket makers import cultivated rods from Europe for the visible parts of their wares, but use wild willows for ribs, stays, hoops, and bands. The cutters go by ones and twos into the swamps, their only tool a pocket knife, and cut osiers where they can find them, seldom asking leave and seldom encountering interference from owners. Long rods are used for bands and hoops; short, stout ones (usually the butts cut from long ones are pressed into service as ribs and stays for lids, sides, and bottoms. The freshly cut rods are usually carried to some log that rises a few inches out of the swamp water, and the operator sits in the shade and peels them, then lays them in the sun to dry. Sunshine whitens the rods, but a shower of rain, or even a cloudy day, will darken them and lessen their value. The cutters have no way of bleaching them white again. The cutting and peeling of 500 to 700 osiers is a day's work, and they sell for 25 to 75 cents a hundred, delivered at the basket factory. The usual size sells for 25 cents. The butts for stays bring 10 to 25 cents a hundred. The rods must be cut "in season" or they are brittle. There are two seasons, one from February to April before the new wood has begun to form under the bark, the other from August to November after the new wood has hardened and grown tough. It was not found practicable to procure statistics of the annual cutting of the wild willow osiers, as the cutters make no reports, and guard their trade secrets with jealous care. The total quantity cut, however, cannot be very large. Some kinds of rough, heavy baskets, for barn, factory, and plantation use, are made wholly of wild osiers.

White Oak.

A number of oaks in Louisiana pass as white oak at the sawmill; and, after they leave the saw mill for further manufacture, it is generally impossible to separate the true white oak lumber from other which passes for it. The difference in the appearance of the woods of several of these oaks is slight, and for all practical purposes it is not necessary to distinguish between any of them.

Hickory.

Five or six hickories in Louisiana pass as one in the factory. Between some of them considerable difference exists in the appearance of the growing tree and of the manufactured wood, but most manufacturers in reporting the use of hickory did not say whether it was shag, bitternut, water hickory, pignut, or mockernut. All of these are used, but the amount of each could not be ascertained. The state has only fairly commenced to draw upon its own hickory resources, and much goes to northern cities for final manufacture.

Texan Oak.

This wood is sometimes called "spotted oak" in Louisiana, but it nearly always is listed as red oak. The true red oak (*Quercus rubra*) is a more northern wood but there are a number of excellent timber trees belonging to the red oak group, and Louisiana is well supplied with them. They are broadly distinguishable from the white oak group on account of their sharp-pointed leaf lobes, while those of the white oaks are rounded. However, some oaks in Louisiana that have unlobed leaves are commonly spoken of as red oak—the willow oak for example; and, in practice, it is generally the appearance of the wood and not the shape of the leaves that determines the classification of oak lumber in the mill yard. If the wood looks white, or bears considerable resemblance to genuine white oak (*Quercus alba*) it is called white oak; otherwise, it is considered to be red oak. Though the manufacturers in the state used a million and three quarters feet of Texan oak, they reported less than twenty thousand feet that could be identified as northern red oak. The locality whence it comes, and the price, assist in its identification.

White Ash.

The word ash in Louisiana means several things; but white ash is most common and it greatly exceeds in quantity used all other woods that pass through the factories under its name. Among the other woods in the list with this one are green ash, hackberry, and sugarberry. The two last named do not belong in the ash family, but their wood looks somewhat like ash and goes along with it. Both are cut and sold in considerable amounts in the state, and go to the shops and factories, yet not one manufacturer in Louisiana reported their use. In nearly all cases it was

doubtless a matter of mistaken identity—the sugar-berry and hackberry when they reached the factories were supposed to be ash.

Magnolia.

Two magnolias are used by the manufacturers of Louisiana, the evergreen and the sweet. The former is the larger and more valuable tree, and more than one and a half million feet were reported, while the use of sweet magnolia was only 45,000 feet. The evergreen magnolia is praised by some users and condemned by others. Some claim that it is a satisfactory substitute for yellow poplar in many places, while others find fault with hard, black, flinty streaks which the wood sometimes contains. The streaks dull tools quickly, and are blemishes on the surface of dressed wood. If the lumber is carefully selected, some high grade stuff can be picked out. Few woods show less uniformity in quality. The white wood in a magnolia tree compares not unfavorably with holly, but is not quite as white. Next to the white portion may lie wood almost as black as ebony, and there are all shades and colors. A distinct pink sometimes shows when large logs are freshly sawed. It is said that none of the colors are permanent, but the lights grow darker, and the darks lighter with exposure to weather. In rural communities dugouts are made of this wood for navigating rivers and estuaries, and give satisfactory service.

Yellow Poplar.

Louisiana lies on the southern outskirts of the yellow poplar's range, but the supply reported by manufacturers comes wholly from without the state. The saw mills in the state cut a little, but at least part of the small amount comes down the rivers from the north.

Basswood.

The whole reported supply of basswood came from without, though, as with yellow poplar, a little grows in the state. A very small but unique use is made of this tree in the northern parishes. The inner bark, which is tough, soft, and pliable, is braided into mule collars by negroes for use in the small fields and truck patches. Such collars are similar in mechanism to those made of corn husks in pioneer days in the Ohio valley. The braids of bark are sewed together with small splits of cow oak or some other tough wood.

Engelmann Spruce.

This wood does not grow in the south, and it is a matter of surprise that 100,000 feet of it was used by the manufacturers in Louisiana. It comes from the northern Rocky Mountain region.

Black Gum.

When a Louisiana sawmill man speaks of black gum he frequently means tupelo. Black gum is good for a few purposes, and unfit for others. It is unwedgeable, and this property sometimes gives it a value. It makes good rollers, such as are used at the wharfs and landings where boards and planks are unloaded from barges. The lumber is shoved along the rollers from the boat to the land. In Rapides Parish a little black gum lumber is mixed with tupelo and sold as such, and the practice probably obtains elsewhere.

Cow Oak.

This tree belongs to the white oak group, and its lumber is generally marketed as white oak, but a little is sold under its own name. Overcup oak stands in a similar position. Both of these are plentiful in some parts of the state and in some parts baskets are made of cow oak splints—long, narrow ribbons of wood split or drawn from billets. Such baskets were in general use before the Civil War on plantations, and some are still made and in use there. They are now more frequently seen in laundries and markets where a rough, strong basket is demanded. They are home made, and many of the makers are old people who learned the trade many years ago and now follow it for a livelihood. Chair seats and backs are braided of the same material. Lumbermen in northern Louisiana occasionally split canthook handles of the wood, and use them in preference to any other native species.

Elm.

Three species of elm go into manufactures in Louisiana, white elm, wing elm, and cedar elm. The first is the common elm, and it was the only one listed in the returns, but the two others are in pretty general use. The woods are similar, and no great difference in leaves or form of trees are noticeable, and furniture and vehicle manufacturers who are the principal users consider the three elms as one.

Mahogany.

Strictly speaking, there is only one mahogany, but several woods are bought and sold as such, and by common consent pass in the markets as mahogany. Two such woods are reported by the Louisiana manufacturers, one from Mexico (*Swietenia mahogoni*) the true mahogany, the other from Africa (*Khaya senegalensis*), which is a very fine wood and is used the world over.

Chestnut.

Practically the entire demand for chestnut in Louisiana comes from the makers of coffins and caskets. The wood does not grow in commercial quantity in the state.

Beech.

Beech in Louisiana usually goes begging. The Census of 1909 reported only seven mills cutting it in the state, and only two manufacturers mentioned it in their reports. However, there is plenty of it growing in the forests of the northern regions, but generally the quality is not good. The trees lack the smooth, clear boles common in the beech of the northern states. A little flooring is sawed from this wood in the region between Monroe and Shreveport, but elsewhere the lumberman of Louisiana passes the beech by, and manufacturers of furniture do not demand it. There is only one species of beech in the United States—the same in Pennsylvania and in Louisiana. The blue beech (*Carpinus caroliniana*), though bearing some resemblance both in appearance and name, belongs to a different family.

Red Cedar.

This species is scattered over a good deal of Louisiana, but very little goes to saw mills, and Tennessee supplied nearly all that is used.

Maple.

As with oak and elm, several species of maple are classed as one wood. Sugar maple is usually listed separately because it does not grow in Louisiana. Three native maples figure in the supply drawn upon by manufacturers in the state, though the total amount is small. They are silver maple, Drummond maple, and Florida maple. When these are used, they are listed as "soft maple," without further distinction. Makers of violins and gun stocks have found the Drummond maple in Union Parish of fine quality, with curled grain and bird's eye effect. Makers of bentwood rustic furniture occasionally obtain supplies of Florida maple in the northern part of the state, particularly in Ouachita Parish. Mills in the region where these species grow, saw them and send them to market simply as maple.

White Pine.

For more than a century white pine has been in the Louisiana markets. It does not grow in that state. Within two years after the purchase of Louisiana by the United States, rafts of white pine cut in western New York and northeastern Pennsylvania had floated down the Allegheny, Ohio, and Mississippi Rivers, 2,000 miles, by the windings of the streams, and were sold at New Orleans for \$40 per thousand. The raftsmen who made these journeys were accustomed to return to Pittsburg on foot. White pine still goes regularly to Louisiana, but the amount is small and most of it is made into patterns.

Birch.

Two species of birch are listed for use in Louisiana, the sweet birch of the north, and the native birch, or river birch, which is fairly abundant in many parts of the state. The native species lacks figure and grain to make it valuable as furniture wood, but it has many good qualities which will doubtless win for it a place at no distant day in the esteem of Louisiana manufacturers. It will make good frames or cores, upon which to lay veneers of more attractive woods. At present, the whole cut is converted into ox yokes.

Persimmon.

This belongs with minor species as far as manufacturing in Louisiana is concerned. It is a shuttle wood, but shuttles are not made in the state.

Dogwood.

This wood is in the same class with persimmon as to use. What is cut goes to northern or foreign shuttle makers.

Osage Orange.

A few planted trees of this species are occasionally cut in the northern part of the state, and are

sent to wagon makers. A little wood is used, as inlay for furniture, tool handles, and novelties. There is no reason to suppose that its importance as a commercial wood will increase in the state. No supply of it is coming on for future use. What little is now cut comes from remnants of old hedges.

Locust.

A rather large number of buggy hubs are sold yearly in Louisiana, but few are made there. This is about the only demand for locust. It is not cut in the state, but comes from Kentucky and North Carolina.

Circassian Walnut.

Red gum has made great inroads upon the use of Circassian walnut for furniture and finish, though small amounts of this scarce and expensive wood find their way to this country from regions south of the Caspian Sea. The price of the 1,000 feet reported in Louisiana was \$140, which is very low for this wood. It is procured with difficulty in the remote valleys of Asiatic Turkey and Russia, and smaller and smaller amounts reach the market year by year.

Cherry.

This wood is scarce and little thought of in Louisiana, and the small quantity cut in the state was reported at ten dollars a thousand feet. It was bought in the log, and the cost of sawing was added to the price.

Catalpa.

This wood will probably never be much used for manufacturing purposes, being more valuable for fence posts. The small amount reported in Louisiana was used for tables, newel posts, and boat knees. Natural crooks were utilized for the knees. It is claimed that artificial crooks may be grown by bending the young tree and compelling it to grow in that form. If so, it may attain to some importance in the manufacturing of small boats. Efforts have been made to stain the wood to resemble mahogany. It is not difficult to imitate the color, but the rings of porous springwood are so marked, and are so different from mahogany, that successful imitation is difficult. Neither would it be profitable to substitute catalpa, for the counterfeit would cost more than the genuine article. Catalpa bears the Indian name given it by the Cherokees who once occupied the region northeast of Louisiana. That was the original home of the common catalpa.

Umbrella Tree.

There is little reason to suppose that this tree, whose chief value is in its shade, and in its symmetrical crown, will ever become important as a producer of lumber. However, it possesses some properties which make it interesting. It is a native of India, but flourishes so well in Louisiana that it has escaped from cultivation and is running wild. It is of very rapid growth. Boards clear of knots and sapwood have been sawed in Tangipahoa Parish eight feet long and 15 inches wide from a tree 18 years old. When the tree grows in the open and is cared for, its crown takes the form of an umbrella, whence the name; but the forest-grown tree loses its symmetrical form. Some growing on the borders of swamps in St. Bernard Parish might pass in shape and general appearance for butternut trees growing in the forests of Pennsylvania. The same characteristic may be observed where the trees have escaped from cultivation in the parishes of Lafourche, Terre Bonne, St. Mary, Iberia, and elsewhere in southern Louisiana. The tree's very rapid growth, fine color, and the marked rings of its wood, may lead to its use where novelty of effect is desired. A little furniture and finish are now made of it. The wood does not finish smoothly in an ordinary planer, but sandpapering improves it. The grain is coarse, that is, the spring wood is very open and porous, while the broader bands of summer wood are dense. The natural color of the wood is reddish brown, the sapwood yellow.

Red Mulberry.

The mention of red mulberry, though the quantity is very small, shows the use of an unusual wood in furniture making.

Willow Oak.

In Louisiana the willow oak is called red oak. Its leaves are willow-shaped and distinguish the tree from any other with which it is likely to be associated. In only one instance is this wood mentioned under its true name in the reports of Louisiana manufacturers, yet it is cut by millions of feet in the state. In some localities it is the prevailing species, more of it being found than of any other one species. This is true in the flood plains of many of the streams in Chatahoula, Caldwell, and

Ouachita Parishes, and also in many other parts of the state. Perhaps no other hardwood in Louisiana promises as much for the future as willow oak. It grows rapidly, assumes good shape of trunk in forest situations, and has many good qualities. The court house square at Monroe, La., contains a number of planted trees of this species. Two were sawed down in the spring of 1911. Annual rings showed them to be 55 years old, sound, and free from shake. At 3 1-2 feet from the ground one was 42 inches in diameter, the other 49 inches. During the first thirty-five years these trees grew from two-thirds of an inch to one and three-fourths of an inch in diameter per year. The sapwood of each was about three inches thick. The general appearance of the heartwood resembled that of northern red oak. The logs cut from the trees scaled 1300 feet, board measure, for the smaller, and 1700 for the larger, representing a growth of lumber of about 28 and 31 feet per year respectively. It is evident that a woodlot of such trees, planted and cared for under forestry methods, would produce lumber in large amounts. When the time comes for the people of Louisiana to plant forests, the willow oak will doubtless merit a prominent place in wood supply. The stumps, and part of the trunks, of two other willow oaks in a vacant square in Monroe were still larger. One was 60 and the other 61 inches in diameter, breast high, the age of one having been 69 and the other 70 years, as shown by the rings. Calculations based on the stumps and the portions of the trunks remaining on the ground indicated that one tree contained 3450 and the other 3555 feet of lumber. During their growing periods one laid on approximately 49 and the other 51 feet, board measure, of wood a year.

It is remarkable how different are the opinions expressed of the value of willow oak for manufacturing purposes. It is praised and condemned. Those loudest in its condemnation base their objection upon the difficulties encountered in seasoning the wood. Others complain of no such difficulty. In some instances men disparage willow oak when they have in mind water oak (*Quercus nigra*), a tree bearing some resemblance, but of a different species. Even water oak, upon better acquaintance, will probably be found much better than its present reputation. Tupelo was once considered a nuisance, but it is now valuable. One by one the rejected woods are coming into favor, as men learn how to handle them, and find out what they are good for. Willow oak is coming into its own in Louisiana now, and water oak will follow at no distant day, for the small matter of seasoning a wood cannot long keep it out of use. Since these two oaks seem to promise much in the future, particular care was had to inquire into their uses in different localities, while prosecuting the field work connected with this investigation. An examination of the list of uses for various woods, beginning on page 30 of this report, will show that Willow oak and water oak compare favorably with most other species.

UNREPORTED WOODS.

An inspection of Table 1 will show that several of the woods listed are accompanied by no figures giving the feet used annually. That is because no manufacturer listed those woods. As far as reports sent in by the makers of furniture, finish, boats, vehicles, and other commodities are concerned, the list of woods in the table might have ended with *lignum-vitae*. That wood in the table, however, is followed by twenty-four others. Some of these have been mentioned in the foregoing discussion, where they were included under the names of others, as the elms, hickories, and maples, and the reason for including others, though not mentioned by any manufacturer, will now be given.

During the progress of the field work in Louisiana, many parts of the state were visited, and it was discovered that several woods were being cut in the forests, sent to saw mills, cut into lumber, and at that stage they disappeared from view. If this lumber were used in the rough—as in construction of buildings, fences, and the like, and was not further manufactured—this investigation was done with it; for it took into account such lumber only as passed through further stages of manufacture. Careful inquiry developed the fact that much of the lumber which, under its own name, had dropped out of sight after it left the saws, was being shipped to factories under other names, or by no names at all. In addition to this, a few woods were used in a small way locally, perhaps not passing through a manufacturing plant.

American Holly.

A small holly tree is occasionally cut in Louisiana, and goes to the brush makers, or is converted into small articles, such as surveying instruments, or small boxes for handkerchiefs and collars.

Black Jack.

This oak is always rather small and generally of poor quality. It is abundant in Louisiana, and the wood serves as repair material for heavy wagons, and sometimes goes into new vehicles. Chair makers buy it, and a little is made into other furniture. It seems to be more in favor in Grand and Rapides Parishes than elsewhere in the state, and it is not unusual to see black jack logs on skidways, trucks, and at mills in that region. Logs above eighteen inches in diameter are uncommon.

Chittimwood,

and its near relative, Buckthorn *Bumelia* or Southern buckthorn, are used for crosscut saw handles, small cabinet work, sometimes for box lumber, and fence posts. Only occasionally are these woods large enough for saw timber.

Honey Locust and Water Locust.

These two thorny trees, the latter generally smaller than the first, are nearly always considered to be one and the same in Louisiana, where their common name is "thorn tree." In the Red River Valley, sawlogs two feet in diameter are sometimes seen, but that size is unusual. The lumber is rough, coarse, and is little thought of. Some of it goes to furniture factories, but may be employed as crating material only. Carpenters lay it for subfloors—the rough floor which is to be covered with some better wood. The trees are so little valued that unless quite convenient, they may be passed by in logging operations.

Live Oak.

This tree is abundant in the flat, coast regions of Louisiana, and is found in all parts of the state.

It was once valuable as ship timber, but it is now one of the most neglected woods in this country. The unshapely trees are unsuitable for saw logs. A little of it goes to vehicle factories, but no other use, except fuel, could be found for it in Louisiana.

Pecan.

This tree is "pecan" where it grows for ornament and bears nuts, but when it is cut and goes to the vehicle factory it becomes "hickory." It is not regarded as the equal of the other hickories to which it is related, and that is perhaps the reason why those who use it do not list it by its true name.

Spanish Oak, Turkey Oak and Yellow Oak

are regularly cut by the hardwood mills in the northern parts of Louisiana, and the operators occasionally recognize them; but when the lumber goes to the furniture factory and vehicle shop it is called either red oak or white oak.

Sassafras.

Though sassafras is seldom mistaken for any other wood, it was not reported by any manufacturer in the state. Some of it is cut, however, in the northern parishes, and one of its uses is for flooring. Cabinet makers buy it and make wardrobes and clothes chests of it. It is highly esteemed along the rivers of northern Louisiana for dugout canoes, being light, long-lasting, and not liable to split or check by action of the weather. The sassafras trees of Louisiana are generally too small for canoes, for the species there approaches the southern limit of its range. Rivermen in need of dugouts watch the streams that flow from Arkansas, and gaff choice sassafras logs as they float down on floods, and these supply their wants.

PLANING MILL PRODUCTS.

Table 2.

PLANING MILL PRODUCTS.

Species—	Grown in Louisiana.—		Grown Outside La.	
	Quantity used annually (Ft. B.M.)	Av. cost per 1000 feet at factory.	Quantity (Ft. B.M.)	Av. cost per 1000 feet at factory.
Longleaf pine	644,321,266	\$10.50	641,521,266	\$10.49
Shortleaf pine	377,476,618	10.50	374,476,618	10.52
Cypress	184,210,000	16.21	184,210,000	16.21
Loblolly pine	7,500,000	12.00	7,500,000	12.00
Tupelo	5,000,000	8.50	5,000,000	8.50
White oak	3,635,000	15.95	3,635,000	15.95
Texan oak	1,063,000	24.99	1,063,000	24.99
Totals	1,223,205,884	\$11.39	1,217,405,884	\$11.40

Nearly all manufacturers of wood products use machines of some sort to dress lumber and to that extent most of the output of such factories might be classed as the product of planing mills. The accompanying table (No. 2), however, does not include so much. What appears in this table does not appear in other tables of this report, except that there may be slight and unavoidable duplication in a few particulars, for it is impossible to trace all lumber from the sawmill to the last manufacturer who handles it before it becomes a finished product. The manner in which the statistics for this report were collected and compiled made it possible to so check and cross-check the items that few, if any, of them appear in more than one table, and there is, therefore, practically no duplication.

A considerable part of Table 2 consists of flooring, siding, car roofing and siding, fencing, and heavy timbers, but it was not found practicable to separate these items into classes, to make a table (or industry) of each class. Many of the large mills in Louisiana plane boards, planks, and dimension stocks simply to lessen the weight and reduce freight charges on long hauls. Items of this kind figure prominently in the table. Timbers of large size, for bridges, trestles, and large buildings, are occasionally surfaced by the mill that saws them. This item appears also in the table.

Louisiana supplies practically all of the wood listed in table 2. A little longleaf pine came from Mississippi and some short leaf pine from Texas, and none from elsewhere. A large part of the material reaches the mill as logs. The bulk of the output is from large mills which do their own logging. The low average price of the lumber is due to that fact, and the price is made up, chiefly, of stumpage, cost of logging, the cost of sawing, and the handling at the mill up to the time it reaches the planer. Some of the mills in giving the cost of the rough lumber when it reaches the planer omit the item of "depreciation of plant." That is as much a charge against the lumber as any other

item is, for a plant, costing perhaps one hundred thousand dollars, will wear out, and if the work is to continue the plant must be replaced, and at any event, the cost of the plant constitutes part of the cost of the lumber sawed. With this explanation, it will be apparent that the average costs in the table are a little too low, though the difference is very small in most cases.

The market for the planing mill products of Louisiana is both domestic and foreign. Shipments go regularly to all parts of the United States. The foreign demand is large and in many countries. Canada and Mexico are important buyers, and nearly every seaport and many interior cities of the West Indies, Central America, and South America draw supplies of this material through New Orleans, and other ports on or near the Gulf of Mexico. Large quantities go to England and Scotland, to Germany, France, Belgium, Italy, and Spain. In northern and western Europe the hard pine of Louisiana competes with the pine from the Baltic Provinces which once nearly monopolized the European markets. The southern pines have been able to gain and hold a considerable part of that market. South Africa is a large buyer of pine from the Gulf region.

Table 3 compares the planing mill output of Louisiana with certain other states. In order to make the basis for comparison the same for the several states, tables 2 and 6 for Louisiana are combined, because the figures for the other states represent a combination of similar products.

Table 3.

Planing Mill Products of Louisiana Compared with Certain Other States.

States.	Quantity used annually (Feet B. M.)	Average cost per 1000 feet at factory.	No. of woods used.
Louisiana	1,259,775,551	\$11.52	15
North Carolina	368,016,000	12.59	14
Wisconsin	174,185,000	30.19	25
Maryland	81,356,000	27.46	23

Engelmann spruce, a wood of the northwestern part of the United States, appears nowhere else in this report, and no satisfactory reason has been given for the use of this wood among and in competition with the abundant and cheap soft woods of the South. It is good material, and is widely used for doors, sash, and frames, but its appearance in rather large quantity in Louisiana was scarcely to be expected.

The difference in price between Texan oak and the northern red oak, where both are employed in the same classes of work, is well shown in this industry. The red oak costs three and a half times as much as the Texan or spotted oak.

The yellow poplar demanded by this industry was cut in Kentucky, sweet birch in Wisconsin, cherry in Pennsylvania, black walnut in Arkansas, red oak in Kentucky, Engelmann spruce in Washington, and the mahogany—of which two kinds were used—was brought from Central America and Africa.

Louisiana sells its interior finish, doors, sash, etc., in nearly all states in the union. The product competes in the North and Northeast with spruce, oak, basswood, yellow poplar, and white pine; in the

far West it competes, but to a less extent, with redwood, western red cedar, Douglas fir, and the white and yellow pines of the Pacific coast and the Rocky Mountains; and in the middle region, from Mexico to Canada, it shares the trade with the similar products of both East and West. A wide foreign market is supplied also. It has not been the purpose of this investigation to trace the shipments to their ultimate destinations, but it may be stated that they go to practically every civilized country in the world, but chiefly to the West Indies, and the eastern countries of Central and South America, including Mexico.

A small quantity of the lumber shown in the foregoing table was made into grain doors which were sold to railroads. Similarity of name is the sole reason why this commodity was included in the table. The doors are not for houses or offices, nor does the "grain" refer in any way to painting, finish, or texture or figure of the wood. The doors are of cheap lumber, roughly nailed together, and are used as inside doors of cars in which grain is shipped. Their purpose is to prevent the contents of the car from wasting when the outside doors are opened.

The commodities included in Table 6 are gener-

ally made of the best or second best grades of lumber, though in some instances lower grades were reported. The sizes and forms in which this lumber reaches the factories are many; but perhaps three-fourths of it is one-inch stock, and the remainder ranges in thickness up to three inches, or more in some kinds of stair work, posts, and columns. Nearly all reaches the factory as rough, unplanned lumber, and in a few instances it comes as logs and is converted into lumber on the premises.

It was found generally in Louisiana that manufacturers of interior finish and related products work their waste into other commodities and sell them wherever a convenient market can be found; but the lack of diversified industries, as such exist in some of the northern states, renders it impracticable in many instances to utilize odds, ends, and left-overs. In such cases a good deal of wood goes to the furnace in the mill yard, or feeds the fire under the boilers. Sometimes edgings are made into molding, lath, or spindles; short boards are converted into boxes, wedges, mutts, etc., short squares into table legs, balusters, or chair stock; while cypress pieces are frequently sent to factories which make washing machines, tubs, buckets, and keelers.

FURNITURE.

Table 7.

FURNITURE.

Species—	Grown in Louisiana.—		Grown Outside La.	
	Quantity used annually feet at (Ft. B.M.) factory.	Av. cost per 1,000	Quantity feet at (Ft. B.M.) factory.	Av. cost per 1,000
Red gum	3,415,000	\$11.03	3,315,000	\$10.91
Cypress	2,355,500	10.68	2,355,500	10.68
White oak	863,300	15.64	860,000	15.43
White ash	645,000	19.39	595,000	19.76
Yellow poplar	342,000	15.76	.....	.....
Cottonwood	200,000	18.75	200,000	18.75
Texan oak	175,000	6.29	175,000	6.29
Loblolly pine	100,000	12.00	100,000	12.00
Evergreen magnolia	85,000	16.65	85,000	16.65
Longleaf pine	60,000	18.00	60,000	18.00
Shortleaf pine	50,000	12.00	50,000	12.00
Black willow	40,000	15.00	40,000	15.00
Sugar maple	30,000	36.00	.....	.....
Red cedar	20,000	38.00	.....	.....
Red oak	2,000	60.00	.....	.....
White pine	1,000	48.00	.....	.....
Mahogany	1,000	140.00	.....	.....
Totals	8,384,800	\$12.66	7,835,500	\$12.27

Except cypress, practically all the furniture made in Louisiana is of hardwood. Cypress is one of the few soft woods which is well suited to both outside and interior furniture construction, and that fact accounts for its large use as furniture material. The cut of this wood in the state exceeds nearly threefold the combined cut of all the hardwoods, but nearly two and a half times as much hardwood as cypress is demanded by the manufacturers of furniture. Seventeen woods are used, but six of them come wholly from outside the state. Many grow in commercial quantities in the state but are not listed in the statistics of lumber bought for furniture. Three oaks are reported, but there are several others, while hickory and tupelo, both abundant, are not reported by any manufacturer of furniture. Three maples grow in the state, yet none of the wood reaches the furniture makers. The small quantity of sugar maple reported was grown in Wisconsin. Beech is abundant in many of the forests of northern Louisiana, and is good material for certain parts of furniture, yet none is used. Two species of elm are found, both excellent chair material and suitable for the interior of most kinds of furniture, yet elm is not found in the furniture statistics of the state. More than a dozen other good furniture woods grow in the state, but apparently are not used.

The red gum reported came from Louisiana and Mississippi; yellow poplar from Tennessee and Mississippi; red cedar from Tennessee; white oak from Louisiana, Oklahoma, and Tennessee, and the mahogany from Cuba.

Red gum enters into all parts of furniture, both exterior and interior. Yellow poplar serves chiefly for shelves, table tops, and wardrobes. Magnolia is substituted for yellow poplar with general satisfaction, and is specially commended for furniture doors. It keeps its shape well during weather changes. The discolored heartwood of some of the logs is sawed into crating lumber for use in furniture factories. Red cedar is occasionally demanded for drawer bottoms when furniture is made to order. Its odor is reputed to drive moths away, and though it is an expensive wood, the demand for it continues from generation to generation. It has been used during three hundred years in this country to keep injurious insects away from clothing and furs.

Although the furniture factories of Louisiana fall

much short of supplying the home demand, they export to Central and South America, the West Indies, and a little to Europe. The low cost of raw material, the low freight rates by water, and the high prices received in foreign countries, make the export of furniture profitable in Louisiana. At the

same time, the indications are that some of the good home markets are neglected. It is said that red gum furniture, made in northern cities, is sold in considerable quantity in New Orleans and other towns of the state. Not infrequently it passes for Circassian walnut, and so closely resembles it that the difference is hard to detect—in fact, it is claimed that the chief difference is that the red gum is handsomer.

The furniture factories of the state do not report much saving of waste through the making of by-products. Some of the short pieces of oak are sold for heading material in cooper shops; red gum short lengths are made into boxes; and cypress odds and ends are converted into tubs, fence lath and tomato sticks.

A comparison of Louisiana with certain other states in the manufacture of furniture will show how small a beginning it has made in this industry. The difference brought out by the comparison is emphasized if the forest resources of Louisiana are compared with those of some of the states which are far ahead of it in furniture manufacture. It is not possible to say exactly what the timber resources of the different states amount to in feet or dollars, but it is known that Louisiana has enormous supplies of both hard and soft woods. Acre for acre of forest area, Louisiana will compare favorably with any other state, both in quantity and quality of timber. The table which follows compares the furniture industry in Louisiana with certain other states, also the timbered areas, and shows how much furniture wood each of the states uses yearly per 100 acres of forest land.

Table 8.

The Furniture Industry in Louisiana Compared with Certain Other States.

States.	Quantity used annually. Feet B. M.	Average cost per 1000 ft. at factory.	Number of woods used.	Area in forest acres.	Amount used for furniture per 100 acres of forest feet B. M.
North Carolina	182,861,250	\$18.00	18	22,592,000	809
Illinois	123,643,930	37.89	41	6,518,000	1897
Wisconsin	48,376,000	25.22	15	20,320,000	238
Massachusetts	48,143,300	28.36	23	2,688,000	1791
Kentucky	26,577,100	26.63	26	14,218,000	187
Maryland	17,774,675	29.32	24	2,816,000	631
Oregon	8,853,250	22.48	23	34,752,000	26
Louisiana	8,384,800	12.66	17	18,208,000	46

The foregoing table would be misleading if interpreted to mean that each of the states draws furniture material from its own forests only. No state in this country does that. There is a constant exchange of lumber between different regions, and often these regions are far apart. The Pacific Coast draws supplies from the East, and the East draws from the Pacific Coast; Wisconsin manufacturers send to Louisiana for cypress, Maryland buys cottonwood, white oak, and cypress there, and Louisiana in turn purchases white oak in Tennessee, cottonwood in Mississippi, and cypress in Arkansas. Statistics show that Louisiana actually uses a less amount of its homegrown lumber in its own furniture factories than it ships to the furniture factories of Illinois.

The table is instructive because it shows how great may be a region's forest resources, and how moderate the use made of them at home, as in Louisiana's furniture industry; while, conversely some regions with comparatively small resources of the kind demanded, have developed extensive industries by drawing supplies from distant localities, as in the cases of Massachusetts, Maryland, and Illinois. A very high development of home resources is seen

in North Carolina's furniture industry which draws 94 per cent of its wood from the state's forests; and with a wooded area but little larger than Louisiana's, it turns into furniture more than twenty times as much lumber, and pays nearly one and a half times as much for it, per thousand feet. Illinois furniture makers pay three times as much per thousand feet for their lumber as the manufacturers in Louisiana pay, and Massachusetts, Kentucky, Wisconsin, and Maryland pay more than twice as much. The markets in which the finished products are sold are not equally accessible to all these states, for Louisiana, by reason of higher freight rates, is at a disadvantage in competing for some of the northern markets. There are, however, many markets where the Louisiana product competes with little or no disadvantage on account of higher freight. Water carriage is cheap, and the ports of Louisiana are within reach of the whole Atlantic Coast from Maine to Florida, as well as the West Indies, and most of the Spanish-American and European countries. The possibilities of developing a trade in furniture manufactured from the excellent and very cheap woods of Louisiana, will doubtless attract much attention in the near future.

VEHICLES AND VEHICLE PARTS:

Table 9.

VEHICLES AND VEHICLE PARTS.

Species—	Grown in Louisiana.—Grown Outside La.		Grown in Louisiana.—Grown Outside La.		Grown in Louisiana.—Grown Outside La.	
	Quantity used annually feet at (Ft. B.M.) factory.	Av. cost per 1000	Total cost.	Quantity feet at (Ft. B.M.) factory.	Av. cost per 1,000	Av. cost per 1,000
White oak	3,189,300	\$12.61	\$40,203	3,189,300	\$12.61	.....
Hickory	2,963,800	26.54	78,663	2,963,800	26.54	.....
Cow oak	90,000	13.89	1,250	90,000	13.89	.....
Overcup oak	90,000	13.33	1,200	90,000	13.33	.....
Beech	35,000	20.00	700	35,000	20.00	.....
Yellow poplar	30,000	50.00	1,500	22,000	40.91	8,000 \$75.00
Red gum	30,000	20.83	625	30,000	20.83	.....
White ash	26,250	39.24	1,030	26,250	39.24	.....
Longleaf pine	16,000	26.56	425	16,000	26.56	.....
Texan oak	10,500	25.71	270	10,500	25.71	.....
Shortleaf pine	2,500	26.00	65	2,500	26.00	.....
Locust	2,200	61.36	135	.....	.....	2,200 61.36
Red oak	2,000	60.00	120	.....	.....	2,000 60.00
Cypress	2,000	45.00	90	2,000	45.00	.....
Evergreen magnolia	500	22.00	11	500	22.00	.....
Totals.....	6,490,050	\$19.46	\$126,287	6,477,850	\$19.36	12,200 \$70.08

Except a little yellow poplar, locust, and red oak, Louisiana depends entirely upon its own forests for vehicle wood. The poplar is made into panels for carriages, the locust into hubs, but the use to which the 2,000 feet of imported red oak is put is not stated. Oak and hickory are the most important woods in this industry. Four oaks are included, namely, the common white oak, the cow oak, the overcup oak, and the Texan oak, which is commonly called red oak, or spotted oak. Louisiana is a large user of hickory, and it nearly all goes into vehicles. Most of the hickory cut in the state is shipped to the other states rough or only partly manufactured, there to be finished and made ready for use. The cut of hickory lumber in the state is nearly eight million feet, besides much not listed as lumber which goes out as logs, bolts, or billets. The manufacturers in the state use less than three million feet of this fine vehicle wood. A considerable part of that appearing in the accompanying table as manufactured product, is not in the form of vehicles ready for use, but as completed parts, such as spokes, hubs, shafts, poles, and gears. These are shipped to northern factories where they are assembled, ironed, painted, and sent out as finished vehicles. It is not possible to state how much of Louisiana's six and a half million feet of vehicle wood shown in the table is actually finished in the state and made ready for the consumer. Vehicle making in many regions is somewhat different from most other kinds of manufacturing, because it is rather unusual for one factory to begin with the rough wood and turn out the completed vehicle; but the finished product of one concern becomes the raw material for another, thus passing by successive stages, and through successive mills and factories, from the rough material to the completed product.

There are, however, a number of shops and factories in Louisiana which make vehicles ready for use. These vehicles are of many kinds, from the heaviest wagon, to the lightest buggy. First consideration is given to supplying local demand, and after that, buyers in neighboring states are supplied. Louisiana farm wagons are sold in Central Texas and Eastern Missouri. In the latter instance, the cheap freight by river assists the manufacturer in selling his wagons. The complaint is common, however, that freight rates to many parts of Texas render it difficult to sell Louisiana-made wagons there in competition with large wagon manufacturers of Indiana, Illinois, Kentucky, Missouri, and Arkansas.

Water rates are low from Louisiana ports southward, and vehicles are shipped to Mexico, Central America, and Panama. The latter country buys heavy wagons made in New Orleans, and also light vehicles, such as are demanded by butchers, bakers, and peddlers. The beech reported by this industry is made into felloes for heavy wagons; the locust for small business vehicle hubs. It is claimed for beech that it seasons more quickly than oak, and that it stands well the strain to which it is subjected in heavy trucks. Wagon bottoms are made of longleaf pine and Texan oak; and cypress bends well and is used for bows for tops of light wagons. Strong, thick panels for coal wagon bodies are made of ash, which is less liable than oak to split and pull apart by shrinking and swelling. The small quantity of magnolia reported was substituted for yellow poplar in light panels. Kentucky supplied the red oak and the locust, and Tennessee the yellow poplar bought by the vehicle makers.

It does not appear that vehicle makers are working much waste into by-products. One factory uses small pieces to make wheelbarrows. Much of the white oak and hickory goes to the factory as logs;

but many billets, and much sawed lumber and dimension stock are demanded. The sawed stuff is one inch thick and upwards. The pine is bought after surfacing. Buggy makers report the use of considerable red hickory, that is, the common hickory's red heartwood, which was formerly considered unsuited for use. Tests have shown, however, that for many purposes it is entirely satisfactory.

Table 10.

The Vehicle Industry in Louisiana Compared with Certain Other States.

States.	Quantity used annually Feet B. M.	Average cost per 1000 feet at factory.	No. of woods used.
Kentucky	59,445,500	\$30.00	14
Illinois	57,930,000	41.49	25
Wisconsin	41,664,000	41.02	16
North Carolina...	15,636,000	26.30	8
Louisiana	6,489,550	19.46	15
Maryland	1,956,300	36.89	15
Oregon	198,200	104.71	11

TANKS.

Table 11.

TANKS.

Species—	Grown in Louisiana.—Grown Outside La.		Grown in Louisiana.—Grown Outside La.		Grown in Louisiana.—Grown Outside La.	
	Quantity used annually feet at (Ft. B.M.) factory.	Av. cost per 1000	Total cost.	Quantity feet at (Ft. B.M.) factory.	Av. cost per 1,000	Av. cost per 1,000
Cypress	5,715,000	\$15.15	\$86,590	5,715,000	\$15.15	.....
Longleaf pine	10,000	20.00	200	.....	.....	10,000 \$20.00
White oak	10,000	40.00	400	.....	.....	10,000 40.00
Texan oak	10,000	40.00	400	.....	.....	10,000 40.00
Totals.....	5,745,000	\$15.25	\$87,590	5,715,000	\$11.52	30,000 \$33.33

The manufacturers engaged in this industry report that the output for the whole state has declined in recent years. Water cisterns built above the ground were once a necessity in nearly all parts of the state, but particularly in the southern portion and in regions where the land lies low and flat. The decline in the use of such cisterns is not due to any change in the ground level, but to the fact that many of the larger towns have installed municipal water works, and private residences no longer need cisterns to store rain water. In many parts of Louisiana, water from shallow wells has never been a success; not that there was any lack of ground water, but rather that there was too much of it. It rose in wells within a few feet of the surface, and often quite to the surface of the ground. It was frequently little better than stagnant surface water, and was unfit for domestic use. The country being flat, there were few springs anywhere, and in many places none. It often happened that, with a superabundance of water everywhere, there was none fit to drink. One of the first cares of the house builder, therefore, was to provide a cistern for collecting and storing rain water. The custom prevailed in the towns as well as in the rural districts, but less in the northern part of the state than in the south, because among the hills and rolling country of the north many wells and occasional springs met the demand.

Municipal water works have been built recently in many of the towns. New Orleans is just now completing a fine system at great expense, and thousands of cisterns in that city are approaching the end of their usefulness. It is said that New Orleans

at one time contained 90,000 cisterns. The estimate would seem high were it not for the fact that many houses had two or more cisterns, some outside and some indoors. In nearly all cases, the cisterns were above ground—unlike those in many dry regions which are built of masonry and cement below the surface. The soft and saturated soil underlying New Orleans was not suited to the construction of subterranean cisterns of masonry.

At the present time in New Orleans many cisterns are being torn down, and after rejecting such pieces as are too much decayed for further use, rebuilt cisterns are constructed of the old serviceable lumber. These are shipped to the country where they find sale for windmill tanks, or some other use. Some of the shops which formerly manufactured cisterns for city use, now confine their activities chiefly to rebuilding old ones which they ship away to sell, often outside the state.

All cisterns in Louisiana are not for rainwater, though most of them are. Breweries, bakeries, dye-works, laundries, vinegar makers, and others use them. The distinctions between cisterns, tanks, vats, and troughs are not always clearly drawn. The use is given more consideration than the shape in assigning names to the different articles. In this report all wooden containers too large to be classed with cooperage, and constructed to hold fluids, are considered under the general caption of cisterns and tanks. Silos might properly be included, but none were reported in the state.

Manufacturers of cisterns and tanks in Louisiana export many to the West Indies and to Central America. Belize and British Honduras are good customers. Most of the cisterns sent to Central American countries are for rain water in towns which have no water works. Some that go to Panama, Mexico, Cuba, and Porto Rico are for use in manufacturing establishments. Shipments are regularly made to several European countries, and occasionally to South Africa.

An examination of Table 11 will show that cypress is used almost exclusively. The longleaf pine, white oak, and Texan oak together amount to only 30,000 feet, a quantity so small in comparison with the cypress that it is almost negligible. Cypress is an ideal wood for this purpose, and stands as high as any in the United States. It lasts many years, even in warm and damp situations which induce speedy decay in most woods. Some of the old cisterns in New Orleans which are now being removed because the installation of city water works renders them unnecessary, were built before the Civil War, and often there is not a stave in them

but can be used again. However, the average life of a cypress cistern is not so long. The best and clearest lumber is used. None was reported bought for cisterns that was under one inch thick, and much was over two inches, and all was of the best grades. Some was bought as rough lumber, but most was dressed.

The waste in a cistern factory is comparatively small, since the material is generally bought in the sizes and grades which can be worked with greatest economy. Pieces under size are made into small tanks and tubs; and what is otherwise unsuited for the general purpose, is occasionally disposed of for screen doors, brackets, and plasterer's lath.

Many sizes and shapes of tanks and cisterns are made. A few hold 40,000 gallons, and from that extreme size the range is downward to fifty or a hundred gallons. Those bound with hoops, as all the round ones are, are smaller at the top than at the bottom, an arrangement which prevents the hoops from dropping off and wrecking the structure in case of shrinkage of the wood in dry weather when the water within becomes low. Many slender, two-story cisterns are seen in the crowded quarters of towns, principally in New Orleans. They are built thus to economize space where buildings stand close together and cisterns depend upon height rather than diameter for their cubical contents. The two-story cistern, which may be twenty feet tall, has two water-tight parts, the upper and the lower. Water may be drawn from either without disturbing the contents of the other. The purpose in having two, one above the other, rather than one very tall cistern, is that the pressure may be lessened.

Table 17.
MISCELLANEOUS INDUSTRIES.

Species—	Grown in Louisiana.—		Grown Outside La.	
	Quantity used annually feet at (Ft. B.M.) factory.	Av. cost per 1000	Quantity feet at (Ft. B.M.) factory.	Av. cost per 1,000
Longleaf pine	6,666,500	\$ 7.28	6,666,500	\$ 7.28
Cypress	4,011,000	19.54	4,011,000	19.54
Yellow poplar	801,000	35.03	801,000	35.03
Red gum	576,000	13.04	576,000	13.04
Shortleaf pine	535,000	8.65	305,000	9.61
Tupelo	521,000	13.94	521,000	13.94
Cottonwood	371,000	7.40	180,000	6.66
White elm	60,000	12.00	60,000	12.00
Mahogany	40,000	115.00	40,000	115.00
Chestnut	40,000	35.00	40,000	35.00
White pine	24,500	80.61	24,500	80.61
Hickory	23,000	34.34	21,000	34.76
White ash	20,200	15.35	20,200	15.35
Red cedar	16,000	50.62	16,000	50.62
River birch	10,000	12.00	10,000	12.00
White oak	6,200	35.48	6,200	35.48
Evergreen magnolia	6,000	15.33	6,000	15.33
Loblolly pine	5,000	14.00	5,000	14.00
Soft maple	4,000	12.00	4,000	12.00
Texan oak	3,000	25.00	3,000	25.00
Red oak	3,000	46.00	3,000	46.00
Persimmon	2,000	10.00	2,000	10.00
Dogwood	2,000	12.50	2,000	12.50
Osage orange	2,000	12.50	2,000	12.50
Sugar maple	1,000	60.00	1,000	60.00
Cherry	1,000	10.00	1,000	10.00
Hardy catalpa	1,000	25.00	1,000	25.00
Umbrella wood	1,000	25.00	1,000	25.00
Mulberry	500	20.00	500	20.00
Water oak	500	20.00	500	20.00
Willow oak	500	20.00	500	20.00
Totals.....	13,753,900	\$13.72	12,339,400	\$12.11

pears small in the table, are woods in pretty general use, though almost invariably under other names. This is more fully set forth, with reasons for it, in the discussion following table 1 of this report.

Ten states and one foreign country supply the wood listed in this table, which Louisiana does not procure from its own forests. Some hickory is reported from Alabama and Indiana; sugar maple from Maine; mahogany from Mexico; white pine from Michigan; red oak from Indiana and Wisconsin; cottonwood from Mississippi and Missouri; red cedar from Tennessee; persimmon, dogwood, and yellow poplar from Alabama, and chestnut from North Carolina and Kentucky.

The articles made are sold in many parts of the world. Wooden water pipe of banded cypress staves finds a large market in Mexico where it is used in draining mines, or in leading water to them, or in supplying it for municipal or manufacturing purposes. Trunks have their principal foreign market in the several countries of Central America. The wood of which the trunks are made is chiefly cottonwood, cypress, red cedar and ash. Some of this is three-ply veneer. The red cedar is made into trunk trays, it being in demand for that purpose because of its odor, which is supposed to be obnoxious to moths and other injurious insects which are liable to infest stored clothing.

One of the most widely sold products of Louisiana wood manufacturers is cotton ginning machinery. Practically every cotton-growing country of the world buys some of it. India and Egypt are particularly good customers. The machinery consists of feeders, presses, condensers, and elevators, with necessary appliances. Four woods are reported for these commodities, longleaf pine, red gum, tupelo, and cypress.

Much longleaf pine is sent to the distilling plants and is converted into various commercial commodities, among them being tar, turpentine, charcoal, pine oil, tar oil, and pyroligneous acid. Most of the wood for distillation is procured from old stumps. It is therefore a utilization of waste. Limbs and defective logs unfit for lumber are also used. The extent to which this industry may be developed depends upon the market for the products and the cost of manufacture; for the supply of waste is without limit at this time. The cost of cutting the pine stumps at the level of the ground is an item of some consequence.

Cypress is the chief wood entering into refrigerator construction, and outside of the state, the principle market for refrigerators is in Central America. Only one wood was reported for ladders, shortleaf pine. Cypress is the most important wood for washing machines, and the product is sold in Canada, West Indies, and Europe, as well as in the United States. Some of the output is shipped in the form of cut and fitted parts, to be assembled and finished when they reach their factory destination.

Coffins and caskets are made of several woods. The cheaper grades are of tupelo and red gum. More

expensive woods enter into the better grades. Among them are yellow poplar, cypress, red cedar, chestnut, and mahogany. The lasting properties of cypress have made it a favorite casket wood since the first settlements by Europeans in Louisiana. Expensive caskets are in more demand in some parts of the state now than formerly, particularly in New Orleans. When the towns and cities were poorly drained, vaults above ground were preferred by those who could afford the additional expense; but with good drainage, the manner of burial has undergone a change, and high grade caskets are growing in demand. Much mahogany is used. In some instances casket shells and burial boxes are made of wormy mahogany, because it is cheaper. It answers as well for the purpose intended as the high grade wood. Wormy mahogany is as sound as any, so far as decay is concerned, but is perforated by small holes varying in size from a pin point to a lead pencil. The holes are the work of the teredo or shipworm, and represent a period in the mahogany log's history, on its way from forest to factory, when it was submerged in salt water for a considerable time. Most of the logs are cut in Mexico, and by various methods of transportation, by land and water, reach New Orleans. It is evident that some of the logs, somewhere on their journey, are occasionally left a little too long in briny water, and the teredo gets in its work. The perforated mahogany is very similar in appearance

to "sound wormy" chestnut, which is a very common form of that wood, regularly carried by most lumber yards. In the manufacture of coffins and caskets in Louisiana, chestnut and wormy mahogany are used for the same purpose. Yellow poplar and red cedar are employed in the manufacture of fine caskets. A large part of the trade is with foreign countries. High grade caskets are sold in Mexico, Central America, Panama, West Indies, and South America.

Longleaf pine is manufactured into paving blocks, which are creosoted, and sold in different parts of the United States and in Mexico. Shortleaf and loblolly pines are not objectionable for paving blocks, if trees are selected with narrow annual rings. As a usual thing, the yearly rings of the longleaf pine are closer together than are those of other southern pines.

The river birch which is listed in the table was all made into ox yokes. It is considered one of the best woods for that purpose, because it is strong, wears smooth, is moderately light, and resists decay. Three other woods are occasionally made into ox yokes, evergreen magnolia, black gum, and tupelo. The ox yoke industry is of considerable importance in Louisiana where large numbers of oxen are worked in logging operations.

Most of the white pine and some of the cypress represented in table 17, were made into patterns. The cypress is cheaper, and where it will answer, it has replaced white pine, but for exacting work, no other wood equal to white pine for patterns has been found.

The brush industry in Louisiana is not large, but trade in the finished product is both domestic and foreign. Eight woods are used, mahogany, white oak, white ash, sugar maple, yellow poplar, tupelo, red gum, and evergreen magnolia. No other industry paid as high a price for white oak. Following are the kinds of brushes made: Asphalt brushes with steel teeth—for sweeping asphalt pavement; casting brushes with steel teeth—for painting ships; spiral flue brushes; spiral bottle brushes; ant paste brushes—used by confectioners to keep ants out of cake and candy boxes; deck scrubs—for cleaning the woodwork of ships; house scrubs; street brooms; tar brushes—for spreading tar on roofs; car washers—for cleaning the exteriors of Pullman cars; clothes brushes; hair brushes; paint and whitewash brushes of many kinds. The magnolia reported has taken the place of holly for fine brush backs. It is sometimes made up strip and strip about with mahogany, a back with alternate dark and light stripes resulting. The mahogany used is chiefly scraps from other factories. Very small pieces can be used. At the present time, Panama buys a good many brushes made in Louisiana.

The absence of a table in this report showing the handle industry in Louisiana is due to the fact that very little such manufacturing was reported. Some thousands of split hickory cant hook handles are made, and there are a few handles of other kinds. The absence of an extensive handle industry in the state is remarkable, because Louisiana is a large producer of such hickory as handles are made of. All that was reported is included in Table 17. The annual use of wood for handles in several states follows: Massachusetts 770,500 feet, Wisconsin 1,650,000, Oregon 1,854,400, North Carolina 3,595,000, Illinois 12,582,000 and Kentucky 35,670,000.

Table 18.
SUMMARY OF PRECEDING TABLES OF INDUSTRIES.

Industries—	Average price paid for lumber at the factories per 1,000 ft. B. M.	Apportionment of the total quantity of lumber among the industries (Approx. per cent.)
Planing mill products (Table 2).....	\$11.49	90.28
Boxes (Table 4).....	9.77	4.13
Doors, sash, blinds, etc. (Table 6).....	17.95	2.69
Furniture (Table 7).....	12.66	0.62
Vehicles and vehicle parts (Table 9).....	19.46	0.49
Tanks (Table 11).....	15.25	0.42
Boat and ship building (Table 13).....	24.49	0.34
Fixtures (Table 15).....	37.12	0.02
Miscellaneous (Table 17).....	13.72	1.01
Totals.....	\$11.63	100.00

The ratio of total cut in the state to the amount further manufactured is not the same for all the species. The cut by species as given in the table which follows is from the Census Bureau's figures. "Forest Products of the United States, 1909," pub-

lished 1911. Some of the species are grouped with others, and totals can be given for the groups only. In but one instance did Louisiana manufacture a larger quantity of a wood than its saw mills cut—yellow poplar. Table 19 shows the amounts and percentages.

Table 19. ANNUAL LUMBER CUT COMPARED WITH AMOUNT FURTHER MANUFACTURED.

Table with 4 columns: Species, Total cut, Amount further manufactured in 1910, and Per cent. of manufactured to total cut. Includes species like Longleaf, Cypress, White oak, Cottonwood, etc.

In order to compare these figures with similar data from other states, Table 20 is given.

Table 20.

The Lumber Output and the Amount Further Manufactured in Several States Compared.

Table with 4 columns: State, Annual Lumber Cut Feet B. M., Quantity Further Manufactured Feet B. M., and Ratio of Manufactures to Total cut per cent.

Maryland 267,939,000 284,346,895 106
Massachusetts 361,200,000 549,319,644 152
Illinois 170,181,000 1,781,536,120 1047

Those states which use more lumber in their factories than their saw mills cut bring supplies from elsewhere to make up the difference.

APPORTIONMENT OF WOODS AMONG THE INDUSTRIES.

It is shown in Table 21 how each of the woods put to use in Louisiana is apportioned among the several industries. White oak and Longleaf pine are the only woods demanded by every industry, while twenty-three of the species are employed by

Table 21.

PER CENT. OF THE DIFFERENT KINDS OF WOOD USED BY EACH INDUSTRY.

Large table with multiple columns for industries like Boxes and crates, Fixtures, Furniture, etc., and rows for various wood species like Basswood, Beech, Black gum, etc.

*Less than 1-100 of 1 per cent.

no more than one. However, those which appear in a single industry are not demanded in large quantities.

WOODS USED BY INDUSTRIES IN LOUISIANA.

Table with 4 columns: Quantity used annually (Feet B. M., Per Ct.), Average cost per 1000 ft., and Total cost f. o. b. factory. Lists various industries and their wood usage.

Table 22, which follows, shows how Louisiana's total of 1,354,954.101 feet of lumber employed for manufacturing purposes yearly is apportioned among eight general industries, and a number of smaller industries grouped as miscellaneous.

SPANISH MOSS. (Dendropogon Usenoides.)

Spanish Moss is more widely distributed through the markets than any other product of Louisiana's forests. It is sold in every state of the Union, in every country in Europe, in Egypt, South Africa, Asiatic Turkey, Japan, Siberia, the Philippines, Australia, Mexico, South America, and the West Indies.

Though it is spoken of as moss wherever it is known, it is not a true moss, as botanists define it, but a leaf-bearing, flowering plant of the pine apple family, that lives on air and water, and uses the tree chiefly as a support to hang on. It seems probable that it was carried to our shores from the West Indies, but not in historic times. It grows in the vicinity of the coast from Virginia to Texas. A single tree may bear a ton, though usually much less. The plant hangs in strands from a few inches long to many feet. Ten feet is not unusual, fifteen is occasional, and a single strand 21 feet long, observed in Calcasieu Parish, was the longest seen during the investigation of the industry in the spring of 1911.

The plant bears a small, solitary green flower, so inconspicuous that few persons notice it. The seed is covered with fine hairs which render it sufficiently buoyant to float long distances on the wind. When the seed strikes the side of a tree, or a branch, the hairs adhere to the bark and hold the seed until it has had time to germinate. Rootlets fasten themselves in minute crevices of the bark and the plant hangs there and grows. Strands wind themselves around twigs, limbs or protuberances of bark, and the rootlets soon decay. Thenceforth the plant, or moss as it is called, hangs like clothes on a line, and all the nourishment it gets comes from air and water. It may be propagated without seed. Tufts of the moss may be blown by wind, or carried by birds in building nests, and if securely fastened to the branch of a tree, they may grow. The plant more frequently spreads by that means than by the scattering of seeds.

The moss is used in upholstery—for stuffing mattresses, cushions, and saddles—and has been so employed for generations. It is not, therefore, a new thing, but its use has greatly increased in recent years. Louisiana is said to furnish much more than half of the world's supply, and a brief account of the industry there should be of interest.

Harvesting the Crop.

Though the moss is planted naturally, and grows wild, its gathering and preparation for use must be done with due regard to season. Practically all the crop in Louisiana is harvested by negroes who go about it singly or in small companies at times of year when plantation work is slack. The moss hangs on trees along the borders of swales and in deep swamps, some of it near the ground, other on branches all the way to the tops of the tallest trees. The gatherer's chief care is to bring it down. Sometimes he climbs the trees, pulls it loose and lets it fall. He often takes serious chances by going out on limbs to make a clean pick. Others do not climb, but use long poles with sickle-like hooks to bring the moss down. Still others content themselves with gathering what may be reached, by hand, or such as may be blown down by wind. Since most of the moss, if left to grow, will sooner or later be blown down, the harvesters have only to bide their time, and they will secure most of it on the ground. Many of the swamps are covered with water most of the time. In such places the gathering is done in boats that are pushed among the trees; but this method has its disadvantages, the chief of which is that overhanging branches constantly rake the moss from the boat into the water. The moss-gatherers find their best harvest when timber cutting is carried on where moss is plentiful. They can harvest the whole crop without climbing. When moss is stripped from standing trees, a new crop grows in a year or two. Though it will hang a considerable time after the tree that bears it has died, it seldom, if ever, attaches itself and grows on a dead tree. Some insist that moss kills trees, but this view should be accepted with reserve; for a tree has borne its load of moss as long as the oldest resident can remember, with no noticeable injury to the tree's vitality.

Curing Moss.

After moss is picked from the trees it is rotted or cured after the manner of flax, and for the same purpose, namely, to get rid of the waste portion of the stalk. It is the inner, hard stalk of flax which is objectionable; but it is the outer, powdery bark of the moss which the rotting removes. The real body of the moss, the fibro-vesicular skeleton, is a long, slender, horsehair-like thread extending the whole length of the plant. This is the valuable part, and it is separated from the outer bark by rotting. To do this the moss is piled in heaps on damp ground, or in water, and is covered with thin earth. Its slow combustion generates sufficient heat to burn off the outer bark, and a mass resembling black horsehair is left, and that—after it has received certain other treatment—becomes the moss of commerce. The time allowed a heap to complete its rotting process varies—depending on the owner's hurry to sell it. At the end of ten days the heap is hot enough to burn the hand if thrust beneath the surface. At the end of thirty days much of the hull or bark has disappeared, and the moss

has grown dark, but is not yet black. If the owner is impatient to realize on it, he sells it at that stage, but receives a low price, because the product is yet in a crude state—known in the trade as "gray moss." He may receive a cent or a cent and a quarter a pound when he has carried it to the dealer. The longer it is left in the rotting pile the blacker it becomes, and the more it is worth. It is not profitable, however, to leave it more than three months, and few leave it that long. The best three-months moss sells for four cents per pound. The bulk and weight diminish as the rotting process is lengthened, and though the price per pound increases, there are fewer pounds.

Process of Drying.

Dealers insist that moss offered for sale must be comparatively dry. If it is otherwise, they deduct liberally for its dampness, and the seller has learned by experience that there is little profit in wet moss. Therefore, he makes an effort to dry it before it goes to market. In traveling through the moss-producing regions of Louisiana, one often sees the fences, sheds, clothes lines, and other objects about cabins covered with moss, hung there to dry, after it has completed the process of the rotting heap. Wind and sun dry it in a day or two, and it is ready for its first market. It should be explained that the moss usually passes through two successive markets before it reaches the ultimate consumer. The first is the country store which buys it from the people who gather it; second is the wholesaler who gins it, bales it, and ships it to near and distant regions.

The Market.

Local dealers, generally country merchants, barter with gatherers for their moss. Payment is sometimes made in money, but usually in merchandise, such as groceries, shoes, and clothing. The moss finds its way to the country stores by many modes of conveyance, in sacks carried on shoulders or head, in wagons, carts, sometimes by boat or canoe; and in quantities ranging from a ton or more down to a few pounds. The country or village store-keeper puts it up in bales weighing several hundred pounds, and bound with old rope or wire. He ships it to the wholesalers in New Orleans or elsewhere. Much goes to that city by boat, and immense piles of it may often be seen at the wharfs, whence it is hauled to the warehouses and gins to be cleaned, rebaled, and sent all over the world. The annual crop in Louisiana amounts to millions of pounds when bought by the country merchants, and the gatherers receive approximately \$250,000 for it. The wholesalers who clean it and sell it to consumers expend considerable money in the process, and by ginning it reduce the weight almost one-half; but they receive higher prices, and their annual sales reach about half a million dollars. The best is worth ten cents a pound.

Ginning.

When the moss reaches the wholesaler it is filled with many impurities which must be removed before it is fit for the consumer. It contains twigs, sticks, leaves, and bark. Some of the wholesalers clean the moss by hand, paying operators by the pound for the work. Hand-picked moss is usually rated a little higher than that cleaned by machinery, because the threads are less broken. Until a few years ago all moss was cleaned by hand, and if dyed, as much of it was, it was afterwards dried like clothes on lines. Some still do it that way; but the gin now does most of the cleaning. An up-to-date moss gin requires an engine of 100 horse power. The moss arrives in bales of some hundreds of pounds. It is fed into machines which remove the impurities, frequently as much as 800 pounds for a ton of crude moss. Although every known appliance for preventing the escape of dust into the air is made use of, the process is very trying on the lungs of operatives. The position of feeders—the putting of moss into the machines—and off-bearers of refuse are so trying that few can do the work. However, men are occasionally found who fill the places without apparent discomfort, though much of the time almost lost from sight in clouds of dust. The operatives are nearly all negroes, men and women, and some have done the same tasks many years, with little vacation or holiday. The dirt which is removed in the process of ginning supplies a considerable part of the factory's fuel. The moss which goes into the machines a gray mass, comes out clean black. Electric holsts pick up hundreds of pounds at a time and carry it to dye vats where it is made a shining black, after which it passes through dryers, and is then pressed into bales of from 40 to 100 pounds, and is ready for the markets of the world. It looks like hair, and many persons who buy it in cushions and upholstery suppose it is hair. There is a test which will determine this. A hair drawn between the nails

of the finger and thumb will pass smoothly its whole length. A thread of moss so drawn will show a joint or rough place every two or three inches. The cost of hair is about 50 cents a pound, the cost of the best moss 10 cents. A moss mattress or cushion, under usual conditions, is good for eight or ten years.*

*In ginning moss constant vigilance is required to prevent solid bodies from going into the machines. The temptation to put heavy objects in the bales to make them weigh more seems well nigh irresistible. Stones, brick, plough shares, flat irons, log chains, and axes, are neatly stowed away in the center, and in one case a large iron pump was found, and in another a 98-pound lump of lead. Inasmuch as the wholesalers tag every bale as it comes in, they are generally able to ship the stones and bricks back to the men that sold them, but iron and lead are worth more by the pound than the crude moss, so these are sold to junk dealers.

Dealers prefer winter-picked moss, for it is then dryer, as it does not grow in cold weather. They claim that moss growing on some trees is much better than that on others, and experts who handle much of it claim to be able to determine the species of trees on which it grew by simply examining the moss. The strongest moss grows on cypress, and for most purposes is considered the best; but that growing on live oak is more elastic. Next in the scale comes tupelo moss. The bulk of the supply comes from these three species, probably because they are more abundant than other species in the swampy tracts and fog belts where moss reaches its best growth. Moss from pine trees is said to be unmarketable. In fact, little moss grows on pines, perhaps because they usually occupy dry tracts. Dealers, however, with one accord, declare that pine moss is worthless.*

*No attempt is here made to reconcile the conflicting claims of botanists who say that the moss takes nothing from the tree, but simply hangs on it, and the moss buyers who declare that the quality of moss depends upon the species of the tree which bears it. Perhaps there is lack of data to support the statement that the moss prefers certain species, other things being equal, but willow seems remarkably free from its presence, while live oak, cypress, tupelo, and hackberry though mixed with the willows, are often loaded with it. In fact, observations in more than thirty parishes of Louisiana, in course of this study, failed to show a single instance of moss growing on willow, though dead bundles, carried by wind, frequently hang on the branches of this tree.

As a forest resource, moss in Louisiana is in no immediate danger of exhaustion. The present demand is met without difficulty. Little moss is now being gathered north of Lakes Pontchartrain and Maurepas where much grows, and many other producing regions are practically untouched. The depletion of the supply will probably not come until the swamp forests have been cut.

USES OF WOOD.

Manufacturers and others in Louisiana report uses for different woods as follows:

AMERICAN HOLLY.—Brush backs.
BASSWOOD.—Boxes, horse collars (bark).
BEECH.—Boxes, crates, gearwheel teeth, heavy wagon felloes, veneer, wagon bolsters.
BLACK CHERRY.—Furniture, plane handles, tobacco pipes.
BLACK GUM.—Boxes, crates, excelsior, ox yokes, rollers.
BLACK JACK.—Chair backs, chair seats, table legs, wagon tongues, reaches, bolsters, sandboards, felloes, spokes.
BLACK SPRUCE.—Boat spars.
BLACK WALNUT.—Taborets, screen doors.
BLACK WILLOW.—Baseball bats, boats, boxes, crates, furniture shelving, wagon beds.
BUCKTHORN BRUMELIA.—Boxes, crosscut saw handles, fence posts, small cabinet work.
CATALPA.—Boat knees, brackets, newel posts, small furniture.
CEDAR ELM.—Chair stock, hoops, trunk slats, wagon poles.
CHESTNUT.—Caskets, coffins, office fixtures.
CHITTIMWOOD.—Saw handles, wedges.
CIRCASSIAN WALNUT.—Finish, furniture.
COTTONWOOD.—Carriage panels, cracker boxes, egg cases, excelsior, furniture shelving, kitchen tables, sugar barrel heading, trunks, wagon beds.
COW OAK.—Canthook handles, chair stock, furniture, vehicles, axels, bolsters, felloes, hubs, hounds, reaches, spokes, tongues, wagon bed bottoms, woven or braided chair bottoms and backs, woven baskets for laundry and plantation.
CUBAN PINE.—Balusters, bed slats, boats, boxes, car siding, ceiling, doors, excelsior, flooring, frames, grain doors, molding, wagon bottoms, weatherboarding.
CYPRESS.—Balusters, barges, beer vats, blinds, boats, boxes, brackets, bric-a-brac, butter tubs, cabinets, car siding, caskets, ceiling, chairs, china closets, churns, cisterns, coffins, columns, conduits, cotton gins, cross arms, doors, doughtray, drying racks, dyetubs, fence lath, finish, flooring, frames, furniture, garden sash, gavels, hothouse frames, hothouse sash, ladders, lath, mantels, milk buckets, molding, motor boat finish, newel posts, panels, pat-

Miscellaneous.

- American Turpentine and Tar Co., New Orleans
- Bancroft, Ross & Sinclair Co., New Orleans
- Beyerbach, Phillip P., New Orleans
- Bullon, D. C., & Co., Bolinger
- Carrollton Excelsior & Fuel Co., New Orleans
- Connell Iron Works, New Orleans
- Crescent City Moss Ginnery, New Orleans
- Crescent Felt Mattress Works, New Orleans
- Crescent Trunk Co., New Orleans
- Duffy Trunk Co., New Orleans
- Fields Manufacturing Co., Shreveport
- Gullett Gin Co., Amite
- Hallett Manufacturing Co., New Orleans
- Hammond Building and Manufacturing Co., Hammond
- Kyle Lumber Co., Franklin
- Laitner Brush Co., New Orleans
- Leslie, J. I., Ringgold
- Louisiana Creosoting Co., Winnfield
- Mass, Jacob & Co., New Orleans
- McGee Manufacturing Co., New Orleans
- Murphy Iron Works, New Orleans
- New Orleans Trunk Co., New Orleans
- Orleans Manufacturing Co., New Orleans
- Payne & Joubert, New Orleans
- Swoop, Julian M., New Orleans
- Southern Mattress Works, New Orleans
- Weis & Lesh Manufacturing Co., Delhi
- Wyckoff, A., & Son., Alexandria

APPENDIX.

The Bureau of the Census, in cooperation with the Forest Service, collects and publishes year by year statistics showing the output of lumber, lath, shingles, cooperage, veneer, and certain other forest products in the United States and in the separate states. That work is independent of the studies of the manufactures which the Forest Service has made in several of the states. The latter supplements the former, and care is taken that work done by the Bureau of the Census is not duplicated. The Forest Service begins where the Census leaves off—after lumber leaves the sawmill. There are certain products which are in their finished form when they appear in the Census figures, and for that reason they are outside the scope of the Forest Service's study, because they are not subject to further manufacture. If, however, a state's wood-using industries are to be fully presented, it becomes necessary to include some of the census statistics. Such is the purpose of this appendix. The figures which the census gives are for all states, but such only as relate to Louisiana are here presented and in condensed form.*

*Those who wish to examine the statistics more in detail are referred to "Forest Products of the United States 1909," issued in final form May 19, 1911, Government Printing Office, Washington, D. C., compiled by the Bureau of the Census in cooperation with the Forest Service Department of Agriculture.

SHINGLES.

Table 23 which shows the cut of shingles is approximate only, for it may include some not belonging to Louisiana.

Table 23.

Cut of Shingles in Louisiana. (Approximate only.)			
Wood	Number	Equivalent In Board Feet.	Value.
Cypress	1,386,722,000	194,141,000	\$2,815,000

LATH.

A complete list of woods used in making lath cannot be given, because this commodity is often a by-product in saw mills and is cut from slabs, crooked logs, and odds and ends of all species which come to the mill. The usual woods for this purpose in Louisiana are pine, cypress, and tupelo. Figures are presented in Table 24.

Table 24.

Output of Lath in Louisiana.			
Woods.	Number.	Equivalent in board feet	Value.
Various	377,708,000	105,756,000	\$868,728

SLACK COOPERAGE.

Cooperage is divided into two general classes, that meant to contain fluids, and that intended for dry commodities. Each class is divided into numerous grades or kinds. Tight cooperage may hold molasses when it will not do for alcoholic liquors, because the pores of some woods are so open that alcohol will pass through. In the same way, a slack barrel may do well enough for apples or potatoes while granulated sugar will sift through the cracks and be lost. The maker of a barrel, whether slack or tight, must know the commodity which will be carried in it; and the buyer of the barrel must be careful, also, and not accept what will not answer his purpose. The best woods and the most efficient workmanship are required in the making of whisky barrels, and white oak—under which name a number of species are included—is the best. Wine, vinegar, and oil barrels are less exacting, but comparatively few woods answer well even for these. The makers of slack bar-

rels have more woods to choose from, and so various are the commodities to be carried, that a barrel which will not do for one—sugar, flour, or cement—may be satisfactory for others, such as potatoes, poultry and cabbage.

Three articles make up a barrel, the staves, the heading, and the hoops. Table 25 shows the number of staves, their equivalent in board measure, and the species of wood of which they are made.

Table 25.

Output of Slack Cooperage in Louisiana Staves.		
Woods.	Number.	Equivalent in board feet.
Red gum	12,659,000	2,531,000
Cottonwood	7,460,000	1,492,000
Black willow	3,073,000	614,000
Elm	400,000	80,000
Oak	300,000	60,000
Pine	258,000	52,000
Ash	150,000	30,000
Totals	24,300,000	4,859,000

A comparison of Tables 25 and 26 shows that more wood is reported in Louisiana for heading than for staves. This does not necessarily mean that it takes more wood to make a barrel's heading than to make its staves. The two commodities are separately made, and it happened in Louisiana that more lumber went into heads than into staves. The reverse might be the case in other states.

Table 26.

Output of Slack Cooperage in Louisiana.		
Woods.	Number (Sets)	Equivalent in board feet.
Cottonwood	1,251,000	3,252,000
Tupelo	537,000	1,396,000
Red gum	154,000	400,000
Black willow	104,000	270,000
Ash	94,000	244,000
Pine	20,000	52,000
Oak	1,000	2,600
Elm	1,000	2,600
Totals	2,162,000	5,619,200

Hoops are listed with slack cooperage. Tight barrels also need hoops, but they are usually of metal, while many of those for slack barrels are of wood. Wire hoops, however, are used in large numbers. The hoop pole business has been important in this country since cooperage began, but it has undergone change to meet changed conditions. It was once supposed that hickory was about the only wood suitable for barrel hoops, and young hickories, from one to two inches in diameter, were cut from New England to Florida in unnumbered millions for the hoop pole market. The old style tobacco hogshead—the kind that was rolled to market and gave the English language the word "rolling house," which word went out of use when the hogshead ceased to roll—was an extravagant user and waster of hoops in its day. Two or three full sets of hoops were often required for a hogshead, for it was customary to cut the hoops whenever a prospective buyer wanted to look at the tobacco. Other barrels used immense numbers, and the drain upon the forest's straightest, smoothest, most promising young trees was beyond calculation. Finally coopers began to learn that hoops could be made from large trees as well as from sprouts. A tree which would make only one hoop when four years old might make a thousand when it reached the age of fifty. A marked change likewise came about in the kinds of wood found available. An inspection of Table 27 will not show one foot of hickory or oak which were once almost the only species cut for hoop poles.

A cooper of a century ago would have thought pine and red gum as utterly unfit for hoops, yet Louisiana makes nearly all its hoops of these two woods.

Table 27.

Output of Hoops in Louisiana.		
Woods.	Number.	Equivalent in feet, B. M.
Pine	*8,000,000	2,160,000
Red gum	*6,755,000	1,823,000
Elm	50,000	13,000
Totals	14,805,000	3,996,000

*The data in Table 27 was taken from the records of the Bureau of the Census. (Census bulletin, Forest Products No. 10, 1909). The figures, however, seem questionable.

Tight Cooperage.

More wood is required for a stave or a set of heading in tight cooperage than in slack. The staves and heads are thicker. There are, of course, different sizes and classes of barrels in both slack and tight cooperage, and any comparison of one with the other must be in a general way only. A stave for a

huge crockery hogshead, which is slack cooperage, is larger than a whisky barrel stave; but comparing class with class, tight cooperage staves are larger than slack.

Table 28.

Output of Tight Cooperage in Louisiana.		
Class.	Number.	Equivalent in feet, B. M.
Staves	17,288,000 pcs	15,559,000
Heading	864,739 sets	4,496,000
Total		20,055,000

There are other kinds of cooperage not usually listed as tight or slack. Tubs, buckets, firkins, keelers, piggins, noggins, churns, ice cream freezers, and the like, are examples. These articles are not extensively manufactured in Louisiana, and what material was found on the subject is included in Table 17 of this report. Such articles are generally called woodenware.

VENEER.

Table 29 shows the cut of veneer in Louisiana, reduced to feet, log scale. It was practically all rotary cut. A log is held in a machine and made to revolve against a strong knife which pares off the wood round and round, like peeling an apple. The shaving thus cut off is as wide as the log is long, often three or four feet, and is usually about as thick as a sheet of pasteboard. The thicknesses range from 5-16 down to 1-50 of an inch. There are three kinds of veneer, classified according to the method of manufacture: the rotary cut, the sliced, and the sawed. The sliced veneer is cut on the principle of a carpenter's plane cutting a shaving. The cutting machine is very strong and rigid. Sawed veneer is produced like any other lumber, but the saws are very thin, in order that unnecessary waste may be avoided. Usually, but not always, the rotary veneer is the cheapest, and is cut from cheap woods, while the sawed and the sliced represent expensive material. The woods cut into veneer in Louisiana were of the cheaper sort—compared with mahogany, Circassian walnut, and white oak. The most of the product probably went into boxes and crates. The quantity seems small, and it is difficult to reconcile it with the 56 million feet of wood made into boxes and crates in the state (See Table 4). It is not possible to say what proportion of the boxes and crates were made of veneer, for statistics of lumber and veneer in that industry are not kept separately, but much veneer is used for boxes—apparently much more than the whole reported output of veneer in the state.

Table 29.

Output of Veneer in Louisiana.	
Species.	Feet, log scale.
Cottonwood	2,559,000
Yellow pine	202,000
Red gum	178,000
Tupelo	137,000
Evergreen magnolia	88,000
Total	3,164,000

TURPENTINE AND ROSIN.

The seven states, Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina and South Carolina, produce practically all of the rosin and turpentine in the United States. The output of turpentine in five of those states is declining, and in two, Florida and Louisiana, it is on the increase. In five of them the yield of rosin is increasing, and in two, South Carolina and Mississippi, it is decreasing. The increase in Louisiana from 1904 to 1909 was nearly 600 per cent for turpentine and about 800 for rosin. Similar increases are shown for no other state. In the whole country in 1909 the output of turpentine was 28,989,000 gallons, and of rosin 913,920,000 pounds. Table 30 shows the output and the value in Louisiana.

Table 30.

Output of Turpentine and Rosin in Louisiana.		
Class.	Quantity.	Value.
Spirits of turpentine	1,452,000 gallons	\$689,000
Rosin	46,760,000 pounds	690,000

OTHER PRODUCTS.

The Bureau of the Census gives statistics of output for railroad ties, telegraph and telephone poles, and wood distillation, but not by states, and it is impossible to allot Louisiana's portion of the whole. The sawed railroad ties are included in the lumber cut; but most ties are hewed. Such data on wood distillation as were secured during the field work in the state are included in Table 17.

SUMMARY.

The saw mills of Louisiana cut more lumber per mill than those of any other state, the average being

5,400,000 feet. That is about twenty times the average cut of the mills in the state of New York. Owing to the fact that statistics for poles, hewed ties, and wood distillation are not in form for use in state reports, the total of Louisiana's forest products cannot be given. Table 31 gives all available figures showing amounts. Though in cut of lumber, the latest statistics show Washington a little ahead of Louisiana, the grouping of all known data for each state shows that Louisiana's forests yield more wood than those of any other state. Whether an apportionment of hewed ties, poles, and wood distillation to the states where they belong would change the relative rank of these two states cannot be told with certainty, but it would probably leave Louisiana still two hundred million feet ahead of any other state in total output. That may be proper subject for congratulation by the business men of Louisiana, but it calls up a question of a serious kind: How long will the state's forests hold out with a drain of five billion feet a year, and what is being done in the way of providing a future supply? It is a fact apparent to all who travel through the state that the forests are not reproducing anything like they do in some other regions.

Young cypress trees are almost unknown, and when the present stand has been cut, the end of cypress lumbering in that region will come. Even if young cypresses were coming on, it takes two hundred years for one sawlog to grow. Longleaf pine is in nearly the same situation. Occasionally vigorous stands of seedlings are seen, but the areas

are usually small and far apart. The end of the longleaf lumbering will come about as soon as the end of the cypress. Longleaf pine seedlings have bark so thin that a moderate fire kills them—even when they have reached sapling size—and fires are frequent in Louisiana. They do not attract as much attention as the fires in the Northwestern states, which frequently become spectacular conflagrations; but as destroyers of future forests, it is not improbable that the slow, easy-going fires of Louisiana do as much damage as those of Idaho or Washington.

There is a little more hope for the shortleaf, loblolly, and Cuban pine in Louisiana, for they seem to possess more vigor, reproduce better, and grow

faster, but unless those species are given some encouragement, they cannot supply sawlogs in quantity sufficient to keep future lumber yards stocked. In some parts of Virginia and North Carolina loblolly pine overran abandoned plantations in past years, and grew so rapidly that large lumber operations are now carried on in old cotton and tobacco fields. The same pine would probably repeat the process in Louisiana and solve part of the problem of supply, if the chance were given; but the Louisianans are showing no disposition to abandon their plantations. Therefore, the future sawlogs must come from elsewhere than from old fields. The state has broad stretches of as fertile land as can be found anywhere; but it has much other soil that is thin, and it is the thin soil which must produce

the lumber, for the rich land is and will be in too much demand for cultivation for much of it to be spared for trees, except along swamp edges and estuaries where willow and cottonwood will repay well those who give them a chance to grow.

The people of the state might assure an adequate supply of lumber by keeping the poor lands growing pines, and the wet lands in willow, cottonwood, willow oak, white oak, and other oaks, red gum, and a few others; but those things will not come about of their own accord; and the present forests are going at a rate never seen elsewhere in the United States as the following table shows.


Table 31.

Summary of Louisiana's Forest Products.

Products.	Annual Output Feet B. M.
Sawed Lumber	3,551,918,000
Shingles	194,141,000
Lath	105,756,000
Tight cooperage	20,055,000
Slack cooperage	14,474,000
Veneer	3,164,000
Fuel	*1,285,862,000
Total	5,175,370,000

*This number is calculated on the basis of 600 feet board measure to the cord of wood. The number of cords, 2,143,104, is taken from Forest Service Circular 181, "Consumption of Firewood in the United States."

The Wood-Using Industries of Texas

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FORESTRY
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UNIVERSITY OF CALIFORNIA

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The Wood Using Industries of Texas

Exhaustive Investigation by United States Forest Service Gives Details of Lumber Consuming Plants Already Established and Tells of Great Forest Resources Available for New Establishments in the Future—Increasing Number of Woodworking Industries Is Shown by Report—Diversified Interests Involved in Present Plants, but Need for a Larger Utilization of the State's Lumber Production Is Evidenced by the Investigations.

NOTE.

The following report was prepared by Hu Maxwell, expert, and Charles F. Hatch, statistician in forest products, attached to the Office of Wood Utilization, U. S. Forest Service, Chicago. It is published and thus made available to the public through the courtesy of The Lumber Trade Journal, New Orleans, La.

PREFACE.

Texas is the largest State and has more forested area than any other, though the total stand of its timber is much below some of the rest. The area of its woodland has been placed at about 40,000,000 acres; but it is difficult to draw the line between forested and unforested land in the State. There are all grades and degrees from the heavily timbered pine belts of the east to the thinly covered brush land in some of the central, southern and western parts. Much land is covered with tree growth and yet is incapable of producing a large amount of merchantable lumber, because the trees are too small for milling purposes. There is room for difference of opinion as to where the lines should be properly drawn between the timbered and un-timbered portions of Texas. The estimate of 40,000,000 acres of forest land includes only that which now is capable of yielding a reasonable amount of saw timber per acre, and does not include wide expanses of brush.

Texas is 825 miles long and 780 wide and varies in altitude from sea level to 8,382 feet at the summit of Baldy Peak in Jeff Davis County. The surface varies greatly, as might be expected in an area so large. Flat plains of deep, fertile soil are succeeded by rolling hills and limestone ridges; steep rocky slopes with practically no soil, and mountains rugged and sterile. In the low plains of the south frost is seldom seen. In the high plateaus of the northwest the mercury sometimes falls below zero. In the eastern part rains are abundant; in some of the western regions there is not enough to support much vegetation.

It might be expected that a region so large, and varying so greatly in its climatic and physiographic features, would support forests both valuable and interesting. Such is the case. Practically the whole range of forest trees known to the temperate zone are represented here by species, genera or families. The cypress and tupelo which flourish with their roots buried in water most of the time reach fine dimensions along the rivers or within reach of the brackish water which the winds or the tides force inland from the arms of the Gulf of Mexico. The other extreme in the scale of vegetation also flourishes in Texas, the xerophytic cacti of the high and dry western plateaus. Between these extremes there are perhaps 150 species of trees, ranging from the tallest pines and the largest red gums to the small, hard and beautiful acacias which are found in the thorny jungles along the Rio Grande. All weights of wood are represented, from

the almost iron-like density of *lignum vitae* and *koerberlinia* to the lattice-like stems of the *opuntias* on the western mountains.

No careful estimate has ever been made of the standing commercial timber of Texas. Figures have been published giving such estimates for a few of the best-known species. The longleaf pine area has been placed at a little less than 3,000,000 acres, with a stand of about 30,000,000,000 feet. That would average 10,000 feet to the acre, and some might regard it a pretty high average for so large an area. The oaks are found in extensive regions, but not in stands as pure as the pines.

In taking up this study of the wood-using industries of Texas the Forest Service purposed to supply information not available in any public or private report. The Bureau of the Census, co-operating with the Forest Service, collects and compiles annually statistics showing what the country's total sawmill output is; what the output in each State is; what is the mill value for each kind of wood in the several States; what kinds of wood and how much of each one are manufactured into lumber in each State, and in all the States. But this stops short of giving all needed information on the subject. It does not go beyond the rough lumber, and presents no statistics to show what becomes of the lumber after the sawmills turn it out in the rough state. The present report takes up the subject where the census leaves off; that is, it considers rough lumber as raw material for further manufacture, and shows what becomes of it, what it is used for, and what products are manufactured from it. For instance, the census statistics give figures showing how much red gum the sawmills cut into rough lumber, but that is all. This report follows that lumber until it has been made into finished commodities, such as furniture, vehicles, finish for houses, ships and boats, musical instruments, and whatever it goes into. It is thus shown what becomes of the wood which sawmills convert into lumber and stack in their yards. This report, however, does not take up the wood which is not further manufactured after it leaves the sawmills. If oak or any other wood goes into rough construction, or railroad ties, or bridge timbers, or is taken for any other purpose which uses it in the rough, it is not considered as raw material for further manufacture. A State's sawmills may turn out a large quantity of a certain wood, and little of it may be further manufactured. In that case, if no explanation were offered, it might appear that the difference between what the mills cut and what the factories account for is unreasonable.

CONTENTS.

	PAGE
Preface	27
Woods used in Texas.....	27
Basswood	38
Beech	38
Birch	38
Black cherry	38
Black gum	38
Black walnut	38
Black willow	38
Chestnut	39
Chinquapin oak	39
Cottonwood	39
Cypress	39
Douglas fir	39
Magnolia	39
Gambel oak	39
Hackberry	39
Hickory	39
Mahogany	29
Mexican white pine.....	29
Osage orange	29
Overcup oak	30
Pin oak	30
Post oak	30
Red cedar	30
Red gum	30
Red oak	30
Sitka spruce	30
Spanish cedar	30
Sugar maple	30
Sugarberry	30
Sugar pine	30
Teak	30
Texas oak	30
Tupelo	30
Western white pine	30
Western Yellow pine	30
White ash	30
White elm	31
White oak	31
White pine	31
Willow oak	31
Wing elm	31
Yellow pines	31
Yellow poplar	31
One seed juniper.....	31
Mountain juniper	31
Mesquite	31
Unreported woods	32
Wood using industries.....	35
Planing mill products	35
Sash, doors and millwork.....	35
Packing boxes and crates.....	36
Car construction	36
Furniture	36
Agricultural implements	37
Fixtures	37
Tanks	37
Vehicles and vehicle parts.....	37
Handles	38
Trunks and valises.....	38
Patterns	38
Miscellaneous products	38
Summary by industries	39
Percentage of woods used in different industries.....	39
Average cost of woods in each industry.....	39
Uses of woods	39
Directory	42
Uses of minor species	43
Shingles	43
Lath	43
Cooperage	44
Lumber cut	44
Appendix	44

SUMMARY OF KINDS OF WOOD USED IN TEXAS.

KINDS OF WOOD.		Quantity		Average cost per 1,000 ft.	Total cost f. o. h.	Grown in Tex. Per ct.	Grown out of Tex. Per ct.
Common Name.	Botanical Name.	Used annually.	Per cent				
Shortleaf pine	<i>Pinus echinata</i>	331,388,685	43.47	\$12.64	\$ 4,189,267	98.56	1.44
Longleaf pine	<i>Pinus palustris</i>	253,652,900	33.27	12.71	3,223,614	83.99	16.01
Loblolly pine	<i>Pinus taeda</i>	109,080,000	14.31	11.51	1,255,370	100.00	.....
Red gum	<i>Liquidambar styraciflua</i>	24,994,000	3.28	13.87	346,786	83.36	16.64
Cypress	<i>Taxodium distichum</i> ..	14,022,500	1.84	23.07	323,441	50.20	49.80
White oak	<i>Quercus alba</i>	6,010,308	.79	28.86	173,461	73.90	26.10
Cottonwood	<i>Populus deltoides</i>	4,278,300	.56	21.21	90,728	59.10	40.90
Texas oak	<i>Quercus texana</i>	2,814,500	.37	18.91	53,216	98.93	1.07
White ash	<i>Fraxinus americana</i>	2,393,940	.31	21.66	51,850	76.37	23.63
Tupelo	<i>Nyssa aquatica</i>	2,026,000	.27	12.50	25,327	100.00	.....
Willow oak	<i>Quercus phellos</i>	2,000,000	.26	12.00	24,000	100.00	.....
Western yellow pine.....	<i>Pinus ponderosa</i>	1,504,000	.20	53.82	80,939	47	99.53
Chinquapin oak	<i>Quercus acuminata</i>	1,152,000	.15	15.22	17,532	100.00	.....
Wing elm	<i>Ulmus alata</i>	1,035,000	.14	12.27	12,700	100.00	.....
Post oak	<i>Quercus minor</i>	812,000	.11	23.81	19,335	100.00	.....
Birch	<i>Betula</i> (—)	766,525	.10	55.39	42,458	.....	100.00
Evergreen magnolia.....	<i>Magnolia foetida</i>	722,000	.09	12.89	9,308	100.00	.....
Sugar pine	<i>Pinus lambertiana</i>	504,328	.07	48.04	24,229	.....	100.00
Yellow poplar	<i>Liriodendron tulipifera</i>	379,480	.05	56.60	21,480	.....	100.00
White pine	<i>Pinus strobus</i>	377,800	.05	58.05	21,932	.....	100.00
Black gum	<i>Nyssa sylvatica</i>	360,000	.05	13.81	4,970	100.00	.....
Mahogany (American).....	<i>Swietenia mahoganii</i>	348,210	.05	154.59	53,831	.....	100.00
White elm	<i>Ulmus americana</i>	276,000	.04	19.35	5,341	81.88	18.12
Pin oak	<i>Quercus palustris</i>	215,000	.03	15.30	3,290	.....	100.00
Hickory	<i>Hicoria</i> (—)	186,948	.02	68.20	12,749	88.26	11.74
Black walnut	<i>Juglans nigra</i>	135,000	.02	74.48	10,055	.....	100.00

KINDS OF WOOD.		Quantity		Average cost per 1,000 ft.	Total cost f. o. b. factory.	Grown in Tex. Per ct.	Grown out of Tex. Per ct.
Common Name.	Botanical Name.	Used annually.	Per cent				
Water hickory	Hicoria aquatica						
Water oak	Quercus nigra						
Whiteleaf oak	Quercus hypoleuca						
Wild china	Sapindus marginatus						
Wild plum	Prunus americana						
Yellow buckeye	Aesculus octandra						
Yellow oak	Quercus velutina						
Yopon holly	Ilex vomitoria						
Totals		762,336,112	100.00	\$13.30	\$10,144,925	91.51	8.49

*Less than 1/100 of one per cent.

†This and 79 species which follow were not reported by any manufacturer but were found in use.

suit it best, and when it finds conditions just right it grows nearly or quite as fast as any tree in this country. Twenty or thirty years will produce small sawlogs, and twice that period suffices for trunks occasionally two feet or more in diameter. Being a waste land tree, it is worth the consideration of those who think of planting woodlots for commercial timber growing. Its light seeds are scattered far and wide by the wind, and if suitable tracts are made ready, the planting will generally be done by nature if seed trees nappen to be in the vicinity. The wood is strong and reliable, but not handsome.

Chestnut.—Texas grows none of the chestnut which its factories use, but imports it from the States in the Appalachian region, or the Ohio valley. Though it is an excellent wood for certain purposes, it does not belong in the indispensable class, and if it were withdrawn from market its place could be filled with something else. Considered for the whole United States, it is probably the most important wood in the manufacture of coffins and caskets. Custom controls that use. Undertakers insist that no reason can be given for the demand made upon chestnut for burial cases, except a long-standing custom which had its origin no one seems to know where. The wood is still abundant, but the cut is heavy, both for lumber and tanning extract; and in recent years the appearance of a diseased condition affecting this timber in some of the best chestnut regions of the country has caused concern for the future.

Chinquapin Oak.—This oak seems to supply a large quantity of wood to manufacturers in Texas. It is possible that some reported by this name was other oak. Its range does not extend westward of the Guadalupe Mountains, and it attains its best size and form in the eastern part of the State. Trees eighty feet high and three feet in diameter are occasionally found. The wood is strong, of good grain, and is serviceable for many purposes. The leaf resembles that of the swamp white oak and the chestnut oak, though it is smaller than either.

Common Cottonwood.—Texas is not a large producer of this wood and in 1910 only fourteen mills in the State reported any in their output. Many mills cut small amounts and did not report it in the census returns for that year. This tree is able to eke out an existence in nearly any kind of soil, and it can get along with comparatively little water, but it does not prosper under such circumstances. It wants plenty of moisture and a fertile soil to show best results. It is a frontier tree, and not only in Texas but elsewhere in the Plains States it was found by explorers and first settlers miles in advance of the fringe forests of other species. The seeds are light, and the wind carries them long distances. Some of the millions thus scattered found lodgment near springs of water and in damp situations along water courses, and thus the outposts of the forests were planted. The trees' custom of growing where the ground is damp often saved it from prairie fires in the days when grass was burned yearly. The fact that cottonwood grew farther out on the plains than most other trees gave it an importance in early years which it does not hold now. Frontiersmen built corrals and barns of cottonwood logs when they could procure nothing else. At the present time it has taken its place as a material for manufacturing, and is bought and sold on its merits as far as supply will permit. It is becoming scarce. The sawmill cut in the country is less now than it was ten or twelve years ago. There is no immediate danger that cottonwood will fall entirely either in Texas or in the country generally, but the best has already been cut in most States, and dependence must be placed on young trees now coming on.

Cypress.—Cypress in Texas is of less importance than the pines, and the yearly output of this wood will likely decrease until it reaches a low place in the State's list of natural resources. Nature has confined it to overflow land and many tracts of that kind in Texas produce no cypress. It grows in certain river bottoms, but usually not in extensive bodies. The State has no large cypress mills, as Louisiana has, and the total cut is only moderate. There are few young cypress trees coming on. When the

old trunks have been cut, or when they fall in course of nature, their places will be left vacant, unless some other kind of tree fills the openings. It is a tree that grows very slowly, and two or three centuries are required to produce a trunk large enough for first-class sawlogs. It can not be expected that young cypress will be set apart for future cutting. The returns will be too far in the future, and if any tree planting is done, some species of more rapid growth will be chosen.

Douglas Fir.—This wood was unknown in the eastern and middle regions of the United States a few years ago, and, as a comparatively new comer, it has met with favor. Most of it is cut in Washington and Oregon, but it abounds in the nonthern Rocky Mountain States. A common name for it is Oregon pine, and it is occasionally called red fir. The trees attain great size, and very large timbers are cut from them. In Texas it enters into competition with longleaf pine probably oftener than with any other. The two woods are much alike in many ways. Both are very strong and stiff, and are used for similar purposes. Douglas fir is cut in larger quantity than any other wood in the world, except the southern yellow pines, and is so cheap in the regions where it is produced that it is able to force its way into markets hundreds or thousands of miles away. Its high price in Texas limits its competition with its great rival, longleaf pine. It costs more than three times as much as the pine.

Evergreen Magnolia.—This is not a timber tree of first importance in Texas or anywhere else. A few years ago it was seldom cut except in very small quantities; but it was found to possess good qualities, and now it goes regularly to the mills which saw hardwoods in the region where it grows. The wood of different magnolia trees, or even the wood of the same tree, shows lack of uniformity. Some of it looks like yellow poplar and compares favorably with it in several particulars, while other of it is very dark, with hard flinty streaks which not only presents a poor appearance, but dull the tools of the wood-working machines and create an unfavorable impression of the wood generally. This magnolia holds pretty closely to the damp lands in eastern and southeastern Texas. The amount of the annual cut is not known, because it goes in with the minor species in most places and no separate account is taken. It is coming into more notice every year, and some manufacturers have been so successful in finding ways to make it serviceable that the best grades are easily sold. The wood does not hold its color very well. The light-colored sapwood is apt to become darker after exposure to the air, and the dark heartwood fades a little. The tree is so handsome in the forest that it is occasionally spared when the surrounding trees are removed. For purely ornamental purposes it is one of the finest of all southern trees. In the parts of Texas where it grows naturally, it is destined to survive most of its associates, and in years to come it may be regarded as more ornamental than useful.

Gambel Oak.—This tree will never be important except locally. It is scarce in Texas of a size fitting it for commercial purposes, and much of the wood contains hard and dark colored streaks. When a choice tree is found the wood makes good furniture and finish. It is found in the western part of the State where woods are scarce, and this gives it more value than it would have if its range lay in the wooded regions of the east. Nearly any kind of tree is valuable when it is the only one to be had.

Hackberry.—A good deal of confusion exists in Texas between hackberry and sugarberry. One is frequently mistaken for the other. They are so nearly alike, however, that for all practical purposes they might be considered the same. Botanists more than wood users try to keep them separate. Though hackberry is cut in rather large amounts in Texas, as well as in more than a dozen other States, the census returns of the lumber cut of the United States do not mention this wood, not even among the minor species. That is because it loses its identity when it reaches the sawmill. Hackberry lumber is seldom heard of. It goes as ash, or else by no name at all. Users generally consider it not quite as strong as ash, and with grain and figure

less pronounced, but otherwise it compares favorably with white ash. Mature trees often have little or no colored heartwood.

Hickory.—Texas is not an important producer of hickory. Thirteen mills reported it in their output in 1910, the latest census figures. Wood users list less than 200,000 feet a year. Hickory approaches its southwestern limit in Texas, and the species known as pecan is the only one that is fairly abundant, though five other species grow in the State. Users of hickory generally make no distinction between the species in listing them for statistical purposes, but they clearly recognize a difference when selecting the material for use. Few manufacturers will buy pecan hickory on equal terms with bitternut, shagbark, or pignut. The six species of hickory found in Texas are, mockernut (*Hicoria alba*), pecan (*Hicoria pecan*), bitternut (*Hicoria minima*), water hickory (*Hicoria aquatica*), shagbark (*Hicoria ovata*), pignut (*Hicoria glabra*). The only one of these to attain its best development in Texas is pecan. Along some of the water courses in the southwestern part of the State, pecan trees grow four or five feet in diameter.

Mahogany.—Two species of mahogany are imported by Texas manufacturers. The most common is the American species, which, speaking from the standpoint of the botanist, is the true mahogany, the kind that has been in use four hundred years. It is cut in Mexico, Central America, the northern States of South America, and the West Indies, and is usually imported in the log. The other kind reported in Texas is the African species. The two bear close resemblance, and some manufacturers prefer one and some the other. There are other woods which pass commercially for mahogany, but none were reported in Texas. Wood staining has been so far perfected that many common American woods are finished in such close imitation of mahogany that they successfully pass for it.

Mexican White Pine.—This tree is more abundant in Mexico than north of the international boundary, but it occurs in the southwest, where some call it Arizona pine, or simply white pine. Competent judges have pronounced it the nearest approach in good qualities to the white pine of the Lake States of all the woods of this country. It has not yet been much used in the United States. Large and fine forests of it are said to exist among the mountains of northwestern Mexico.

Osage Orange.—This valuable wood is of peculiar interest to Texas, because of its unique history and because of its probable future importance when the country shall be brought to depend on planted trees for wood supply. Osage orange has been planted in perhaps every State of the Union, and grows successfully in most of them. It is one of the most widely distributed of American forest trees, but its distribution has been chiefly artificial. It was found originally in a very restricted region, from which it was carried for hedge and ornamental planting far and wide. Its natural home, to which it was confined when first discovered, embraced little more than 10,000 square miles, and probably half of that small area produced no trees of commercial size. Its northern limit was near Atoka, Okla., its southern a little south of Dallas, Texas; a range north and south of approximately one hundred miles. Its broadest extent east and west was along Red River, through Cooke, Grayson, Fanning, Lamar and Red River counties, Texas, about 120 miles. Some osage orange of commercial size grew outside the area thus delimited, but no large amount. Much of that region, particularly south of Red River, was prairie, without timber of any kind; but scattered here and there were belts, strips, thickets, and clumps of osage orange mixed with other species. On the very best of its range, and before distributed by white men, this wood seldom formed pure stands of as much as 100 acres in one body, and since the country's settlement, the stands have become smaller or have been entirely cleared to make farms. All accounts agree that the osage orange reaches its highest development on the fertile lands along Boggy and Blue Rivers in Oklahoma, though fine bodies of it once grew south of the Red River in Texas, and much is still cut there, though the choicest long ago disappeared. Few trees are less exacting in soil, yet when it can make choice it chooses the best. In its natural habitat it holds its place in the black fertile flats and valleys, and is seldom found on sandy soil. It is not a swamp tree, though it is uninjured by occasional floods. The tracts where it grows are sometimes called "board swamps," though they are marshy in wet weather only.

Thirty or forty thousand square miles of northeastern Texas are fenced with osage orange posts, and nearly half of the houses in the same region stand on blocks of this wood. It is equal to any timber in this country in resulting decay. It has been much used as bridge piling, and to a less extent for telephone poles. Ten or twelve thousand wagons are made yearly with osage orange felloes. The wood shrinks and swells very little, and wheels

stand the hot dry roads of the southwest better than if made of any other wood. They are not recommended for rocky roads, because osage orange fellows are so unyielding that they will splinter by jolting over rocks.

Osage orange is popularly supposed to be of slow growth, but such is not always the case. Growth depends on soil and situation. Planted hedges have been known to produce posts in a few years. A log in the University collection at Austin is twenty-three inches in diameter, and it grew in forty-two years. A tree less than thirty-five years old near Victoria, Texas, is twenty-four inches in diameter.

Overcup Oak.—The acorn usually is the means of identifying this tree in the woods, but the wood so closely resembles white oak that one may be taken for the other. Their qualities and uses are much the same. It is often called swamp white oak in Texas. It is probable that more of it was cut than Table I shows, because some manufacturers put it down as white oak in their reports.

Pin Oak.—Nearly a quarter of a million feet of this oak was reported by Texas manufacturers, at an average price of \$15.30 a thousand feet. There is some reason to doubt the correctness of this identification, and those who reported it may have applied the name to some other species. It is customary in some localities to give this name to several species of oak. The true pin oak (*Quercus palustris*) bears a general resemblance to the true red oak, but its leaves are deeper lobed and sharper pointed, the bark is smoother in young trees, and the trunks are bristling with small branches set at right angles like pins. (Hence the name.)

Post Oak.—The wood of this tree bears very close resemblance to the true white oak (*Quercus alba*), and for most purposes is as good. It grows in Texas westward to the 100th meridian, and south to the San Antonio River. Some of the users consider that the post oak in Texas is inferior to the same species in the northeastern part of the United States. Similar complaints are made against some of the other oaks that grow in Texas and which are found also in the cooler and damper parts of the country.

Red Cedar.—The 2,000 feet of red cedar listed in Table I is an inadequate showing for this wood in Texas. It seems to imply that red cedar is one of the least important of the State's native wood, while the fact is it is one that promises much. The species grows in at least half the State, and in the region about Austin, between that city and San Antonio, and south and southwest as well as in the west over parts of the Edwards Plateau, this tree is found growing by untold thousands. The growth is usually small, the trunks often making only posts or small poles; but what is wanting in size is made up in quantity. The dry rocky ridges in the vicinity of the eastern escarpment of the Edwards Plateau are thickly covered with cedars which have appropriated practically all of the ground to themselves. Train loads of posts are hauled from the region into surrounding agricultural country. In some places the loose bark is removed from the posts and is sold in the towns for kindling wood. It may be put up in bales somewhat like hay to facilitate the handling. When near enough to markets, the limbs and tops are cut into stove wood. When this is done, utilization is almost complete. But in districts more remote it is not practicable to work up the refuse so closely.

Red cedar is now and will continue to be a valuable forest resource in Texas. What the osage orange is for fence posts in the northeastern part of the State, red cedar is in the south, but not in the extreme south. Much that is too small for posts makes stakes to strengthen wire fences. Young cedars spring up where the old are cut, and though the growth is not rapid, there is always a supply coming on. It is a "poor land" tree, and by contenting itself with thin, rocky soils, it leaves more favored situations for farm crops. As the country develops, the demand for fence material will increase and red cedar will be one of the standard woods for this purpose.

Red Gum.—Red gum is cut in the eastern half of Texas and is one of its important timbers. It has won its way in spite of much prejudice against it. It is not an easy wood to season, and for a long time the belief prevailed that it could not be dried in a way to fit it for any but rough purposes. Experience has shown that its seasoning is practicable, and it has taken its place among the best furniture and finish woods of this country. The same tree has two kinds of wood, white or pale yellowish sap, and darker colored heart. Occasionally a tree of large size is nearly all white, while others are largely heartwood. Red gum may be worked to show a pleasing grain. It is made to imitate walnut, oak, cherry, birch and other expensive cabinet woods.

Red Oak.—Many oaks pass as red oak, but the United States Forest Service applies that name to one species only (*Quercus rubra*), and that does not grow in Texas. It is a northeastern tree, and its commercial range approaches no nearer Texas than

where it is found in central Tennessee. It is hard to identify it by the wood alone by tests available to the ordinary user, as several of the red oaks bear close resemblance. The names of several of them are so confused that they afford no assistance in identification. Red oak is a standard, first-class furniture and finish wood. For most purposes it is fully equal to white oak.

Sitka Spruce.—This Pacific Coast wood comes principally from the State of Washington, and its high cost by the time it reaches Texas excludes it from all uses except the most important. It is received in stock so free from imperfections that waste in its conversion at the factory is reduced to a minimum. The average tree of this species in the most favored regions of its range is three or four times as large as the average spruce tree of the northeast, and of course it yields more clear lumber.

Spanish Cedar.—Spanish cedar is the most important cigar box wood in this country. It does not grow in the United States, but comes from Mexico, Cuba and other Spanish-American regions. It is imported in various forms, but much comes as logs of different diameters and lengths. The tree attains large size if left to grow to an old age. Early Spanish explorers in the West Indies and along the coast of Mexico and Central America spoke of canoes hewed from cedar trunks, large enough to carry thirty or forty persons. It would now be difficult to find trees of anything like that size near the coast. Much of the cigar-box material comes to this country as logs the size of telegraph poles. This is converted into thin lumber or veneer. If lumber is used, the cigar boxes are of solid wood; but if veneer is employed it is very thin, scarcely thicker than paper, and is pasted on the backing of other woods. When that process is followed, the cigar box is apparently solid cedar, but is really made with very little of that wood.

Sugar Maple.—The hard maple of commerce is nearly all cut from the sugar tree, the same from which sugar is manufactured in the north. The tree touches the eastern part of Texas, and there reaches the southwestern limit of its range. It is too scarce to furnish much lumber, and only a chance tree is cut in logging operations or when land is cleared. All of the reported sugar maple in Texas was shipped into the State from the North. The usual name applied to the wood is hard maple. The average cost in the State is more than twice what it is in Illinois, but the small quantity used in Texas is responsible for the extra high price.

Sugarberry.—The description of hackberry applies equally well to sugarberry, as the two woods are so nearly alike that users do not distinguish between them. Both are bought and sold as ash in Texas, though for some purposes the wood is not quite as satisfactory as ash.

Sugar Pine.—California supplies this wood, and Texas manufacturers use half a million feet of it yearly. The tree is so named because on its native mountains a sap or juice oozing to the surface where the wood has been injured is condensed by evaporation into a white sugary substance not unpleasant to the taste. It is the largest of the pines in this country. Single trees sometimes saw 20,000 feet of lumber, a large percent of which is of high grade. In the central and eastern States, sugar pine is often taken as a substitute for white pine. It is cheaper than white pine of the same grade where both are shipped the same distance.

Teak.—This high-priced wood, greatly admired for boat finish and heavy doors, comes from India and Siam. Its principal value is due to the wearing qualities where it receives rough usage; but its beauty is also appreciated. It bears some resemblance to mahogany, but its color is less rich. It was the costliest wood imported in Texas, and the whole 8,000 feet was employed in boat building. An oil in the wood has a tendency to preserve iron from rust, and ship builders appreciate this property.

Texan Oak.—The most abundant oak in the State is the Texan oak, which is commonly called red oak by those who use it. Others know it as spotted or Spanish oak. It belongs to the red oak group, and is cut in the eastern and central portions of the State. It is put to practically all uses for which any oak is suitable. It is quarter sawed, and the grain and figure compare favorably with those of the genuine red oak of the Ohio valley. The acorns of this species ripen in two years, the same as other members of the red oak group. The acorns of the white oaks ripen in one year.

Tupelo.—Tupelo is cut in the forests and goes to market under other names. In some localities it is called bay poplar, in others simply gum, or black gum. In the past the wood has been responsible for many seasoning troubles, but these have decreased in recent years as the handling of tupelo has become better understood. It is a swamp tree and it can stand in water most of the year, and still prosper. In that respect it is in a class with cypress. It is a slow grower and a tupelo tree is not worth much until it has a century or more to its credit.

Its slow growth makes it impossible that tupelo can have much place in this country's future forest policy.

Western White Pine.—This wood comes from the northern Rocky Mountain region, chiefly Idaho. It is often substituted for the white pine of the Lake States, but it has not yet gained much foothold in Texas, as is shown by the small quantity reported in Table I. The wood is light in weight and color, works well, holds its shape after seasoning, and is a reliable material. By the time it pays freight on the long haul from Idaho to Texas it is by no means a low-priced wood. It should not be confused with western yellow pine, which is often called white pine.

Western Yellow Pine.—When the wood reaches Texas it is frequently called California white pine. It is a western species, covering the region from the eastern base of the Rocky Mountains to the Pacific Coast. Its range extends into some of the western counties of Texas, but the timber there is small and of comparatively little value. The best comes from California and Oregon, and from certain favored localities of the Rocky Mountains and the Basin States. The wood belongs with the yellow rather than the white pine, but it bears some resemblance to the latter. It is soft and is easily worked, and less resinous than longleaf pine, though experiments have shown that naval stores may be obtained from the western species. It was formerly believed that the Rocky Mountain form of this tree, including that found in western Texas, was a separate species from the Pacific Coast form, but at present they are considered to be the same species.

White Ash.—This is the common ash in the eastern and central parts of the United States. Texas supplies more than three-fourths of this wood used by its factories. The species reaches its southwestern limit in the State. It is a wood of all-round usefulness, and most industries employ it.

White Elm.—This elm is widely distributed over the United States east of the Rocky Mountains, and within that range most regions have enough of it to meet their needs. It has half a dozen names, not including "rock elm," which is applied to all species of elms in some parts of their ranges, though it is not the proper name of any of them. Workers in wood say that few trees show as readily as elm the effect of soil upon wood. One soil may produce brash wood, another a very tough one; and there seems to be much difference in weight and color, which is accounted for by differences in soils. This may explain why in one locality the name rock elm is applied to a certain species, and in another locality the term is applied to an elm of a different species. The wood of all the elms is coarse and characterless, and is never employed where handsome appearance is the object sought.

White Oak.—The range of the white oak overlaps the northeastern region of Texas. It reaches its best development in the Ohio valley and among the Appalachian mountains, but it has extended its range over the whole eastern and central portion of the United States, and in Texas it reaches its southwestern limit. Some of the white oak timber in Texas is good, but most of it falls below the quality growing in Kentucky and Indiana. Woods generally lose in quality as they approach the limits of their ranges. There is only one white oak which is properly called by that name, but there are several species belonging in the group of white oaks. The wood of some of them closely resembles that of the true white oak, and when the different kinds are mixed it is very difficult to separate them according to species. In practice it is not done. White oak is so named because the bark and the wood present a whitish appearance; but the wood and the bark of post oak are as white, and several other species are nearly.

The oaks may be broadly divided into four groups if the shape of the leaves is made the basis for division. The white oaks, including a dozen or more species, have leaves with rounded lobes; red or black oaks, with a score of species, have lobes with sharp points; the chestnut oaks, with four or five species, have notched leaves like those of the chestnut, and the willow oaks have leaves like the willow or laurel, without notches or lobes. Representatives of all four groups are found in Texas. There is a representative species for each group. The white oak is the type for the round-lobed species; the red oak for the pointed-leafed group; the chestnut oak for those with notched leaves; and the willow oak for those with smooth-edged leaves.

The men who work in factories are not necessarily acquainted with the appearance of the trees as they stand in the forests. They judge a wood by its appearance, and not by the shape of the leaves, which they may never see. They are for that reason less exact in designating species than is the man who works in the woods. They class as a white oak all light-colored oak that works like true white oak and they follow the same course with red oaks. In actual practice nearly all oaks are considered either white oak or red oak. The compiler of statistics often finds it necessary to make special inquiry to deter-

mine the exact species. If this were not done, most state reports of wood uses would name few species of oak other than white and red.

White Pine.—The reign of the white pine in the United States is a thing of the past, though a large amount is still demanded. It does not grow in the state, and the lumber now used here comes principally from the Lake States, where it was once lumbered in enormous quantities, but now to a much less extent. Much white pine lumber is still in the market, but not all that passes for white pine is the genuine article. Some is Norway pine cut in the Lake States and Canada; some is the western white pine, a different species from the northern Rocky Mountain states; the California sugar pine furnishes some of it, and the western yellow pine more, and a small amount is the Mexican white pine. These several species pass as white pine in the lumber market, and it is difficult to determine how much of the total is the real article. All are good woods, and for some purposes are doubtless as good as white pine. No manufacturer expects, nor should the buying public expect, to obtain much white pine now of a grade equal to that on the market when the original pine forests of New England, New York, Pennsylvania and the Lake states were available.

Willow Oak.—This tree is nearly but not quite an evergreen in the extreme southern part of its range. Its thick, willow-shaped leaves adhere to the twigs until the new crop of the following year pushes them off. The wood resembles red oak, and it often passes under that name. The tree grows rapidly and the annual rings are broad and clearly defined. It is one of the most promising species of eastern Texas. Not only is the wood of high grade and useful for many purposes, but the tree increases in size so rapidly that few species promise better returns from planted stands. It has not yet been planted to any extent. One factor not in its favor is that it is somewhat exacting in its soil and moisture conditions. It must have plenty of water or the trunk becomes stunted. It may be expected to do well in Texas only in the eastern half of the state, and there only near water courses where the soil is deep and damp.

Wing Elm.—This wood passes under various names, and those who use it are apt to call it elm without any qualifying term. The wood differs little from white elm, but some consider it a little harder and tougher. It is not called wing elm because its seeds are equipped for flying, as might be supposed, but because its small twigs are provided with flat keels, often a half an inch or more wide. The wings are of no use to the tree, as far as is known, but they are an easy mark of identification. The tree is called cork elm and rock elm, but these names are applied to other species of elm as well, and cork elm is the proper name of one of them.

Yellow Pines.—Three species of yellow pine grow in Texas, and are cut in large quantities by sawmills and are made into finished commodities by manufacturing plants. The three kinds of pine are sometimes spoken of collectively as yellow pine or southern yellow pine; but it often happens that it is necessary to be more exact in specifying the kinds, and they are listed according to species as longleaf, shortleaf and loblolly. Sawmill output, as it is handled by the census, usually groups all three under the common name of southern yellow pine. The purpose in that case is merely to separate them from the western yellow pine of the Rocky Mountains and Pacific coast regions, and the other pines figured in the lumber cut of the United States. That general classification is considered sufficient in reporting the sawmill output, but factories which work the lumber into finished products find it necessary to separate the general groups of woods into species.

Shortleaf Pine.—Factories in Texas report the use of 48 species of wood, but more than ninety per cent of all consists of the three species of yellow pine. Shortleaf leads in quantity, with longleaf second, and loblolly third, according to the reports of manufacturers. The principal supply of shortleaf pine comes from the northeastern section of the state; the loblolly belt is south of that, and the longleaf nearer the coast. The belts of the different pines are not clearly defined in all places and there is much overlapping of ranges.

Shortleaf pine has a number of characteristics which separate it from its relatives in the yellow pine group. Its leaves are shorter than those of any other timber pine in Texas, and that usually makes the identification of the standing tree easy; but it is often desirable that the logs or lumber be identified when far removed from where the trees grew. It is not always easy to do that, particularly to distinguish shortleaf from loblolly pine in the log yard or lumber pile. There are some general features belonging to each of the species which will assist in distinguishing one from another. Longleaf has comparatively thin sapwood and much heart. Both shortleaf and loblolly pine have thick sapwood and comparatively little heart. These features alone usually are sufficient to identify longleaf pine logs,

if compared with those of the two other species; but shortleaf pine and loblolly are so nearly the same in the proportionate amounts of heartwood and sapwood that some other mark of distinction must be sought and it is not always possible to find it on a general view of the logs.

Shortleaf pine grows rapidly the first thirty or forty years of its life, and the yearly rings showing the growth are wide. But after that age is reached the tree develops a tendency to grow more slowly and the annual rings are narrower. Upon examining the end of a shortleaf pine log, therefore, the part next the center is apt to be found made up of broad rings and the outer part of narrow rings. The rule does not always hold, but generally does. Loblolly pine grows rapidly and has wide rings until the trunk attains large size.

Shortleaf pine is at this time the most extensively used wood in Texas, and the greatest demand for it is by manufacturers of doors, sash, and interior house finish. It is a soft wood and joins nicely. It is not difficult to season, and it retains its shape well. The figure is handsome, and the grain holds and displays points and stains. It works easily.

The belief is quite general among workers in pine that there are two species of shortleaf in Texas, one whiter and softer than the other, but botanists have not been able to work out two species and hold that the differences in wood are due to soil, climate and other factors of environment. In some instances the soft variety of shortleaf is called Texas white pine. The best of it closely resembles the white pine of the Lake states.

The cutting of this species is gaining rapidly on the growth and the supply must run short before many years. It is said that pines have encroached a good deal on the prairie land in Texas since the country was settled, and the Indian fires stopped. The young growth coming on is not enough to make up the yearly drain to supply the mills.

Longleaf Pine.—A considerable amount of small growth of longleaf pine is met with in places near the southeastern border of Texas; but the fact is apparent that the end of this fine wood, as a timber supply, is only a question of a few years or decades. Large tracts which were once heavily wooded are now bare of trees. In many instances farmers followed the lumberman, and crops grow among the stumps. In other cases, stumps dot wide expanses of pasture.

This pine possesses great strength, stiffness, and hardness, and is fitted for special places. It is the great bridge wood of the central and eastern part of the United States. Its chief competitor in that line is the Douglas fir of the Pacific coast. Each holds the field nearest it, and in the broad belt of country, midway between the two, they meet in sharp competition. In good qualities they are pretty evenly matched. The western wood may be had in larger pieces, but the southern pine is sawed in dimensions large enough for all ordinary purposes.

The hardness as well as the strength of longleaf pine qualify it for use as flooring. It wears well, is not inclined to splinter under hard usage, and is of handsome appearance. Car manufacturers use it for framing timbers, as well as for flooring and siding. The long beams cut from the shapely trunks of this species constitute excellent frames and trusses for large buildings.

The longleaf forests of Texas are now coming in as a source of naval stores, such as rosin, pitch, turpentine, and oils. A few years ago Texas contributed little to that industry. Georgia was once the chief field; then it moved westward successively into Alabama, Mississippi, and Louisiana. The gradual shifting of the center of the naval stores supply westward marks in a general way the depletion of longleaf pine. Texas has the farthest west and the last of the large stands.

Loblolly Pine.—In some instances loblolly is called longleaf pine, and in others it is classed as shortleaf. Its needles are midway in length between longleaf and shortleaf, and when compared with the former they are short, and in comparison with the latter they are long. It is not improbable that the figures for loblolly pine in Table 1 are far too small because of the custom of calling this wood either longleaf or shortleaf pine. The wood bears much closer resemblance to shortleaf than to longleaf pine, and is made into doors, frames, and different kinds of finish.

Loblolly pine is an aggressive tree. It pushes into vacant land wherever it finds it, and takes possession and generally crowds out most other species. It prefers old farms as a seeding ground, and so prompt is it in improving opportunities of that kind that it is apt to distance its competitors in the race. In some of the Eastern states, particularly Virginia, North Carolina, and the eastern shore of Maryland, it has taken possession of thousands of old fields where corn and tobacco once grew. In Texas there are few worn-out fields, and the spread of loblolly pine over land of that character is not common; but the species is spreading where forests have been cut, and also into many prairie tracts

where no trees grew half a century ago. If one may judge the future by present indications, this tree will be the longest survivor of the pines of Eastern Texas. The longleaf will be the first to give up the fight because of its inability to compete for space, and the loblolly will be last because it will win in that competition.

Yellow Poplar.—This fine forest tree is not found growing in Texas in commercial quantities. Its range is in the Appalachian region, but demand for the wood exists in practically every manufacturing section of this country. It once competed with pine, but it is no longer a competitor, having risen above most of the pines in refinement of uses. Its high price excludes it from many places where it was once common, but it has a few places which it continues to hold in spite of cost. One of these is in the manufacture of fine carriage bodies, where broad panels, particularly those of curved form, are demanded. No wood surpasses yellow poplar in smoothness of finish and in ability to hold high-class paints.

One-Seed Juniper.—The one-seed juniper is a desert tree that comes down into western Texas from the mountains. It is not of good form for lumber, the trunk being short and rough. The numerous knots are apt to be much darker in color than the body wood; but that is not necessarily a defect, for in making clothes chests, the remarkable contrast in color between the knots and other wood gives the articles a peculiar and attractive appearance. The trunks are sharply buttressed and deeply creased. Sometimes the folds of bark within the creases almost reach the tree's heart. The sapwood is thin, the heartwood irregular in color. Some is darker than the heartwood of the southern red cedar; other is clouded and mottled, pale yellow, cream-colored, or streaked with various tints.

This tree can be economically worked only as small pieces. It takes a soft, pleasing finish. It is a lathe wood and shows to best advantage as balusters, ornaments and small posts; and as Indian clubs, dumb-bells, balls and lodge gavels. It has been made into small game boards with fine effect, and it is excellent material for small picture frames. Furniture makers find for it several uses. It ought to be valuable in the manufacture of small musical instruments where fine polish and novel figures are desired, but inquiry failed to discover that it has ever been so used in Texas. It is not an abundant wood, nor is it convenient to market.

Mountain Juniper.—This tree has several local names in Texas, among them being juniper cedar, mountain cedar, juniper and rock cedar. It grows in southwestern Texas, and is closely related to the red cedar. When mountain juniper grows under adverse circumstances it assumes fantastic and distorted forms which bear little resemblance to any of its relatives. It has been planted for ornament to a small extent, along the coast about Corpus Christi and between there and the Rio Grande. That region is outside of the species' natural range, and the trying climatic conditions strangely affect the tree's form, and the trunks often resemble twisted and interwoven bundles of lead-colored vines—buttressed, fluted and gnarled. The branches under these circumstances lose the horizontal or upright positions which they have in their natural environment, and droop in ragged festoons; and the wind in winter whips most of the foliage from them. Few of the planted trees are yet above a foot in diameter or more than twenty or thirty feet high. In its natural range the tree may attain a diameter of two feet and a height of 100 feet. Even in its natural range the creases in the trunk are often so deep as almost to divide the trunk in two; and trunks of planted trees are sometimes entirely divided, forming two or more stems.

The sapwood of the mountain juniper is very thin. It is not a tree that can be profitably cut into lumber of the usual kinds and sizes, because of its odd-shaped and irregular trunk. It lends itself more economically to the manufacture of articles made up of small pieces. Some of the wood is extremely beautiful, having the color and figure of French walnut. There is great difference, however, in color and figure, and the wood from one tree is not a sure guide to what another may be. Boards a foot wide, or even less, may show several figures and colors. Some pieces of the wood suggest variegated marble; others are like plain red cedar. Some is light yellowish in color; other has a tinge of blue. Small spindles, such as are made into grills, show to fine advantage. It may be highly recommended for picture-frame molding and for small panel work and turned ornaments. Fine stair balustrades have been made of it, including newel posts and railing. Furniture makers use it. Those well acquainted with it say that the wood varies greatly in hardness, even in the same trunk. Some is tough and flinty, other soft and brittle enough for lead pencils. It has been substituted for red cedar by clothes-chest makers; and goblets, cups, rings, dishes, trays and other small wooden-ware are turned by the lathe.

Mesquite.—Persons well acquainted with Texas,

both past and present, say that the mesquite area is at least double now what it was when the state came into the Union. Old stands were scattered here and there, but hundreds of square miles which were in grass only, and little of that, half a century ago, now support forests of mesquite. It is perhaps a misnomer to designate some of these stands as forests, for they present a rather ragged and sorry appearance, but they are forests in the process of forming. The old growth, which is found principally in the counties bordering on the lower Rio Grande, is made up of trunks of large size, but the stands that have come on within the past fifty or sixty years are of smaller trees. A large mesquite trunk is from one to three feet in diameter; a small one from one foot down to an inch or two. A person would need to hunt from center to circumference of Texas to find many mesquite trunks that would make a straight saw-log twelve feet long. The tree is generally one of the most crooked, deformed and unpromising in the whole country; and its habit of dividing into forks near the ground, like a peach tree, makes it still more difficult to make use of. In fact, in winter when mesquite trees are bare of leaves the appearance of a forest reminds the observer of an old, neglected, diseased, moss-grown peach orchard in the eastern states; but in summer the leaves conceal much of the trunk scalliness and deformity, and there is something positively restful and attractive in the prospect of a wide range of these trees, covering hills and prairies. The leaves are compound like the acacias, and are delicate and graceful.

The spread of mesquite in the last fifty or seventy-five years has been attributed to the checking of grass fires which Indians once set yearly to keep the prairies open. The dispersion of the trees is facilitated by the scattering of seeds by cattle which feed on the pods. It is a tree hard to kill. Roots send up sprouts year after year during long periods. Sometimes, but not often in Texas, when adverse circumstances become so severe that the mesquite tree can no longer survive above the surface, it grows beneath the ground, sending only a few sprouts up for air. "Dig for wood" is a term applied to trees of that kind, when fuel is dragged out with mattocks, grab hooks, and oxen.

The roots of the mesquite penetrate farther beneath the surface for water than any other known tree in this country. Depths of fifty or sixty feet are occasionally reached. Well diggers on the frontiers learned to go to the mesquite for water. Large trunks never develop unless their roots are abundantly supplied with moisture. Railroad engineers on the "Staked Plains" of Northwestern Texas turned that knowledge to account in boring wells.

Though mesquite is seldom or never mentioned in the lumber business, it is and has been one of the most important trees of the state. Its fuel value is very great. It has cooked more food, warmed more buildings, burned more bricks, than any other wood in Texas. The tannic acid in it injures boilers and it is not much used for steam purposes. It is a high-grade furniture material, though it is difficult to work because of its exceeding hardness. Ordinary wood-working tools and machinery will not stand it. Sutes of nine pieces are sold in San Antonio at \$200 or \$300. The merchants find difficulty in getting mesquite furniture made. Factories do not want to handle it, though the articles sell higher than mahogany. Large, heavy tables, deeply carved, are sold in some of the cities, but all seem to be made to order and largely by hand. The appearance of the polished and finished wood is a little lighter in color than mahogany. It is not uniform in color, but shades from tone to tone in the same piece. A little of the lighter colored sapwood is worked in with pleasing effect. Some of the tones resemble black walnut, and some suggest the luster of polished cherry.

House movers in Central and Southern Texas make rollers of mesquite. It is of such hardness that some claim a set of mesquite rollers will outlast three of maple or black gum. The wood is brittle, however, and is apt to break if subjected to heavy blows or jolts. Notwithstanding its brittleness, it has always been used for lintels and short beams. The Indians so used it in New Mexico before the Spaniards reached the country, three hundred years ago, and the Spaniards in Southern and Western Texas used it in constructing their forts, churches, and missions. The heartwood is almost immune from decay. Fence posts outlast the men that set them. A timber taken this year from the Alamo at San Antonio was said to have served more than 190 years, with no sign of decay. It was set apart for manufacturing souvenirs. Paving blocks at San Antonio, Brownsville, and other places are reported to wear longer than stone pavement subjected to the same wear. Railroads in the vicinity of Brownsville employ this wood for cross-ties, but it is so hard that holes must be bored for spikes.

Mesquite baskets are made by hand of splits the size of knitting needles, some of white sapwood, others of dark heartwood. Such baskets, large

enough to contain five quarts, sell in the curio shops at San Antonio for \$1.25 each.

Some wagon makers insist that mesquite is in the same class with osage orange for wagon felloes in hot, dry regions; but it does not appear that much of it is so used. The brittleness of the wood is against it, in use as felloes, except for vehicles of the heaviest sort where large pieces are demanded.

Among the uses of mesquite, by-products are an important consideration. The pods are food for farm stock. Before the first railroad reached San Antonio mesquite pods were a regular market commodity. The Mexicans know how to make bread and brew beer from the fruit; tan leather with the resin; dye leather, cloth, and crockery with the tree's sap; make ropes and baskets of the bark. Parched pods are a substitute for coffee; bees store honey from the bloom which remains two months on the trees; riled water is purified with a decoction of mesquite chips; vinegar is made from the fermented juice of the legumes; tomaso of mesquite bean meal, pepper, chicken, and cornshucks; muclage from the gum; and candy and gum drops from the dried sap.

One of the most promising uses for this wood is in turnery. Short lengths can be utilized to advantage. The artistic color fits it for the manufacture of lodge gavels, curtain rings, goblets, plaques, trays, and numerous kinds of novelties. Spindles for grills and stairways do not suffer in comparison with black walnut, mahogany, cherry, and teak.

UNREPORTED WOODS.

An inspection of Table 1 will show that several of the woods listed are accompanied by no figures giving the feet used annually. That is because no manufacturer reported those woods. As far as lists sent in by the makers of furniture, finish, boats, vehicles, and other commodities are concerned, the table might have ended with African mahogany. That wood in the table, however, is followed by others. Some of these have been mentioned in the foregoing discussion, where they were included under the names of others, as the elms, hickories, and maples, and the reason for including others, though not mentioned by any manufacturer, will now be given.

During the progress of the field work in Texas many parts of the state were visited, and it was discovered that several woods were being cut in the forests, sent to sawmills, cut into lumber and at that stage they disappeared from view. If this lumber were used in the rough—as in construction of buildings, fences, and the like, and was not further manufactured—this investigation was done with it; for it took into account such lumber only as passed through further stages of manufacture. Careful inquiry developed the fact that much of the lumber which, under its own name, had dropped out of sight after it left the saws, was being shipped to factories under other names, or by no names at all.

In addition to these, many woods in Texas are employed to a small extent, or for a few special purposes, yet seldom find their way to factories. They are of some value locally, but are practically unknown to the general manufacturer; and if there were not believed to be a future for them, they might very well be passed without mention. But it may be taken for certain that every wood fit for anything has a future. It is not necessarily a question of quantity. Very scarce woods may exactly meet special demands, thereby becoming valuable. There are rare woods in some of the world's markets worth from \$1 to \$3 a square foot. Woods of that kind need not be plentiful to be valuable. Texas may not have any which will ever be worth that much, yet its forests produce many hard, strong, beautifully colored woods, and the public knows very little about them.

In collecting material for this report on the use of Texas woods, a special effort was made to find out something more about the scarce tree species as well as the plentiful. To obtain that information it became necessary to depart somewhat from beaten paths usually followed by compilers of statistics, and to approach as nearly as possible the original sources of information—the people who use the woods and know about them. No tree was passed by because its trunk was small, or gnarly, or knotted, or twisted, and no pains were spared to ascertain if anybody had ever tried the wood for any useful purpose, and what success attended such trial. In the list of eighty-one minor species (so-called) which follow, not one is included which was not found to have been used for some purpose. In nearly every instance the wood was examined to ascertain as many of its properties as could be determined by such an inspection; and in as many instances as possible the living tree was sought in the woods, and was examined with a view to determining size and form as well as the probable quantity of the timber available. Figures showing quantity, however, if they are to be of value, should be based on more general and more widely-collected

information than could be procured in the short period given to this study in Texas.

The main purpose of the search for unreported species—those which no manufacturer listed or described—was to ascertain the kinds and qualities of such woods, and not to attempt a compilation of figures showing the total available amount of each in the state.

The identification of many of the woods in use was difficult. Three or four names may be locally applied to the same wood, or three or four woods pass by the same name. The identification of each species, as accurately as it could be worked out under the somewhat unfavorable and trying circumstances, is shown in Table I. The English name (if it has any) is given in the first column, and the Latin or scientific name in the second. The names, both common and scientific, are those recognized as official in the United States Forest Service's check list of trees. This explanation is made because some species have many names and it is not practicable to give all of them in a table.

In studying the list of unreported and so-called minor species it should be borne in mind from the beginning that most of the woods are scarce. Few of them will ever become attractive to the manufacturer because they can be had in large amounts. Their value must come from a consideration of their quality, not their quantity. Those who look for the latter in Texas will seek it in the yellow pines, the oaks, cypress, red cedar, tupelo and red gum.

Most of the minor species are hardwoods—very hard, strong, durable and many of them are of rare and beautiful colors. They are in the class with fine cabinet woods, such as mahogany, teak, prima vera, ebony, walnut, cherry, and others. Their best use appears to lie in the direction of expensive wares. They ought to find place in the manufacture of a long list of commodities in which small pieces can be used, and first cost of wood is not a serious matter. High-grade musical instruments would come in for first consideration. Some of the acacias, ebonies, mesquites and other hard, splendidly colored woods, growing for hundreds of miles along the Rio Grande valley, could be manufactured into veneers that would compare with most of the rare tropical species. The wood carver can find material there; so can the maker of costly furniture; of artistic wooden-ware; of novelties, specialties, and souvenirs. The idea of cheapness of the finished product should not be the controlling factor with those who turn their attention to the rare woods of southern Texas; but high-grade should hold first place.

The necessarily brief descriptions of the woods which follow, and the mention of a few uses already found for them, are offered only as suggestions to indicate the direction in which interested parties might make further investigations.

Agarita.—The value of this small tree is due to the rich yellow color of the wood, and its fine grain. It is used in small turnery, such as napkin rings, checker pieces, handles for paper knives, crochet hooks, button hooks, hairpin boxes, and articles of that kind. It is one of several different colored woods which are glued together in small strips, the whole forming a block large enough for turning small objects on the lathe. The strong contrast between the different-colored woods joined in the goblet, cup, ring, vase, or box, in its finished form, is very striking. *Agarita* is said to possess the deepest yellow color of all American woods. In Texas the turners who use it join it with holly, Texas ebony, junco, prickly ash, red or scarlet haw, Texas cat's claw, buckeye, sumach, and other richly colored woods to give the desired contrast in composite work.

Agarita seldom attains a diameter above five inches, and in Texas a two-inch stem is up to the average. The roots are as yellow as the trunk wood and are put to the same use. It is the opinion of some persons that the growing of this small tree for its wood might be made profitable. It is grown now for ornamental purposes, and use has been made of its sour, edible berries. It reaches its best development in New Mexico and Arizona.

Alligator Juniper.—Two of the five junipers or cedars of Texas were not reported by any manufacturers. This is one, and drooping juniper was the other. This may justly be considered the poorest in form of the cedars of the state, though it is not the smallest. Trees have been reported five feet in diameter and sixty feet high, but such are extreme cases. Some use is made of the wood by hand-working it into furniture and clothes chests. A little goes to lathes in Austin and San Antonio to be made into novelties, such as trays, cups, rings, and match safes. Small boxes for handkerchiefs and collars are made in cubical form by joining pieces together, and some are turned from solid blocks, the lid being also turned.

The line separating sapwood from the heartwood in alligator juniper is often irregular and vague. Patches of sap may be included in the heartwood, while streaks of the latter are enclosed in folds

of the sapwood. The heartwood is usually of a dirty, red color, the sapwood lighter. In small articles the color is attractive but it does not show very well in panel work where wide pieces are used. The best utilization of alligator juniper would seem to be in the manufacture of articles consisting of small pieces.

American Holly.—This is the common holly of the eastern and southern United States, the same that yields the red berries and green leaves for Christmas decorations. In Texas it reaches a size of ten inches or over. The wood is white, and the largest trunks are usually of one color from the bark to the center. Local shops use holly for furniture, and lathes make novelties of it. Sometimes it is worked into parquet floors. Turned candle sticks and curtain rings are among commodities made of this wood in the state.

Anacahuita.—A little of this wood is used in Texas in the Rio Grande valley for chair rounds, but it has little to recommend it except convenient to those who use it. The wood is brown, and rather fine in appearance, but the trees are too small to be valuable for general purposes.

Anaqua.—This wood, which in color and general appearance somewhat resembles maple, is usually called "Knackaway," which is evidently a careless attempt to pronounce the real name. The tree ranges from the upper San Marcos river to the Rio Grande. It is of rapid growth, and trunks up to nine inches in diameter examined in course of the wood-using study in Texas, showed no heartwood. The wood has a slight yellowish tinge. A little of it is made into molding for interior house finish, also for picture frames. It has little figure, is not plentiful, its size is small, and its future importance is doubtful.

Angelica Tree.—This is a small tree in Texas, and usually develops little or no heartwood. A six-inch log at Austin showed twenty-seven annual rings. The springwood, or the inner and porous part of the rings, is broad and yellow, the summer wood, or exterior part of the ring, is narrow and dark. The wood's figure, due to the marked contrast between the outer and inner portions of the rings, is strong. When finished it shows a rich yellow, but somewhat lighter than dwarf sumach which it resembles. It is made into small shop articles, like button boxes, photograph frames, pen racks, stools, and arms for rocking chairs.

Bitternut.—This is one of the Texas species of hickory not separately reported for any purpose, but it is used like other hickory, and besides is made into furniture, balusters, and thin strips with which to fasten screens in doors.

Black Haw.—A small, scarce tree, and of slow growth. A five-inch trunk that was measured had fifty-four annual rings, and had not yet developed any heartwood. It has little figure, and is whiter than iron wood which it resembles. It takes a splendid polish. Canes are made of it and small articles of turnery. Its color fits it for parquetry, and the wood's smoothness suggests that it might make shuttles, though it is doubtful if enough of it exists to make it commercially important.

Black Jack.—Black jack grows in most of the eastern part of the United States, and is neglected—and not without cause—everywhere. It is usually too small, and of grain too coarse to tempt the wood worker. It has some good qualities, however. A trunk of fourteen inches in diameter had one and a half inches of sapwood, annual rings vague, the heartwood ringed and spotted with different colored woods, but the general tone dark. The Texas University collection at Austin has moldings, spindles, and balusters that show the grain well, and also broad panels made up of quarter-sawed narrow strips, which exhibit the dark flecks in the wood to good advantage. It has evidently not been put to its best in furniture making or in grill and spindle work.

Blue Beech.—In Texas this plain, fine-figured, strong wood is used to a small extent for repairing wagons, and for sledge-hammer handles. The trunk is short and is usually ribbed and angular. The best in Texas grows in the eastern part of the state. Some know it as water beech.

Blue Gum.—It is an Australian tree and grows fairly well in Cameron county and in other extreme southern parts of the state; but the effect of occasional light frosts is seen in stunted twigs. Some of the trees first planted are now eighteen inches in diameter and the wood has been tried for ax handles and singletrees. It is pronounced satisfactory as to toughness and strength, but it warps and checks so persistently in seasoning that persons who have experimented with it see little promise of turning it to practical account. It does not grow as rapidly nor does it appear as healthy in Texas as in central and southern California. It is locally known as eucalyptus in Texas.

Blue Jack.—This tree, often called Durand oak, grows among the rolling hills west of Dallas. Wagon shops use it as a repair material, and it has served

for bridge floors, though it is too small for much use in that line.

Blue Oak.—Sawmills call this blue whistler oak and cut a little of it and sell it as white oak. It is made into furniture, stairwork, and agricultural implements. A measured trunk twenty-four inches in diameter had sapwood one and a half inches thick.

Bluewood.—Paper knives paper weights, curtain rings, dominos, and card receivers are some of the local uses for this wood along the Rio Grande. At Brownsville it is known as Brazil wood and purple haw is another of its names. Trunks are seldom more than six inches in diameter, and ten feet long. The wood is very hard and heavy and takes fine polish. It has been locally used for dye by boiling the chips; but there is difference of opinion as to its value for that purpose. Some call it logwood because of its similarity to the well-known dyewood from Belize.

Box Elder.—Furniture makers employ some of this wood in their business and call it soft maple. It resembles that wood, and the name elder is misleading.

Bur Oak.—This oak is not considered of very high grade in Texas, but a little finds its way into wagon repair shops.

Cedar Elm.—Cedar elm goes into the various uses for which other elms are fitted. It is worked into inside parts of furniture and is liked for refrigerators because it whitens under repeated scrubblings and is easily kept clean. Wagon makers regard it a little tougher than the other elms and make wheel hubs of it. The species reaches its best in the valleys of Trinity and Guadalupe rivers where it is fairly abundant.

Chalky Leucaena.—This tree has leaves like the acacias. It is sometimes called mimosa and is also known as "tepeguaja," which in the Spanish language is said to be equivalent to "bardwood." The best representatives of the species are found near the mouth of the Rio Grande, but the tree has been reported nearly as far north as San Antonio. It has been so much planted for ornament that it is now not easy to determine its exact natural range. It is a beautiful, finely-proportioned tree. A twelve-inch trunk that was measured had one inch of yellow sapwood, and the heartwood resembled mesquite but was not quite so dark. The wood is very hard, solid and smooth, and, judging from its appearance, it might make shuttles. It is used in grill work, small pieces of furniture and tool handles. Sample jewelry boxes made of it suggest the lighter shades of mahogany. A sample of this wood that has been several years in the State University collection at Austin is badly perforated by some small boring insect, but the riddling affects the sapwood only and does not penetrate the heart.

Chinquapin.—A little of this wood goes into furniture factories where it passes as chestnut. It is not a large tree anywhere in the United States, but that in Texas is nearly at the species' best.

Cholla.—A species of cactus which assumes tree form, and attains a height of perhaps ten feet in western Texas, maybe a foot in diameter, is known as cholla. The medullary rays decay after the stem dies, leaving the other fibers intact. The trunk is thus perforated, resembling carved work. Small stems from the dry regions of western Texas are made into canes which are very light and strong, and into shoe buttoner racks.

Cow Oak.—The name of this species is given it because cattle eat the acorns. It belongs to the chestnut oak group, its leaves being toothed like those of the chestnut. Manufacturers class the wood as white oak. It is found in Texas as far west as Trinity river. It is used for wagons, furniture and stairwork, and in fact for most purposes where white oak is used.

Deciduous Holly.—Eastern Texas furnishes a small amount of this wood which goes to furniture factories where some of it is turned for drawer knobs. The wood differs little from the common holly.

Devil's Claw.—An unseemly name and a mass of curved thorns are calculated to repel an approach to this, one of the handsomest cabinet woods of Texas. At Brownsville and at other points along the Rio Grande, cabinet makers use it to make small pieces of furniture, novelties, and ornaments of extra beauty. The wood is dark red, but is clouded with streaks and patches of other shades and tints which may be artistically combined to form pleasing patterns. Sometimes the wood is grayish green. So hard is the wood that those who work it drill holes for nails and screws. An ordinary gimlet meets poor success in boring. It is so saturated with oil that it is greasy to the touch. In that respect, it resembles junco. In Austin this wood has been made into grills, combined with certain other woods, and at San Antonio it makes tool handles, and small turned ware.

Though not plentiful, it is entitled to a place among the commercial woods of Texas. Trunks reach a size above one foot in diameter. The an-

nual rings of a log eleven inches in diameter, measured in the course of this study, was thirty-one years old, with half-inch of sapwood. The wood is inclined to be contorted, due to the presence of pits and cavities which slowly close as the tree advances in age. These add to rather than detract from the wood's beauty. The tree is sometimes called "unadegato," which name is also applied to the Texas cat's claw, a different but closely related species, and confusion occasionally results. Both are acacias. The devil's claw is known also as ramshorn.

Downy Basswood.—The difference between this species and the common basswood is too slight to be easily recognized in the wood. Both are used for the same purposes.

Drooping Juniper.—This scarce and graceful evergreen grows among the Chisos Mountains of western Texas. It can never be of much commercial importance. The wood has been made into candle sticks, pin boxes, picture molding, and small square boxes. Its grain and color resemble alligator juniper. It has been planted for ornament in this country, Europe and North Africa.

Dwarf Sumach.—The name applied to this wood is unfortunate. It is one of the largest of the Texas sumachs, and trunks of sufficient size for turned articles are reported. It is richly striped with yellow and black. Balls turned of it, seven inches in diameter, are used for newel-post ornaments and smaller balls are made for use in darning stockings. Cups are turned on the lathe, and the bright stripes in the wood give the wares a striking appearance. A measured trunk ten inches in diameter was forty-seven years old.

Emory Oak.—Not much can be said for this wood from the standpoint of use. Balusters and moldings made of it are to be seen in the university collection at Austin, and they present a rather poor appearance. The tree belongs among the mountains of western Texas where Indians and Mexicans eat the acorns. A measured trunk thirteen inches in diameter showed very little sap. The wood was coarse, very dark, with but little figure, and with numerous black knots.

Flowering Dogwood.—Dogwood is one of the best materials in this country for shuttles, but none was reported cut for that purpose in Texas, although it there attains size proper for shuttles. Sticks seven inches through or larger are found and with little or no heartwood. It has been tried for small turned articles, such as small rollers. It is very hard and wears well. Some use has been made of it for rounds and other small parts of chairs, where strength is a desirable property. Small wedges used in stone quarries are made of it. The wood is lacking in figure and there is nothing attractive in its dull white color. It polishes smoothly and is valuable as cogs in small wheels.

Fremont Cottonwood.—This species does not compare favorably with the common cottonwood in Texas. It is usually smaller where it occurs among the mountains of the western part of the state. A trunk fifteen inches in diameter was all sapwood—as cottonwoods usually are—and the annual rings scarcely visible. Rude clumsy carts are made of it by Mexicans, and the amount of service they stand is proof that the wood is tough. A little of it finds its way into towns and is made into furniture and sideboards for wagon beds.

Frijolito.—Some call this the coral bean from its red seeds which hang in knotted pods. The beans contain a narcotic poison. The wood is yellow, and handsome canes have been made of it. In the absence of something better, it is used for small tool handles in southwestern Texas.

Gambel Oak.—This species is plentiful on the high mountains of western Texas and along nearly the whole course of the Pecos river, but except a little wagon-repair material, it was not found in use for anything in course of the study of wood uses in the state. The Texas university at Austin has balusters, spindles, and small panels of this wood in the collection.

Green Ash.—In the south of Texas green ash is a repair material for vehicles, and is used for spokes, felloes, hubs and poles. Factories employ it for furniture and stairwork, but call it white ash. It is considered more brittle than white ash.

Honey Locust.—No manufacturer reported the use of honey locust, but it occasionally goes to furniture shops and appears to a small extent in general millwork. The medullary rays show in broad bands, and the wood is quarter-sawed to advantage. Its general tone is dark but with light flecks and streaks. When made into furniture it bears some resemblance to sycamore, but is not quite as coarse in texture. Stair balusters are handsome, the flecks adding much to the wood's appearance. Picture molding shows the grain well, while large stair posts are satisfactory from the artistic standpoint. A tree with forty-two annual rings was thirty inches in diameter.

Hornbeam.—Hornbeam has little figure except that due to prominent medullary rays. The color is

light and flat. It has been tried experimentally for stair balusters and molding, but the effect is too plain to be popular. Its most common use is for vehicle repairs and tool handles.

Horsebean.—The shape of this tree is against its extensive use as a commercial wood. It has a persistent habit of dividing near the ground into from three to a dozen stems, some of which may be a foot in diameter. It is a green-bark tree, wide-spreading and handsome, and has been planted in this and foreign countries. It grows about San Antonio, but is at its best near the Rio Grande about and above Brownsville, and between there and Kingsville, where it is called "ratama." It is armed with thorns and it seems to be able to make room for its low, wide spreading crown by shading to death other growth near it. The wood is fine grained and tinged with yellow. It lends itself well to the making of small articles, and local shops and individuals work it into paper knives, rulers, cups, goblets, paper weights and various novelties.

Huisache.—Along the Rio Grande they call this tree "cassie," a shortening of acacia. It is much planted for ornament about Brownsville. While the tree is standing it is clearly enough distinguished from mesquite, but the woods of the two species are so much alike that popularly they are regarded the same. Mesquite is much more abundant and reaches larger size. The sapwood of huisache is thin and logs that remain in shelter for some time are apt to be bored through the sap by beetles, but the borers stop when they come in contact with the heartwood. An examination of several large pieces that had been seasoning for several months showed that the wood warps and checks pretty badly. It shows well in turnery, such as table legs, spindles, mallet handles, and small egg cups, button boxes, and rounds for large chairs. It takes a high polish, and it closely resembles the best grade of black walnut, but is much harder and stronger. It was not reported from any furniture factory, but it is used to some extent in furniture making. The chief objection to it is its extreme hardness. It is next to impossible to drive a nail into it without first boring a hole. Some of the railroads near the Rio Grande make cross ties of it. The wood resists decay many years.

Ironwood.—They make wedges and small tool handles of this white, unattractive wood. It is of slow growth and is never large.

Kalmia.—The roots of this laurel are made into pipes, spoons, paper knives and other novelties, but not in large quantities. It is sometimes called calico bush, sometimes spoonwood, and occasionally mountain laurel.

Koerberintia.—The local name of this peculiar tree is "hoonkoo" (Junco). Its nearest relative in this country is the paradise tree of Florida and the ailanthus introduced from China. It has a small, thorny, crooked trunk; the wood is dark, turning nearly black with exposure; it is rich with oil; and it is very hard. The species grows in certain places along the Rio Grande. The wood is made into canes, rulers, knife handles, turned articles, and a little furniture of the smaller kinds. The trunks are too small for ordinary sizes of lumber. Samples of this wood in furniture were exhibited at the Brownsville midwinter fair in 1911-12.

Lignum Vitae.—The range of this species in Texas extends along the lower course of the Rio Grande. A trunk eight inches in diameter, near Brownsville, came from a tree thirty feet high. The annual rings were too vague and complicated to be counted, but the tree is evidently of slow growth. The wood is pitted and it contains cavities and creases; but the clear wood is very hard and of fine and various colors. It is dark green, brown, black, yellow and of mixed colors, and clouded effects, all in the same block. Small pieces of furniture, like bureau cabinets, present attractive combinations of colors. The wood is of such exceeding hardness that it turns, breaks, or batters the carpenter's tools. An army officer at Brownsville some years ago made numerous articles of it, such as boxes, trays, souvenirs, canes, paper knives and others which are said to have attracted much attention. Candlesticks, egg cups, goblets, vases, checker pieces, and dominos are now manufactured in a small way. The local name for the wood is "guayacan" in Hidalgo county where the best of it is said to grow.

Live Oak.—Since live oak passed out of use for shipbuilding, it has been a neglected wood, and is now almost forgotten. In some states where it grows it is not even mentioned in wood-using reports. A year or more ago a lot of solid logs three feet or more in diameter, and in or very near the city limits of New Orleans, were offered free to anyone who would haul them away, and no one took them. Yet live oak when properly sawed and finished is among the handsomest of the oaks. Trunks are short and the usual lengths of lumber cannot be had. In Texas small quantities are used for a number of purposes, among them being parquet flooring, pedestals, panels, molding, grills, balusters, ornaments and vehicles. The wood shows remarkably

well when properly finished. The general tone is dark brown and very rich. It takes a smooth polish. The medullary rays are dark, conspicuous and run in wavy lines which give a mottled effect when the wood is made into spindles and small articles. When worked into broad panels the colors may not run uniformly, and the artistic effect is not quite so good as in balusters and small moldings.

Composite panels are manufactured by joining several narrow strips edge to edge. The small pieces may be matched in a way to form a pleasing whole. Some finished pieces of live oak suggest Circassian walnut, but would scarcely pass as an imitation of it, and some resembles black walnut. This indicates how different may be the appearance of selected pieces of this oak. There is room for the workman to select and match this wood to show the best results. The value of this species as a cabinet material has not been appreciated in the past, nor have its possibilities been suspected. The fine effect produced by made-up panels, and by turned balusters and columns, indicates that piano makers would find something new in live oak that might be worth investigating. It is one of the most abundant of the oaks in the extreme South, and the best of it does not grow far inland from the coastal plains.

Stone masons and others who use mallets and mauls often prefer those made of live oak. The junction of a limb with the trunk is selected as the block from which the mallet is made.

Longleaf Willow.—Unless this species is too scarce in commercial sizes it is worth a trial as furniture material. The tone is softer and the color more pleasing than black willow. When polished it bears some resemblance to butternut. A tree fifteen inches in diameter in eastern Texas had eighteen annual rings and no heartwood. The color is a dull white with a suggestion of yellow. The university collection at Austin has a twenty-four inch slab of this willow. An inspection of sample panels and balusters made of it leaves a good impression of the wood's value.

Longstalk Willow.—Osiers of this species are used along the Rio Grande by Mexicans to thatch houses. The willow grows in dense holt on mud flats in the river's flood plain. In the absence or scarcity of other fuel, the small willows are whacked up, roots and all, as wood for cook stoves.

Mexican Madrona.—Plane stocks and tool handles are made of madrona in Texas, but not much is used. The wood is hard, checks badly, and in color is a little lighter than apple wood which it resembles. A seven-inch trunk that was measured had no sapwood, and its annual rings were scarcely visible. The bark's wine-color readily identifies the species in the forest.

Mexican Palmetto.—In the vicinity of Brownsville, summer houses and picnic pavilions are constructed with posts or palisades of palmetto. The leaves are occasionally employed for thatching. Such posts are said to last many years. The largest posts used in that way are about one foot in diameter and twenty feet high, but trees of larger size grow along the Rio Grande.

Mexican Persimmon.—The value of the Mexican persimmon lies in its dark heartwood. A trunk six inches in diameter in the university collection at Austin is nearly all heartwood. The wood is irregular in color, even in the same piece, being variegated with lighter and darker streaks, and cloudy effects. It ought to be fine brush-back material. It is worked into tool handles, lodge furniture, canes, rules, pen holders, picture frames, curtain rings, door knobs, parasol handles, and maul sticks for artists. The trunk is gnarly, and the bark smooth and thin.

Mexican Walnut.—The Mexican walnut does not reach as large size in Texas as farther west. A trunk eleven inches in diameter was the largest seen in the course of this investigation. The wood resembles black walnut, but is a little heavier, and does not appear as regular in color. It polishes well, and is worked into small turnery, gavels, cups, picture frames, knife handles, and a little goes into furniture. The wood is said to be scarce. The nuts are edible, but are quite small, those growing in the canyon of Devil's river not being more than half as large as a medium sized nutmeg and bearing much resemblance to it.

Mistletoe.—This is not a tree, and if classed as a wood it is a peculiar one. It is a parasite, and grows on trees like a branch. No claim of commercial importance is made for it, but it has been experimented with for parasol handles, pipe stems and pen racks. The wood is white and weak, and stocks an inch in diameter are exceptionally large.

Palo Blanco.—In Cameron and Hidalgo counties palo blanco goes to the wagon shops as ash. It is hard but is said to be weaker than ash. Table legs and doubtless other parts of furniture are made of it as a substitute for ash.

Persimmon.—The heartwood of persimmon is made into mallets and gavels and other lodge furniture. The sap is white, the heart very dark;

though a trunk ten inches in diameter may have no trace of heartwood. Persimmon belongs to the ebony family.

Pinon.—Considerable of this nut pine is said to be used locally in western Texas, on the ranches, and in charcoal burning; but in the central and eastern parts of the state it was not found in use except that the university collection of woods at Austin shows samples of it worked into panels and balusters.

Poison Sumach.—Veneer for inlay and small strips for musical instruments are the principal uses for this small tree. The trunk may be five or six inches in diameter. The wood is brown, streaked with red and green, and contains dark rings not apparently due to annual growth. The figure is novel and attractive.

Prickly Ash.—Some know this species as "toothache tree," "tear-blanket," and "sting tongue." The wood shows little difference in color between heartwood and sap. A measured trunk eleven inches in diameter grew in twenty-three years. The wood bears some resemblance to buckeye. It takes good polish and some of it looks like birdseye maple, but the figure does not seem to be due to adventitious buds. It has been made into picture frames and looks well. It is a rapid grower and since its color fits it for the stencil, it might be worthy of consideration for box material, when the time comes in Texas for planting woodlots.

Prickly Pear.—Novelty stores at San Antonio and elsewhere in southern Texas sell baskets made by Mexicans from prickly pear roots the thickness of a small toothpick. The baskets have capacities from two or three to a dozen quarts. The roots are dyed in different colors and the baskets are woven in characteristic patterns.

Red Bay.—The bright red color commends the wood for wider use than it now has in Texas. Pin trays, wooden dishes, small mirror frames, canes and cupboard shelves were the only uses found.

Red Maple.—Its bright scarlet bloom gives the red maple its name. The wood differs so little from that of ordinary sugar or hard maple that in practice the two pass for one. Their uses are, consequently, the same, but the red maple belongs more to the South and sugar maple in the North.

Red Mulberry.—Selected mulberry heartwood is darker in color and richer in appearance than much of the black walnut on the market. If it were more abundant it would hold a high place as furniture material. It is used for table legs, chair arms, small turned stock, grills and lattices, base-blocks and panels, and is employed for cup and goblet turning. Mulberry is combined with agarita, prickly ash, Mexican persimmon, holly and others in making composite vases and cups by first gluing several different colored woods in one block, and passing it through the lathe. Some mulberry is made into parquet flooring. The tree is not a quick grower. A log ten inches in diameter, measured near Austin, had fifty annual rings.

Rocky Mountain Oak.—The largest trunk of this species measured was only one foot in diameter, with sapwood nearly two inches thick. The medullary rays are broad and bright, and though the logs are small they give good results in quarter sawing. The figure is distinct. Spindles and balusters for stairways, and turned capitals for newel posts have been made of this oak. The trees in Texas are not only small but they are scarce.

Sassafras.—In eastern Texas sassafras is used in furniture making. It is not abundant in that region and is only occasionally cut. It is strong and substantial, and while of deeper brown than ash it otherwise resembles that wood in appearance.

Scarlet Haw.—Red haw is the usual name for this tree in Texas. It is small and can never be of much importance, but it has been used in small turnery with good results. The wood is very hard and heavy.

Screwbean.—The screwbean is much like mesquite and is put to similar uses, except that the former is smaller and more limited in its range. It occurs along the valley of the Rio Grande from the mouth of Devil's river to El Paso.

Shittimwood.—This species is abundant in portions of Texas, trees at their best attaining a height of sixty feet and a diameter of two or three. It is frequently known as "gum elastic," the name referring to a resin exuded from wounds in the wood. The resin is used locally as chewing gum. Sometimes the berries are added. A rather large quantity of this species goes to the hardwood mills. The wood is white, with a tinge of yellow, and is used for furniture, vehicles, agricultural implements, boxes, crates, and for most other purposes for which cheap ash, maple or elm is suitable. The wood is plain.

Silver Maple.—Soft maple is the name commonly applied to this species in Texas. It is softer, weaker and generally inferior to the sugar or hard maple (which does not grow commercially in Texas), but for some purposes silver maple is liked better. It is white and delicate, fits nicely in joinery, pol-

ishes well, and meets most requirements. In Texas it goes to the furniture and wagon shops and is often used for interior house finish, and is one of the best woodenware materials in the state. It stencils well, is clean and odorless, and this fits it for first-grade box lumber.

Slippery Elm.—Commercially this is not usually distinguished from other elms with which it is associated in Texas. It is of a little darker color, and some users insist that it is stronger than other trees of the genus. It is used for furniture, agricultural implements, boxes and crates, vehicles and fixtures. The inner bark has medicinal value and is sold in most drug stores. This tree in south Texas is called "oimo Colorado."

Sophora.—The color of the wood of this species gives it the name "pluk locust" in Texas. It is whittled into canes which are hard, strong and heavy. The trees are too small for lumber.

Spanish Bayonet.—Some call the tree Spanish bayonet and know the wood as yucca. At San Antonio, the novelty stores sell pin cushions, hatpin holders, and other useful and ornamental articles of this material. The rim of the trunk or stem is hard and tough, and the inside soft and spongy. Pins are easily inserted in the pith of cross sections. The articles are made in local shops. Stems three or four inches in diameter are liked best.

Spanish Oak.—So many species of oak are locally called Spanish oak that it becomes difficult to determine to what extent the true Spanish is used in Texas. It is at its best near the coast in the eastern part of the state. It goes to wagon shops for repair work, and makers or repairers of cotton and rice machinery use it. A log twenty-four inches in diameter which was examined showed little difference in appearance between heartwood and sapwood. Samples of balusters, panels, capitals, and molding in the university collection at Austin resemble white oak in color and figure.

Sweet Magnolia.—This finely-colored wood is too scarce in Texas to become commercially important, but some excellent specimens are found. A measured trunk seventeen inches in diameter had one inch of sapwood. The heart is used as an imitation of mahogany. It takes high polish, and the brown and darker shades combine with fine effect. Small articles are turned on lathes, and spindles for arm chairs are another class of products made of this wood. By some it is called sweet bay.

Sycamore.—The common eastern sycamore grows as far west in Texas as Devil's River, but it is scarce. What little is cut is likely to go to the furniture shops. A considerable part of the supply is made into chair seats. Some is used for newel posts and railing for stairs, and for panels. A little is converted into picture-frame molding, and a rougher piece for other is found in making ox yokes near the Louisiana line.

Texas Ebony.—The color of the heartwood gives this species its name. The roots are blacker than the trunk, and small articles made of root wood resemble the black ebony of Ceylon; but the trunk wood is apt to be striped with black, brown and medium yellow. The annual rings of growth are frequently of different colors. A trunk that was measured was twelve inches in diameter and twenty-four years old, with one and a half inches of sapwood. Many kinds of articles are made of ebony from turned candlestick, goblets, cups and rings, to cross ties and house blocks and rollers. When used for railroad ties they must be bored for spikes, for the hardness of the wood makes driving very difficult. It resists decay many years and is one of the common fence-post materials near the Rio Grande. It is in much use as fuel, but is said to be objectionable for stove wood because of the intense heat it produces. In open fireplaces it burns with cheerful blaze and glowing coals. Large amounts of it are sold as cordwood about Brownsville.

It is suitable for higher uses than cordwood and cross ties. It makes first-class cabinet material, and by selecting and matching colors, it is worked into furniture. Even large tables are made of it which are elaborately carved, and present a massive and pleasing appearance. At Austin it is manufactured into parquetry floors, being one of the darkest woods employed. The seeds have been used as a substitute for coffee.

Texas Cat's Claw.—A log in the university collection at Austin is nine inches in diameter with twenty-three annual rings. In San Antonio the wood is used for chisel and gouge handles, and at Austin for small frames, scroll work, and curtain rings. In Brownsville small pieces of cat's claw furniture are exhibited in some of the shops or show windows. It is manufactured into mission lamps, candlesticks, paper weights, rulers, canes, umbrella handles, and numerous ornaments. The sapwood is not much used as it is liable to be attacked by boring insects. The heart is dark in color and exceedingly hard. The color varies, however, from nearly red to nearly black. The wood takes a high polish, and is among the most handsome in the state.

Tree Huckleberry.—This is known also as farkie-

berry and sparkleberry, and reaches its best development in eastern Texas. Trees five or six inches in diameter are the maximum. The wood is hard and heavy, is light brown, tinged with red. Occasional uses of the wood are reported. It has been employed in a small way for turnery in the Texas Agricultural and Mechanical College. The wood is hard to split but is liable to check in drying.

Umbrella Tree.—A few small picture frames and spindles for grill work make up the uses found in Texas for this planted tree. The trunk is short, the wood coarse, and of brown color, with figure and general appearance of chestnut. It is a foreign tree brought from southeastern Asia.

Water Hickory.—This is a member of the hickory group and is put to the same uses as the others, though it is seldom given its proper name. The woods of the hickories are so similar that users do not care to separate them. This particular species has been manufactured into counter tops.

Water Oak.—The custom of listing this wood as red oak robs it of some of the credit that should come to it. Though not reported under its own name by a single manufacturer in Texas, it is known to supply material for wagons, furniture, fixtures and general millwork. The figure of the wood is inferior to that of many species of oak, and it is objectionable on account of its poor seasoning qualities; but the wood is strong and reliable and is worthy of more consideration than has been given it.

Whiteleaf Oak.—The beauty of this small, ever-green oak that grows on the high regions of western Texas is in the foliage rather than the wood. Large trunks are apt to be hollow, but the sound wood is used for repairing wagons and it has been tried with some success for furniture. It will never become of other than local importance.

Wild China.—This tree is abundant in Texas, but is of poor form for lumber, the trunks being short and none too straight. It is often planted for shade. It is not a foreign tree brought into this country, as its name might imply. It grows from Georgia to Arizona, but probably will never attain to any more importance in the timber supply than it now holds. It is sometimes called soap berry because substances extracted from the roots and the fruit have been used for soap. The true soap berry is a closely related species. It is credited with being a rapid grower, but the count of annual rings in a number of trunks in Texas did not show it so. The wood bears some resemblance to ash, but is not as coarse. It is used for boxes, crates, furniture and vehicle repairing, but not in large amounts.

Wild Plum.—The wood looks like apple but is of deeper red. It was found one of the woods in use in a shop where butcher-knife handles and wooden spoons are made. A log that measured seven inches in diameter had three-fourths inch of sapwood.

Yellow Buckeye.—A little of this wood is made into boxes in eastern Texas, and ironing boards and bread boards find places for a little. It is a white, soft wood, useful for many purposes, but it is not plentiful or of large size in Texas.

Yellow Oak.—The yellow oak loses its forest name when it reaches the lumber yard and becomes red oak, and is used wherever it is found. The wood varies in quality (like elm) in accordance with soils on which it grows. Good soil produces clear, sound, good-colored wood; poor soil shows results in brash, defective trunks.

Yopon Holly.—The only use found for this small, scarce wood in Texas was for wooden spoons and manicure sets; and the largest trunk measured was only three inches in diameter. The wood is white like other hollies.

INDUSTRIES.

The sawmills of Texas cut 1,884,134,000 feet of lumber in 1910, as is shown by the census figures for that year. Reports came from 466 mills. The quantity further manufactured last year was 768,336,112 feet, according to special reports received and compiled by the Forest Service. That shows the further manufacture of the equivalent of 41 per cent of the cut of the mills. About 9 per cent of the quantity further manufactured is shipped into the State, it being largely such woods as are not abundantly produced in Texas.

Five foreign woods are used in Texas factories—the two mahoganies, African and American; Mexican white pine, Spanish cedar, and teak. The Mexican white pine grows also in the United States and is not strictly foreign species. The combined amount of the foreign woods is only a little more than half a million feet.

It is not always an easy matter to define what is meant by and included in an industry. There are many overlappings and doubtful cases. A clear line between furniture and fixtures, for instance, can not always be drawn; nor between handles and agricultural implements; nor between tanks and cooperage, and so on down the whole list. In dividing

into industries the whole amount of wood used in the State, the Forest Service follows the same schedules and rules in all the States in order to have uniformity, and to facilitate the comparison of one State with another. The classes of commodities in the trunk industry, or the musical instrument industry, or the horse vehicle industry, or any other industry, are the same in all the States. One wishing to ascertain how Michigan compares with Texas in the tank industry can consult the reports for the two States, with the assurance that the same kind of commodities, and no others, are included in both States. The rather large group of industries which are marked "Miscellaneous" in the table is made up partly of odds and ends and of doubtful articles which do not clearly belong in any of the listed industries. That is the place where all the leftovers go.

After this explanation it will be of interest to compare the numbers of industries in certain States. The quantity of wood used is no gauge by which to measure the number of industries, for where development is high and utilization close, subdivisions are clearly differentiated; but where quantity is the principal item considered, industries are apt to be few. The following list by States includes "Miscellaneous" as an industry in each.

State.	No. of Industries.
Louisiana	9
Mississippi	9
Texas	13
Maryland	13
Arkansas	15
Kentucky	19
Alabama	19
Oregon	20
Massachusetts	20
North Carolina	21
Wisconsin	22
Missouri	24
Illinois	51

If there are not at least three manufacturers engaged in making the same commodity, it is not classed as an industry. If less than three, they are listed with the "Miscellaneous." That is to avoid revealing the identity of any manufacturer's figures.

A comparison of prices paid for lumber in different States by firms making similar commodities would show such differences that ordinary market conditions would not afford a satisfactory explanation. The real cause of difference in cost, where it is great, is often to be found in the quality of the products manufactured. Some furniture makers, for instance, pay \$20 or less for lumber, while others pay \$100; but they do not both make the same grade of furniture. When a greater difference in cost of lumber exists than freight and the ordinary market conditions will account for, the difference will usually be found in the grades used. Some white oak may be bought for \$25 a thousand, and other can not be bought for three times that. It is practically impossible in a report such as this to enter minutely into grades of wood used. The average prices paid must serve as an index to the grades.

Planing-Mill Products.

The output of planing mills constitutes the largest wood-using industry in Texas, amounting to 77 per cent of all, and the average cost of the lumber used as raw material is less than in any other industry. The items are flooring, ceiling, and siding. The planing mills which turn out these products are nearly all operated in connection with and as adjuncts of sawmills. The latter make rough lumber which, when it has been properly seasoned, is run through the planers, and is then considered a finished commodity ready for use, and is shipped to market. Stock sizes, kinds, and patterns are made and no special machinery is needed. The mills which saw the lumber, plane it also because it can generally be done more cheaply in that way than by shipping the rough lumber to be made into ceiling, siding, and flooring elsewhere to be planed. But some planing mills do that kind of work though they are not connected with any particular sawmills. They are so situated in relation to supply that they can obtain rough lumber very cheaply and can dispose of the finished product to advantage.

The three species of yellow pine, shortleaf, longleaf, and loblolly, contribute practically all of the wood demanded by this industry. Though eight other species are listed, their aggregate contribution is less than 1,000,000 feet, which is not a quarter of 1 per cent of the whole. White pine is highest in price and loblolly pine the lowest. Seven of the eleven woods, as listed in Table II were supplied wholly by Texas, and only one, white pine, came entirely from without. The State furnished more than 98 per cent of all the raw material used by this industry.

The table does not show where the products are sold, but it is known that one of the best markets

for Texas flooring, ceiling, and siding is Texas itself. An enormous amount of building is going on; but a trade with Mexico has reached large dimensions, and an export business is carried on with several other

foreign countries that buy Texas yellow pine. There is a northern trade, also, which reaches the Central and Plains States.

Sash, Doors, Blinds and General Millwork.

PLANING-MILL PRODUCTS.
TABLE II.

KINDS OF WOOD—	Quantity used annually.		Average cost per 1,000 ft.	Total cost f. o. b. factory.	Grown in Texas, feet, B. M.	Grown out of Texas, feet, B. M.
	feet, B. M.	Per cent.				
Shortleaf pine	294,292,000	50.06	\$11.89	\$3,499,682	294,042,600	250,000
Longleaf pine	196,279,500	33.39	11.75	2,306,103	186,279,500	10,000,000
Loblolly pine	96,410,000	16.40	11.45	1,103,500	96,410,000	.....
White oak	277,000	.05	26.39	7,310	217,000	60,000
Texas oak	152,000	.03	15.03	2,285	152,000	.....
Pin oak	150,000	.02	15.00	2,250	150,000	.....
Red gum	100,000	.02	12.00	1,200	100,000	.....
Cypress	90,000	.01	31.83	2,865	90,000	.....
White ash	75,000	.01	18.00	1,350	75,000	.....
White pine	45,000	*	60.00	2,700	.....	45,000
Post oak	2,000	*	17.50	35	2,000	.....
Totals.....	587,872,500	100.00	\$11.79	\$6,929,280	577,517,500	10,355,000

*Less than 1/100 of 1 per cent.

This industry is closely related to the preceding. Planing machines have much to do with it, but other woodworking machines are employed also. In this, much of the work is done to order; in the preceding, the commodities are made and put upon the market to be sold. Of course, doors, sash, window and door frames, and many other articles belonging to this industry, are manufactured in large quantities and are sold in general markets; but stair work, grills, columns and panel pieces are usually made to order or to meet the requirements of a particular trade. They are a more highly specialized product than flooring, ceiling and siding, and the average cost of the rough lumber of which they are made is more than twice as much. The list of woods used is longer, Table II having eleven, and this table twenty-one. Shortleaf and longleaf pines hold chief place in this as in the preceding industrial table; but they are not so greatly out of proportion with all the others. The western yellow pine occupies a place of no mean importance in this industry, and the high price paid for it is proof that it is not used as a matter of convenience. It is taking the place of the white pine of the Lake States in Texas, and though it costs only \$9 less seven times as much was used in this industry last year. Sugar pine is

another California wood which is being substituted for white pine in Texas as well as elsewhere. More than half a million feet of it appears in Table III. Loblolly pine and tupelo are the two cheapest woods. A few years ago tupelo would scarcely have found a place in this industry, and it is an example of a wood coming up from obscurity and neglect to an important place. Yellow poplar is missing from the industry. A few years ago it would have likely appeared. Scarcity and high price have forced it out, ago when it was passing as yellow poplar, and could not go under its own name.

Mexican white pine appears in no other industry in Texas; but it would appear in several if it could be had cheaper. Manufacturers in different lines hold it in much favor and would buy it, except that the price is prohibitive when it comes in competition with loblolly and shortleaf; but when it competes with the northern white pine and the pines of California, it can successfully hold its own as is shown in Table III.

The only African mahogany reported in Texas appears in this industry, and the only Sitka spruce, which is another Pacific Coast tree winning its way east of the Rocky Mountains.

SASH, DOORS, BLINDS, AND GENERAL MILL WORK.

TABLE III.

KINDS OF WOOD—	Quantity used annually.		Average cost per 1,000 ft.	Total cost f. o. b. factory.	Grown in Texas, feet, B. M.	Grown out of Texas, feet, B. M.
	feet, B. M.	Per cent.				
Shortleaf pine	17,701,000	42.66	\$24.45	\$432,722	15,351,000	2,350,000
Longleaf pine	12,081,000	29.12	22.44	271,067	8,151,000	3,930,000
Cypress	3,662,500	8.83	32.11	117,592	921,000	2,741,500
Tupelo	2,026,000	4.88	12.50	25,327	2,026,000	.....
Western yellow pine...	1,487,000	3.58	53.95	80,217	5,000	1,482,000
Loblolly pine	1,215,000	2.93	12.02	14,600	1,215,000	.....
Red gum	814,000	1.96	20.26	16,490	779,000	35,000
White oak	726,800	1.75	67.61	49,138	166,800	560,000
Birch	509,200	1.23	58.96	30,023	.....	509,200
Sugar pine	502,000	1.21	47.96	24,075	.....	502,000
White pine	195,000	.47	63.08	12,300	.....	195,000
Mexican white pine...	130,000	.31	48.46	6,300	.....	130,000
Texas oak	119,000	.29	33.19	3,950	89,000	30,000
Mahogany	115,000	.28	155.22	17,850	.....	115,000
White ash	60,000	.14	28.33	1,700	60,000	.....
Red oak	60,000	.14	76.08	4,565	.....	60,000
Cottonwood	40,000	.10	27.50	1,100	40,000	.....
Evergreen magnolia ...	27,000	.07	15.30	413	27,000	.....
Sitka spruce	20,000	.05	60.00	1,200	.....	20,000
Sugar maple	1,000	*	70.00	70	.....	1,000
African mahogany	500	*	150.00	75	.....	500
Totals.....	41,492,000	100.00	\$26.77	\$1,110,774	28,830,000	12,661,200

*Less than 1/100 of 1 per cent.

Packing Boxes and Crates.

Red gum is the leading box and crate material of Texas, but evergreen magnolia is cheapest of the nineteen species listed in Table IV. A small quantity of red gum and cottonwood are brought into the State, but all the rest is the home product. A large number of the boxes and crates are for shipping fruits and vegetables from the farms to the markets. The line separating boxes and baskets is often hard to define in this industry. A large part of the material is received in the form of rotary-cut veneer, and by the employment of cleats and reinforcements is worked into shipping containers.

Willow oak supplied more than 5 per cent of the box and crate material in Texas. Most of it was for crates used in shipping farm machinery, fruit trees from nurseries, hardware, and other commodities

requiring strong crates. Hackberry is named in no other industry, but it is used in others and is often called ash.

Cottonwood is highest in price of the nineteen species in Table IV. Most of it is employed for boxes which require stenciling. The wood's white color shows lettering to good advantage. It is valuable also because it possesses no offensive taste or odor and will not contaminate articles of food with which it comes in contact. Ash is valuable for the same reason.

Car Construction.

Twenty-four woods contribute material to this industry in Texas, a larger number than is found in any other industry. Though the average cost, as shown in Table V, is not very high owing to the

presence of cheap woods in large amounts, there are a number of species listed which are worth more than \$50 a thousand, and two above \$150. The costliest is black cherry. It is higher than the mahogany listed and it is seldom that cherry costs that much in any industry. It was used for broad panels and other finish for passenger cars. It is twice the price of the black walnut listed, though usually cherry does not cost as much as walnut.

Nearly four-fifths of the material reported consists of three yellow pines that grow in Texas—longleaf, shortleaf and loblolly. Long leaf is in large demand for car frames, and much of it is heavy stuff. Its value is on account of its strength, stiffness and its long resistance to decay. Little except heartwood is used; in fact, this wood is nearly all heart. Loblolly and shortleaf are softer and not quite as strong, and their principal use as car material is for siding and decking.

White oak is employed for heavy timbers in freight cars, and also as finish for passenger cars. A considerable quantity is demanded for repairs in the many car shops in the State. Chinquapin oak is listed in large amount, and as stated on a former page of this report, there is some doubt as to the identity of some of the wood listed under that name.

Electric cars for street and interurban railways are an important item in this industry. The most of the demand for their construction and repair is met by hardwoods.

The small lots of white pine and sugar pine in the table went to the pattern shops. Some of the cypress and yellow poplar also went there; but these woods are more important as finish for cars. The osage orange reported for car construction may not all have actually gone into cars, but some of it was probably employed as foundations for buildings, blocks and posts for platforms, and other purposes not strictly a part of car construction. The small amount of hickory was used in making railroad wheelpegs.

Texas supplies nearly two-thirds of the wood demanded by its car factories.

Furniture.

The average cost of furniture wood in Texas is not quite as low as in some other Southern States, but lower than in regions further north. The average in Texas is \$17.92; North Carolina, \$17.81; Alabama, \$13.90; Mississippi, \$13.44; and Louisiana, \$12.66. Among States which pay more are the following: Arkansas, \$24.90; Wisconsin, \$25.22; Kentucky, \$26.47; Massachusetts, \$28.30; Maryland, \$29.32; and Illinois, \$39.90. Figures might be obtained to show the average cost in several other States, but they would bring out no points additional to the above, viz: that remarkable difference exists in the cost of furniture woods in near-by regions. The locality where the material is good and is low in price should do a large business in manufacturing furniture. North Carolina is an example of developing timber resources along the line of furniture making. Texas lacks a few of the best native woods, such as maple, cherry, yellow poplar, and black walnut, but it has abundance of others for developing a valuable furniture industry. There is enough of medium-grade oak, substantial elm, and high-grade pine, cypress and tupelo for common furniture, and the forests of fine and beautiful woods, listed usually as minor species, might be drawn upon to furnish veneers for overlaying. A product might be turned out that need fear no competition with any other part of the United States. Texas possesses the material for the highest grade furniture, but it has not yet made much use of any but the more common woods. Elsewhere in this report descriptions of some of the State's rare species are given somewhat in detail, under the heading "Unreported Woods."

Though Texas is a little handicapped in regard to cheap power, when compared with some other regions, it possesses other advantages which fully compensate for what it lacks in this. It has woods which possess grain, texture and color, little, if any, inferior to the rare imported woods. The proper utilization of these woods is in furniture making; not so much massive furniture, but smaller kinds that can make use of the medium-sized trees. Quality rather than amount should be the State's strong point, though of the more common woods it has much, and might equal any other region in volume of product.

Red gum supplies nearly one-half of all the furniture wood listed in Table VI. It is one of this country's best woods for furniture, and has come to the front in recent years. Foreigners first discovered its value. The French called it satin walnut, and the French and Italians sell some of it as Circassian walnut, which it may be made to imitate almost exactly. It is largely used in this country as imitation of Circassian, English and French walnut, not only in furniture, but in the manufacture of interior finish and musical instruments.

HANDLES.
TABLE XI.

KINDS OF WOOD—	Quantity used annually.		Average cost	Total cost	Grown in Texas,	Grown out of Texas
	feet, B. M.	Per cent.	per 1,000 ft.	f. o. b. factory.	feet, B. M.	feet, B. M.
White ash	377,000	68.92	\$22.00	\$8,294	25,000	352,000
Hickory	130,000	23.77	74.62	9,700	125,000	5,000
White oak	40,000	7.31	20.00	800	40,000	.....
Totals.....	547,000	100.00	\$34.36	\$18,794	190,000	357,000

TRUNKS AND VALISES.
TABLE XII.

KINDS OF WOOD—	Quantity used annually.		Average cost	Total cost	Grown in Texas,	Grown out of Texas
	feet, B. M.	Per cent.	per 1,000 ft.	f. o. b. factory.	feet, B. M.	feet, B. M.
Red gum	230,000	46.47	\$20.00	\$4,600	130,000	100,000
Cottonwood	165,000	33.33	19.70	3,250	.....	165,000
White elm	50,000	10.10	50.00	2,500	.....	50,000
Cypress	50,000	10.10	15.00	750	.....	50,000
Totals.....	495,000	100.00	\$22.42	\$11,100	130,000	365,000

PATTERNS.
TABLE XIII.

KINDS OF WOOD—	Quantity used annually.		Average cost	Total cost	Grown in Texas,	Grown out of Texas
	feet, B. M.	Per cent.	per 1,000 ft.	f. o. b. factory.	feet, B. M.	feet, B. M.
Shortleaf pine	226,400	82.36	\$15.00	\$3,396	226,400	.....
White pine	35,000	12.73	80.34	2,812	.....	35,000
Cypress	6,000	2.18	40.00	240	.....	6,000
Western white pine.....	3,500	1.27	50.00	175	.....	3,500
Sugar pine	2,000	.73	62.50	125	.....	2,000
Sugar maple	2,000	.73	100.00	200	.....	2,000
Totals.....	274,900	100.00	\$25.27	\$6,948	226,400	48,500

MISCELLANEOUS.
TABLE XIV.

KINDS OF WOOD—	Quantity used annually.		Average cost	Total cost	Grown in Texas,	Grown out of Texas
	feet, B. M.	Per cent.	per 1,000 ft.	f. o. b. factory.	feet, B. M.	feet, B. M.
Longleaf pine	31,243,000	65.98	\$10.86	\$339,274	12,766,000	18,477,000
Cypress	9,013,000	19.04	17.03	153,485	6,012,000	3,001,000
Shortleaf pine	3,850,000	8.13	13.14	50,580	3,850,000	.....
Red gum	3,040,000	6.42	15.50	47,135	3,000,000	40,000
White elm	50,000	.11	10.00	500	50,000	.....
Basswood	40,000	.08	23.00	920	.....	40,000
Spanish cedar	40,000	.08	31.15	1,245	.....	40,000
Yellow poplar	35,000	.07	23.00	805	.....	35,000
White oak	11,000	.02	30.00	330	11,000	.....
Teak	8,000	.02	220.00	1,760	.....	8,000
Texan oak	6,000	.01	30.00	180	6,000	.....
Osage orange	5,000	.01	125.00	625	5,000	.....
Black walnut	3,000	*	40.00	120	.....	3,000
White ash	2,800	*	27.14	76	2,000	800
Red cedar	2,000	*	30.00	60	2,000	.....
Totals.....	47,348,800	100.00	\$12.61	\$597,095	25,704,000	21,644,800

*Less than 1/100 of 1 per cent.

Beehives are manufactured from clear longleaf pine, but the frames or boxes in which the honey is stored by the bees are of cottonwood, basswood, yellow poplar, or some other wood without offensive odor and with pleasing color. Honey frames are one of the few commodities turned out by the woodworker that are sold to the ultimate consumer by weight, and they are sold at the same price as the honey they contain.

The manufacture of excelsior is not important in Texas. A soft cheap wood is needed and it must possess a considerable element of toughness and elasticity. The principal use of excelsior is for packing purposes and not for upholstery, as many persons suppose. Shippers of dishes, small articles of hardware, and of other breakable commodities, are the largest users. All of the excelsior reported in Texas was made of shortleaf pine.

The makers of chicken coops in the State use a liberal amount of wood. Some of it is pine and some white elm. The latter wood is tough and is made into the long dowels or rods forming the sides, ends and tops of coops. The elm was bought for \$10 a thousand, which indicates that it was purchased in the log form.

Paving blocks are made of both longleaf and shortleaf pine in Texas, and large numbers are manufactured. Wooden paving blocks have been used and experimented with in this and foreign countries for many years; many kinds of wood have been tried, and many failures and many successes have been recorded. The successes have been more than the failures, and the use of the blocks is rapidly extending. Most of the failures and unsatisfactory experiments may be checked against the use of untreated wood. Since treated blocks have become the rule,

that form of pavement has grown rapidly in popularity. The blocks are about twice the size of an ordinary brick, and so cut that the wear falls on the end of the fibers; that is, on a cross section of the tree.

Some very hard woods, as osage orange and mesquite, have been used as paving blocks in Texas; but they are objectionable on account of excessive cost, the difficulty of procuring them of proper form and size, and their tendency to wear smooth and become slippery in rainy weather. As far as their resistance to decay is concerned, they are all that could be desired. A little osage orange block pavement may still be seen in San Antonio which has well nigh outlasted the memory of those who laid it.

In selecting pine for paving blocks, the annual rings of growth are carefully inspected. They must not be too broad; that is, the trees from which they are cut must not be of too rapid growth. The ring, as is well known to most persons, is made up of two kinds of wood—the dark-colored, porous spring growth, and the dense wood laid on in the summer. The latter is harder than the spring wood, and wears down more slowly under the traffic to which paving is subjected. If the rings are wide, the wear gives the top of the blocks a corrugated surface, like a washboard, and makes it objectionable for sanitary reasons. Blocks of longleaf and of selected shortleaf are of such regularly-spaced narrow rings that they wear smooth and always present good surfaces.

Four woods in Texas constitute the cigar box material—red gum, yellow poplar, basswood and Spanish cedar. The four are employed in nearly equal amounts. Red gum is cheapest, yellow poplar next, basswood third, and Spanish cedar the most expensive. Much of the cedar is made into very thin-

sliced veneer and is used as overlay or covering for the other woods. In quantity this cedar surpasses any other cigar-box wood in the United States. It is much employed as veneer, yet large quantities are worked into thin lumber and converted into boxes of solid wood.

Butcher supplies make up part of the material in the miscellaneous table, and two woods—white and Texan oak—are the only species listed.

Refrigerators are made in so small a way that they call for only brief mention. White ash and cypress are the only woods reported for this business. The market for refrigerators in Texas is excellent, and plenty of wood may be had for making them. It would seem that there is room to build up an industry in that line.

A large quantity of wood is made into caskets and coffins in Texas yearly, but the statistics were not obtained in form to appear as a separate industry, and are included in the miscellaneous table. Red gum and cypress are the only woods reported, three-fourths of all being cypress. A large number of the caskets used in the State are made in northern factories, and many more are the work of cabinet makers who turn out a few each in the course of a year, but do not make detailed reports of their output. The boxes in which caskets are always shipped are counted as part of the industry.

SUMMARY BY INDUSTRIES OF WOODS USED IN TEXAS.

Table XV is a summary of all the wood-using industries in Texas. It is a counterpart of Table I, which is a summary by species. Both tables present the same totals but interpret them in different ways. The first shows how much of each wood is used, the cost, etc.; the last shows how much wood of all kinds is demanded by each one of the fourteen industries of Texas. Forty-eight woods are listed in Table I and thirteen industries in Table XV. In this enumeration "Miscellaneous" is classed as an industry, though it is only a grouping of many items. It is numbered XIV. The highest average price for the wood used was by the makers of fixtures, and the lowest by planing mill products. The makers of tanks bought the smallest percentage of material in the State, and the manufacturers of planing-mill products the largest; but no industry procured all of its wood in the State, and none bought all outside. The average cost of the wood reported by all the industries was \$13.30 per 1,000 feet. That can be compared with similar data for other States where the average costs for all wood used were as follows:

State.	Average Cost.
Arkansas	\$11.49
Louisiana	11.64
Mississippi	12.22
Alabama	12.24
Maryland	20.64
Massachusetts	21.23
Kentucky	23.07
Missouri	24.12
Illinois	28.63

PERCENTAGE OF DIFFERENT WOODS USED BY EACH INDUSTRY.

Fourteen of the forty-eight woods reported by the hackberry, Gambel oak, mesquite, mountain juniper, one-seed juniper, red cedar, Spanish cedar, teak, tupelo, western white pine and willow oak. No species is used by all the industries, but four woods—white oak, red gum, cypress and white ash—appear in ten of the thirteen, and Texan oak and longleaf pine in nine. No industry uses more than one-half of the reported woods. Car makers list 24, furniture 23, and sash, doors and blinds 21, of the 48 species; while patterns take 6 and handles and tanks 3 each.

AVERAGE COST OF WOODS IN EACH INDUSTRY.

The difference in the prices paid for a wood by different industries that use it is well illustrated in Table XVII. Practically no one of them have the same average price. White oak is a wood well known and as universally used as any in this country. Some manufacturers in Texas pay three or four times as much for it as others. Longleaf pine does not show such marked difference, but some users pay double what others buy it for. Red gum ranges from \$12 to \$40; Texan oak, from \$10 to \$33.19, and white elm from \$10 to \$50. No general explanation would account for all of these variations, but difference in grade of the materials used is responsible for much of it. Freight rates have some effect on cost, and the form of the material purchased has a great deal. Some buy it in log form for half or less of what rough lumber would cost; a few purchase it by the cord, and others procure it

PERCENTAGE OF THE DIFFERENT KINDS OF WOOD USED BY EACH INDUSTRY.
TABLE XVI.

KINDS OF WOOD—	Agricultural implements	Boxes and crates, packing.	Car construction	Fixtures.	Furniture.	Handles.	Miscellaneous.	Patterns.	Planing mill products.	Sash, doors, blinds & general mill work.	Tanks.	Trunks and Valises.	Vehicles and vehicle parts.
Basswood			3.54	32.15			64.31						
Beech					100.00								
Birch			.30	25.44	7.83					66.43			
Black cherry			29.25		70.70								
Black gum		44.44			55.56								
Black walnut			4.08		3.70		2.22						
Black willow		100.00											
Chestnut				100.00									
Chinquapin oak		13.02	86.98										
Cottonwood	2.69	86.10	.23	.82	5.37					.93		3.86	
Cypress	.71		1.82	.09	.01		64.27	.04	.64	26.12	5.94	.36	
Douglas fir			100.00										
Evergreen magnolia		44.32		.42	50.83					3.74			.69
Gambel oak													100.00
Hackberry		100.00											
Hickory	.53		1.31			69.54							28.62
Loblolly pine		1.17	9.17	.14	.02				88.39	1.11			
Longleaf pine	.81	.18	4.37	.08	.05		12.32		77.38	4.76	*		.05
Mahogany (African)										100.00			
Mahogany (American)			40.98	25.42	.57					33.03			
Mesquite					100.00								
Mexican white pine										100.00			
Mountain juniper					100.00								
One-seed juniper					100.00								
Osage orange			29.99				5.00						65.01
Overcup oak		69.45	1.85										28.70
Pin oak		30.23							69.77				
Post oak		24.63	75.12						.25				
Red cedar							100.00						
Red gum	.80	68.96	.02	.29	13.09		12.16		.40	3.26		.92	.10
Red oak				42.86						57.14			
Shortleaf pine	*	2.34	2.07	.08	.12		1.16	.07	88.81	5.34	*		*
Sitka spruce										100.00			
Spanish cedar							100.00						
Sugar maple			85.76					9.49		4.75			
Sugar pine			.06					.40		99.54			
Teak							100.00						
Texan oak	3.55	5.33	41.85	2.15	35.89		.21		5.40	4.23			1.39
Tupelo										100.00			
Western white pine								100.00					
Western yellow pine				1.00	.13					98.87			
White ash	1.67	41.77	8.65	5.97	14.50	15.75	.12		3.13	2.51			5.93
White elm		39.85			23.91		18.12					18.12	
White oak	2.06	1.00	57.10	4.97	13.96	.67	.18		4.61	12.09			3.36
White pine			27.21					9.27	11.91	51.61			
Willow oak		100.00											
Wing elm		96.62			3.38								
Yellow poplar			73.12	11.86	2.90		9.22						2.90

*Less than 1/100 of 1 per cent.

Hickory.

Axles, bolsters, bolster stakes, brake bars, car hoods, car seats, doubletrees, farm implements, felloes, gears for vehicles, handles, harrows, single trees, spokes, vehicles, velocipedes.

Loblolly Pine.

Balusters, bases, bed springs, beer and soda cases, boxes, brackets, car decking, car roofing, car siding, casing, ceiling, chicken coops, columns, cots, cotton gins, crates, fencing, finish, flooring, furniture, general mill work, lawn swings, locomotive cabs, molding, novelties, porch-frame screens, running boards, sash, screen doors, screen windows, shelves, siding, stairs, store fronts, vehicles, wagon beds, wheelbarrows, windmill towers, window frames, wood turning.

Longleaf Pine.

Balusters, bases, bed springs, beehives, beer and soda cases, book cases, boxes, brackets, car posts, car sills, casing, ceiling, coops, coffins, columns, cot ends, cot rails, cots, cotton gins, cotton presses, crates, decking, doors, fencing, fixtures, flooring, frames, furniture, horse powers, kitchen cabinets, lawn swings, locomotive cabs, molding, novelties, paving blocks, running boards, sash, screen doors, screens, shelves, shiplap, siding, stairs, store fronts, tables, tent poles, underframing, wagon beds, wagon bottoms, well machines, wheelbarrows, wood turning, windmill towers.

Mahogany (Aprican.)

Interior finish.

Mahogany (American.)

Bank fixtures, bar tops, blinds, car finish, church altars, counter tops, doors, fixtures, furniture, molding, store fixtures, sash.

Mesquite.

Rollers.

Mexican White Pine.

Blinds, doors, interior finish, moldings, sash.

Mountain Juniper.

Cedar chests, closet lining, furniture, wardrobes.

One-Seed Juniper.

Cedar chests, furniture, lining for closets, wardrobes.

Osage Orange.

Felloes, fence posts, insulator pins, wagon spokes.

Overcup Oak.

Baskets, crates, felloes, freight cars, harrows, locomotive pilot beams, mission furniture.

Pin Oak.

Baskets, cars, ceiling, crates, felloes, finish, flooring frame work, gears, locomotive pilot beams, office furniture, plow beams, siding, spokes, store fixtures.

Post Oak.

Ceiling, church pews, finish, flooring, freight cars, locomotive pilot beams, logging cars, mission furniture, office furniture, siding, store fixtures, trucks, vegetable crates.

Red Cedar.

Chests, coffins, furniture, lining for closets, wardrobes.

Red Gum.

Bank fixtures, baskets, beer and soda cases, boxes, buffets, cabinets, car finish, chicken coops, china closets, cigar boxes, coffins, cotton gins, columns, couches, counters, crates, desks, drawer bottoms, drawers, dressers, egg cases, fruit cases, kitchen safes, lounges, novelties, panels, sample cases, show cases, store fixtures, tables, trunk boxes, turned work, vegetable packages, wagon beds, wash stands.

Red Oak.

Bank fixtures, bar fixtures, blinds, butcher supplies, cabinets, car buildings, ceiling, chairs, doors, felloes, finish, flooring, furniture, harrows, locomotive pilot beams, mission furniture, molding, office fixtures, porch furniture, refrigerators, sash, show cases, siding, spokes, vegetable crates.

Shortleaf Pine.

Balusters, bases, bedding material, bed springs, beer and soda cases, boxes, casing, ceiling, chicken coops, church pews, columns, coffins, cots, cotton gins, crates, decking, doors, excelsior, fencing, finish, flooring, foundry flasks, frames, freight cars, fruit packages, furniture, grain doors, lawn swings, locomotive pilot beams, logging cars, molding, novelties, paving blocks, porch-frame screens, running boards, sash, screen doors, screen windows, siding, stairs, store and office fixtures, table legs, trucks, vegetable packages, vehicles, wagon beds, wheelbarrows, windmill towers, window frames, wood turnings.

Sitka Spruce.
Blinds, doors, sash.

Spanish Cedar.
Cigar boxes.

Sugar Maple.
Blocks, car floor strips, car matting, flooring.

Sugar Pine.
Car doors, doors, patterns, sash, screen work.

Teak.
Boat finish.

Texan Oak.
Davenport, mission furniture, wagons.

Tupelo.
Columns.

Western White Pine.
Patterns.

Western Yellow Pine.
Blinds, doors, door screens, interior finish, molding, sash, window frames, window screens.

White Ash.
Butchers supplies, car building, car finish, carlings, cores for veneering, fixtures, flooring, fruit crates, furniture, ice boxes, refrigerators, shovel handles, tent slides, tent stakes, vegetable crates, vehicles, windmills.

White Elm.
Cabinets, chicken coops, crates, furniture, trunk slats.

White Pine.
Blinds, car siding, ceiling, cores, doors, door screens, finish, models, molding, panels, patterns, porch screens, roofing, sash, siding, window frames, window screens.

Willow Oak.
Fruit crates, vegetable crates.

Wing Elm.
Cabinet legs.

Yellow Poplar.
Automobile bodies, bread boards, car ceiling, car finish, carriage bodies, car seats, car siding, church altars, cigar boxes, counters, desks, furniture, ironing boards, store fixtures, wagon panels.

White Oak.

Balusters, bank fixtures, baskets, blinds, brackets, buffets, butchers supplies, cabinets, car building, car finish, car seats, ceiling, chairs, chiffoniers, china closets, coffins, columns, davenport, dishes, doors, door screens, dressers, farm implements, felloes, flooring, freight cars, fruit crates, harrows, hubs, interior trim, lawn swings, library tables, locomotive pilot beams, locomotives, mission furniture, molding, plow beams, porch furniture, reaches, refrigerators, show cases, siding, spokes, store fixtures, tables, tongues, turned work, vegetable crates, wagons, wash stands, wheelbarrows, window screens.

DIRECTORY.

Below is a list of Texas wood-using manufacturers who supplied the data contained in this report. Those manufacturing several products classified under different industries will appear in the list, with their addresses, under more than one industry:

Agricultural Implements.

G. B. Studdard, Cushing.
Continental Gin Co., Dallas.
The Murray Co., Dallas.
The Axtell Co., Ft. Worth.
Clark Handle Factory, Henderson.
Kelly Plow Works, Longview.

Boxes and Crates, Packing.

Mechanics Planing Mill, Aransas Pass.
Bullard Gin & Mill Co., Bullard.
Conkling Mill, Box & Lumber Co., Dallas.
Dallas Show Case & Manufacturing Co., Dallas.
Silvers Box Factory, Dallas.
N. A. Slover, Dialville.
Gamer Co., Ft. Worth.
Southwestern Mechanical Co., Ft. Worth.
Texas Planing Mill & Mfg. Co., Ft. Worth.
Elberta Box & Basket Factory, Frankston.
R. T. Chandler, Gallatin.
Eller Wagon Works, Houston.
Houston Show Case Co., Houston.
Aber Box & Basket Co., Jacksonville.
Jacksonville Crate & Basket Co., Jacksonville.

Marshall Manufacturing Co., Marshall.
Mineola Box Co., Mineola.
T. J. Posey & Son, Neches.
Orange Box & Manufacturing Co., Orange.
Cummer Manufacturing Co. of Texas, Paris.
Paris Box & Manufacturing Co., Paris.
F. E. Prince, Pittsburg.
B. Everett, Porta.
J. H. Clanton, Richmond.
Butler Bros., Rusk.
Sulphur Springs Box & Crate Co., Sulphur Springs.
Tyler Box & Lumber Co., Tyler.
P. Mailander & Son, Waco.

Car Construction.

Beaumont Traction Co., Beaumont.
Fort Worth & Denver City Ry., Childress.
Gulf, Colorado & Santa Fe Ry., Cleburne.
Thompson Bros. Lumber Co., Doucette.
El Paso Electric Ry. Co., El Paso.
Northern Texas Electric Co., Ft. Worth.
St. Louis, San Francisco & Texas Ry., Ft. Worth.
Southwestern Mechanical Co., Ft. Worth.
Galveston Electric Co., Galveston.
Grant Locomotive & Car Works, Houston.
Gulf, Houston & San Antonio Ry., Houston.
Houston & Texas Central Ry., Houston.
Houston Electric Co., Houston.
Marshall & E. Texas Ry., Marshall.
Marshall Car Wheel & Foundry Co., Marshall.
Texas & Pacific Ry., Marshall.
International & Great Northern Ry., Palestine.
Trinity & Brazos Valley Ry., Teague.
Texas Midland Ry., Terrell.
Thompson Bros. Lumber Co., Trinity.
St. Louis Southwestern Ry., Tyler.
Texas Central Ry., Walnut Springs.

Fixtures.

Mechanics Planing Mill, Aransas Pass.
C. W. Georgs Mfg. Co., Beaumont.
Brown Wood Works, Dallas.
Dallas Show Case & Mfg. Co., Dallas.
Southwestern Show Case Works, Dallas.
Fort Worth Planing Mill Co., Ft. Worth.
Texas Fixture Co., Ft. Worth.
A. Stein, Galveston.
Houston Show Case Co., Houston.
W. W. Walnwright, Palestine.
H. Wagner & Son, San Antonio.
Pioneer Planing Mill, Sweetwater.
Temple Planing Mill, Temple.
P. Mailander & Son, Waco.
Yoakum Planing Mill, Yoakum.

Furniture.

J. D. Frank & Son, Amarillo.
O. O. Johnson, Aransas Pass.
Hume Lumber Co., Austin.
Betts Mfg. Co., Beaumont.
C. W. Georgs Mfg. Co., Beaumont.
Chase Furniture & Coffin Co., Dallas.
Olive & Meyers Mfg. Co., Dallas.
Southwestern Show Case Works, Dallas.
Texas Cedar Chest Co., Dallas.
A. Brandt Upholstering Co., Ft. Worth.
Fort Worth Furniture Co., Ft. Worth.
Hub Furniture Co., Ft. Worth.
Meyers-Spaltl Mfg. Co., Houston.
Texas Table Works, Houston.
R. G. Brown, Longview.
Longview Mattress & Bedding Co., Longview.
Model Manufacturing Co., Paris.
Rodgers Wade Furniture Co., Paris.
Acme Manufacturing Co., San Marcos.
Southern Furniture Co., Texarkana.

Handles.

J. E. Rausheck, Center.
Fort Worth Planing Mill Co., Ft. Worth.
Clark Handle Factory, Henderson.
Ames Shovel & Tool Co. of Texas, Paris.
The Timpson Handle Co., Timpson.

Miscellaneous.

Mechanics Planing Mill, Aransas Pass.
International Creosoting & Construction Co., Galveston.
Dallas Coffin Co., Dallas.
Parker Cigar Box Co., Dallas.
Texas Refrigerator & Fixture Co., Dallas.
White Manufacturing Co., Greenville.
Houston Show Case Co., Greenville.
Houston Tent & Awning Co., Houston.
Myers-Spaltl Manufacturing Co., Houston.
Morris Gin & Machinery Co., Palestine.
S. H. Croft, Randolph.
Sulphur Springs Box & Crate Co., Sulphur Springs.
Texarkana Casket Co., Texarkana.
National Lumber & Creosoting Co., Texarkana.

Patterns.

The Murray Co., Dallas.
Fort Worth Pattern Works, Ft. Worth.
Gamer Co., Ft. Worth.
Calhoun Woodworking Co., Houston.
Marshall Car Wheel & Foundry Co., Marshall.
Texas & Pacific Railway, Marshall.
International & Great Northern Railway, Palestine.
St. Louis Southwestern Railway Co., Tyler.
Texas Central Railway, Walnut Springs.

Planing Mill Products.

Aldridge Lumber Co., Aldridge.
Blount-Decker Lumber Co., Alto.
Fabian & Taylor, Anderson.
Annona Lumber Co., Annona.
Avinger Lumber Co., Avinger.
R. A. Cope, Avinger.
A. B. Rogers, Avinger.
Steger Lumber Co., Avinger.
Carter Lumber Co., Baber.
Beaumont Sawmill Co., Beaumont.
Neches Lumber Co., Beaumont.
Sabine Tram Co., Beaumont.
Z. C. Daniels, Beckville.
Grogan Manufacturing Co., Bivins.
Waterman Lumber Co., Blocker.
Livingston Lumber Co., Buck.
W. T. Carter & Bro., Camden.
Saner-Whiteman Lumber Co., Caro.
R. E. Trabue, Carthage.
Center Planing Mill & Lumber Co., Center.
Jas. T. Harris Planing Mill, Center.
J. H. Jordan, Center.
J. R. Shillings Planing Mill & Lumber Co., Center.
J. W. Cade, Chandler.
J. W. Allen & Co., Clarksville.
Wahrenberger Lumber Co., Conroe.
J. R. Brooks, Crockett.
Morris Planing Mill Co., Dallas.
Dayton Lumber Co., Dayton.
McShane Lumber Co., Dearborn.
Southern Pine Lumber Co., Diboll.
Crooke & Crooke, Dobbin.
Gebhart-Williams-Fennett Co., Dodge.
Walker Lumber Co., Elmina.
E. F. Adams, Elysian Fields.
Lacy & Co., Elysian Fields.
Chronister Lumber Co., Forest.
J. D. Buckley & Son, Ft. Worth.
Foster Lumber Co., Fostoria.
R. L. Findley, Frankston.
Lawrence Bros., Gllmer.
Thompson & Ford Lumber Co., Grayburg.
Trinity County Lumber Co., Groveton.
Athens Lumber Co., Harrisburg.
Barber Lumber Co., Hartburg.
Geo. W. Fouke Lumber Co., Hawkins.
Henderson Lumber & Planing Mill Co., Henderson.
Rusk County Lumber Co., Henderson.
Texas Lumber Manufacturing Co., Honey Island.
Bush Bros. Lumber & Milling Co., Houston.
Kirby Lumber Co., Houston.
Palmetto Lumber Co., Houston.
Thompson-Tucker Lumber Co., Houston.
West Lumber Co., Houston.
R. W. Wier Lumber Co., Houston.
H. D. Knight, Hughes Springs.
T. G. Watson, Hughes Springs.
C. G. Barrett, Huntsville.
A. A. Atkinson, Jacksonville.
Miller-Brooks Manufacturing Co., Jacksonville.
H. G. Bohlssen, Jasper.
Glen Lumber Co., Jefferson.
Carroll Lumber Co., Joaquin.
Angelina County Lumber Co., Keltys.
Heath, King & Heath, Kildare.
North Texas Lumber Co., Kildare.
H. T. Elder & Sons, Kilgore.
J. G. Reynolds, Lafayette.
Smith & Erwin, Lafayette.
Connor-Campbell Lumber Co., Lassater.
T. H. Leaverton, Latexo.
Newton Lumber Co., Lee's Mill.
Talbot-Duhlg Lumber Co., Lemonville.
Grogan Manufacturing Co., Linden.
Knox Lumber Co., Livingston.
R. G. Brown, Longview.
Castleberry & Flewellen, Longview.
J. H. McHaney Lumber Co., Longview.
Morgan Lumber Co., Longview.
Cotton Belt Lumber Co., Lufkin.
Lufkin Land & Lumber Co., Lufkin.
O. P. Perkins, Magnolia.
Carter-Kelley Lumber Co., Manning.
D. C. Driskell & Bro., Marshall.
Taylor-Turnay Lumber Co., Marshall.
W. M. Bridger, Maydelle.
Attoyac River Lumber Co., Maytown.
Buckner & Seale, Melrose.
Miller & Vidor Sawmill Co., Milvid.
Langford Lumber Co., Mt. Enterprise.
Blunt-Summers Lumber Co., Nacogdoches.
L. M. Brewer, Nacogdoches.

The Craven Lumber Co., Nacogdoches.
 Frost-Johnson Lumber Co. of Texas, Nacogdoches.
 J. Youens & Co., Navasota.
 W. H. Baty, Neches.
 T. C. Buckner Lumber Co., Neuville.
 Thompson & Tucker, New Willard.
 Ogburn-Dalchau Lumber Co., Ogburn.
 Olive Sternenberg & Co., Olive.
 Lutcher & Moore Lumber Co., Orange.
 Miller-Link Lumber Co., Orange.
 Wharey Lumber Co., Palestine.
 Temple Lumber Co., Pinedland.
 Bodan Lumber Co., Pollok.
 Port Arthur Planing Mill Co., Port Arthur.
 Ragley Lumber Co., Ragley.
 Louisiana & Texas Lumber Co., Ratcliff.
 J. P. Pipes & Co., Redwater.
 Gilmer-Alexander Lumber Co., Remlig.
 G. B. Griffin, Retreleve.
 W. H. Lee, Rusk.
 E. P. Yates Lumber Co., Rusk.
 Cariker Bros., Sacul.
 Geo. Springman, Salmon.
 Price & Downs, San Augustine.
 Wm. Cameron & Co., Saron.
 R. C. Miller Lumber Co., Shepherd.
 Cass Lumber Co., Steep Creek.
 T. C. Ripley, Sulphur Springs.
 H. C. Parker & Co., Tencha.
 Zink & Laroo, Terrell.
 Texarkana Lumber Co., Texarkana.
 Peach River Lumber Co., Timber.
 R. S. Shlpp, Timpson.
 J. J. Thomas, Timpson.
 Thompson Bros. Lumber Co., Trinity.
 Palmore & Dean Lumber Co., Tyler.
 Sparkman Manufacturing Co., Ulmer.
 Keith Lumber Co., Voth.
 William Cameron & Co., Waco.
 C. M. Trautschold Co., Waco.
 W. G. Neal, Warren.
 Tyler County Lumber Co., Warren.
 Waterman Lumber & Supply Co., Waterman.
 Keystone Mills Co., Waukegan.
 B. Boettcher, Westfield.
 R. G. Andrews Lumber Co., Winnsboro.
 Winnsboro Lumber Co., Winnsboro.
 L. A. Butler, Winona.
 Elms & Ramsey, Winona.
 Elms & Ray, Winona.

Sash, Doors, Blinds and General Millwork.

Amarillo Planing Mill Co., Amarillo.
 Panhandle Planing Mill Co., Amarillo.
 Anahuac Saw & Planing Mill Co., Anahuac.
 Mechanics Planing Mill, Aransas Pass.
 Calcasieu Lumber Co., Austin.
 Hume Lumber Co., Austin.
 Beaumont Column Co., Beaumont.
 Bettis Manufacturing Co., Beaumont.
 Christopher Mfg. & Lumber Co., Beaumont.
 C. W. Georgs Manufacturing Co., Beaumont.
 Page Manufacturing Co., Beaumont.
 H. L. Fitch, Brownsville.
 C. E. Jenkins, Bryan.
 Kirby Lumber Co., Call.
 Sidbury Lumber Co., Corpus Christi.
 Brown Wood Works, Dallas.
 Buell Planing Mill Co., Dallas.
 Citizens Planing Mill Co., Dallas.
 City Planing Mill Co., Dallas.
 Conkling Mill, Box & Lumber Co., Dallas.
 W. H. Conkling & Sons, Dallas.
 Dallas Screen Co., Dallas.
 Southern Door & Screen Co., Dallas.
 Texas Refrigerator & Fixture Co., Dallas.
 El Paso Sash & Door Co., El Paso.
 Acme Planing Mill, Fort Worth.
 Agee Screen Co., Fort Worth.
 J. D. Buckley & Son, Fort Worth.
 Fort Worth Planing Mill Co., Fort Worth.
 Texas Building Co., Fort Worth.
 Texas Planing Mill & Hfg. Co., Fort Worth.
 Island City Wood Working Co., Galveston.
 A. T. Leith, Galveston.
 Moore & Goodman, Galveston.
 Seaboard Lumber & Milling Co., Galveston.
 Greenville Power & Mfg. Co., Greenville.
 St. Clair's Screen Factory, Greenville.
 White Mfg. Co., Greenville.
 Bering Mfg. Co., Houston.
 Houston Co-operative Mfg. Co., Houston.
 White Pine Grille Co., Houston.
 D. C. Driskell & Bro., Marshall.
 Bartele Bros. Planing Mill, Martin.
 Ramsey Bros., Nacogdoches.
 S. L. Henderson Lumber Co., Naples.
 G. H. Pond, Orange.
 W. & D. G. Broyles, Palestine.
 Palestine Lumber Co., Palestine.
 Model Mfg. Co., Paris.
 Port Arthur Mfg. Co., Jort Arthur.
 Port Bolivar Lumber & Mfg. Co., Port Bolivar.
 Port Bolivar Milling Co., Port Bolivar.

Alamo Sash & Door Co., San Antonio.
 Pacific Planing Mill Co., San Antonio.
 Schulze Bros. Mfg. Co., San Antonio.
 H. Wagner & Son, San Antonio.
 Acme Mfg. Co., San Marcos.
 Thos. H. Severy, San Marcos.
 Pioneer Planing Mill, Sweetwater.
 G. Brotherman & Son, Temple.
 Steele Planing Mill, Temple.
 Temple Planing Mill, Temple.
 Bailey Mill Co., Victoria.
 E. L. Moore, Victoria.
 T. H. Kessler & Co., Waco.
 C. M. Trautschold Co., Waco.
 Waco Sash & Door Co., Waco.
 N. M. Musgrave, Waxahachie.
 Waxahachie Planing Mill, Waxahachie.
 Johnson & Frazier, Winnsboro.
 Yoakum Planing Mill, Yoakum.

Tanks.

Parkersburg Tank Co., Beaumont.
 C. E. Jenkins, Bryan.
 Shirley's Clstern Factory Corpus Christi.
 Sidbury Lumber Co., Corpus Christi.
 Axtell Co., Fort Worth.
 Gamer Co., Fort Worth.
 Houston Tank Co., Houston.
 Schlottmann & Lincoln, Houston.
 Chas. J. Helmman, Yorktown.
 Herm Mellenhaver & Co., Yorktown.

Trunks and Valises.

Henry Pollack Trunk Co., Dallas.
 Wilkins Trunk Mfg. Co., Dallas.
 R. H. John, Galveston.

Vehicles and Vehicle Parts.

Alex. Fiegelson, Beaumont.
 City Planing Mill Co., Dallas.
 Fort Worth Wagon Factory, Fort Worth.
 Nic Bohn, Galveston.
 Gilmer Mfg. Co., Gilmer.
 Eller Wagon Works, Houston.
 B. A. Riesner, Houston.
 Texas Table Works, Houston.
 The Martin Wagon Co., Lufkin.
 Mineola Novelty Works, Mineola.
 Otto Bros., Navasota.
 James Travis, Navasota.
 S. H. Croft, Randolph.
 J. H. Clanton, Richmond.
 Zink & Laroe, Terrell.
 Bender Wagon Co., Texarkana.

USES OF MINOR SPECIES.

Agarita.—Napkin rings, checker pieces, paper knives, crochet hook handles, button hook handles, hairpin boxes.
Alligator Juniper.—Furniture, clothes chests, button trays, cups, rings, match safes, handkerchief boxes, collar boxes.
American Holly.—Furniture, parquet floors, candlesticks, curtain rings, novelties.
Anacahuita.—Chair rounds.
Anaqua.—Molding, picture frames.
Angelica Tree.—Button boxes, photograph frames, penracks, stools, rocking chair arms.
Bitternut.—Balusters, screen door strips, furniture.
Black Haw.—Canes, parquetry, turning.
Black Jack.—Molding, spindles, balusters, panels.
Blue Beech.—Wagons, hammer handles.
Blue Gum.—Ax handles, singletrees.
Blue Jack.—Wagons, bridge floors.
Blue Oak.—Furniture, stairwork, agricultural implements.
Bluewood.—Paper knives, paper weights, curtain rings, dominoes, card trays.
Box Elder.—Furniture.
Bur Oak.—Wagons.
Cedar Elm.—Furniture, refrigerators, wagon hubs.
Chalky Leucaena.—Grilles, tool handles, furniture, jewelry boxes.
Chinquapin.—Furniture.
Cholla.—Canes, shoe buttoner racks.
Cow Oak.—Wagons, furniture, stairs.
Deciduous Holly.—Drawer knobs.
Devil's Claw.—Furniture, novelties.
Downy Basswood.—Furniture, woodenware.
Drooping Juniper.—Pin boxes, candlesticks, picture frames.
Dwarf Sumach.—Newel-post balls, darning balls, cups, veneer, novelties.
Emory Oak.—Molding, balusters.
Flowering Dogwood.—Turnery, chair rounds, wedges.
Fremont Cottonwood.—Carts, wagon beds, furniture.
Frijolito.—Canes, small tool handles.
Gambel Oak.—Small panels, spindles.
Green Ash.—Wagon spokes, felloes, hubs, wagon tongues, furniture, stairs.

Honey Locust.—Furniture, millwork, stair balusters, newels, molding.
Hornbeam.—Molding, balusters.
Horsebean.—Rulers, knife handles, cups, rings, goblets, paper weights, umbrella handles.
Huisache.—Table legs, spindles, mallet handles, egg cups, button boxes, chair rounds, cross ties.
Ironwood.—Tool handles.
Kalmia.—Tobacco pipes, spoons, novelties.
Koebertinia.—Canes, rulers, knife handles, furniture, small turnery.
Lignum Vitae.—Furniture, boxes, trays, canes, mission lamps, vases, checker pieces, dominoes.
Live Oak.—Panels, turned newels, spindles, molding, mallets, mauls.
Longleaf Willow.—Panels, balusters.
Longstalk Willow.—Thatching.
Mexican Madrona.—Plane stocks, tool handles.
Mexican Palmetto.—Rustle pillars, thatching.
Mexican Persimmon.—Tool handles, lodge furniture, canes, rulers, penholders, picture frames, napkin rings, door knobs, parasol handles, maul sticks.
Mexican Walnut.—Gavels, turned cups, picture frames, knife handles, furniture.
Mistletoe.—Pipe stems, parasol handles, pen racks.
Palo Blanco.—Wagons, furniture.
Persimmon.—Mallets, gavels.
Pinon.—Charcoal, panels, balusters.
Poison Sumach.—Veneer, musical instruments.
Prickly Ash.—Picture frames.
Prickly Pear.—Baskets (of roots.)
Red Bay.—Pin trays, dishes, mirror frames, canes, cupboard shelves.
Red Maple.—Furniture, millwork.
Red Mulberry.—Table legs, chair arms, grilles, lattices, turnery, parquetry flooring.
Rocky Mountain Oak.—Turned posts, spindles, molding.
Sassafras.—Furniture.
Scarlet Haw.—Small turnery.
Screwbean.—Furniture, novelties, cross ties.
Shittimwood.—Furniture, vehicles, agricultural implements, boxes, crates, chewing gum.
Silver Maple.—Wagons, furniture, mill work, woodenware, boxes.
Slippery Elm.—Furniture, agricultural implements, boxes, crates, wagon hubs, fixtures.
Sophora.—Canes.
Spanish Bayonet.—Pin cushions, hatpin holders, ornaments.
Spanish Oak.—Wagons, cotton gins, rice hullers, mill work.
Sweet Magnolia.—Furniture, mill work, musical instruments, panels, turnery.
Sycamore.—Furniture, picture frames, ox yokes.
Texas Ebony.—Candlesticks, mission lamps, goblets, cups, rings, turned boxes, furniture, parquetry, inlay, cross ties.
Texas Cat's Claw.—Picture frames, molding, scroll work, tool handles, paper knives, napkin rings, martingale rings, furniture, mission lamps, candlesticks, paper weights, rulers, canes, umbrella handles.
Tree Huckleberry.—Small turnery.
Umbrella Tree.—Grillwork molding, balusters.
Water Hickory.—Counter tops, vehicles, agricultural implements.
Water Oak.—Wagons, mill work, fixtures, furniture.
Whiteleaf Oak.—Wagons, furniture.
Wild China.—Boxes, crates, furniture, vehicles.
Wild Plum.—Knife handles, spoons.
Yellow Buckeye.—Ironing boards, bread boards.
Yellow Oak.—Furniture, finish fixtures, vehicles, agricultural implements.
Yopon Holly.—Manicure sets, solid spoons.

Shingles.

That year Texas mills cut 106,280,000 shingles, which was less than 1 per cent of the output in the United States.

Lath.

The output of lath was 43,160,000, a little over 1 per cent of the country's cut.

Cooperage.

The slack cooperage product was 1,255,000 staves, 40,000 sets of heading, and 3,128,000 hoops. The total of these commodities that year in the whole country was 1,460,878,000 staves, 97,037,000 sets of heading, and 295,712,000 hoops.

Texas turned out for tight cooperage 1,952,000 staves and 699,193 sets of heading. In the whole country there were 304,060,000 stave sand 26,073,754 sets of heading.

Lumber Cut.

In 1910 the lumber cut in Texas, reported by 466 sawmills, was 1,884,130,000 feet, board measure, apportioned among species as follows:

Species—	Feet.
Yellow pine	1,826,931,000
Cypress	1,416,000
Cedar	238,000

Oak	33,998,000
Maple	120,000
Red gum	11,618,000
Beech	40,000
Birch	11,000
Basswood	20,000
Hickory	781,000
Elm	431,000
Ash	3,630,000
Cottonwood	3,853,000
Tupelo	59,000
Sycamore	71,000
Walnut	92,000
All others	825,000

The total yearly amount of wood in Texas further manufactured after it leaves the sawmills is shown in Table I to be 768,336,112 feet, which is 41.5 per cent of the mill cut.

The making of veneers in Texas has assumed large proportions, and most of the product is pine, red gum, tupelo, magnolia and cottonwood. The cut in 1910 was 8,584,000 feet log measure, which was nearly 2 per cent of the veneer cut for the whole United States that year. Expensive hardwoods, such as white and red oak, black walnut and mahogany, are the materials of which the highest classes of veneers are made. There are three methods of manufacturing the commodity—rotary-cut, sawed and sliced. Most of it in Texas is rotary-cut. A log a few feet long is placed in a lathe and is turned rapidly against a strong knife which peels off a thin ribbon of wood the length of the log,

round and round, until the log is cut down to a small central piece called the core. The part sliced off may consist of one piece probably 100 feet long, resembling a bolt of cloth. It is usually about as thick as a sheet of cardboard. The veneer thus cut is made into small boxes, crates and baskets for shipping fruits and vegetables; or, if it goes to a furniture factory, it is made into panels or other pieces by gluing several sheets one upon another until the desired thickness is obtained. Sometimes a thin sheet of veneer is glued upon a thick piece of some other wood, and the veneer becomes the visible outer part. Much furniture and interior finish is made in that way. The finished article appears to be solid wood, but it really is a thin layer of outside veneer upon some cheaper wood. This cheaper wood, which is concealed by the veneer glued upon it, is called "backing" or "core." The word "core" has, therefore, two meanings when used in connection with veneer. It may mean the wood upon which the veneer is glued, or it may mean the central remnant of a log from which veneer has been cut by the rotary process.

Some veneers are sawed much as ordinary lumber is cut in a sawmill, but special machinery is used. The most important part is the extra thin saw which cuts the veneer with the least possible waste in sawdust. Veneer of this kind is generally made from valuable, well-seasoned hardwoods, while rotary-cut veneer is made from logs, generally in the green state, and usually steamed to soften them. Sawed veneer is generally less than a foot in width, and runs about like ordinary lumber in length. The

sawed product often shows the grain of the wood—quarter-sawed if the wood permits it. Sliced veneer is cut from the side of the log like that which is sawed, but a knife is used in place of a saw, and the machine by which the slicing is done is very strong and rigid. One of the advantages of slicing over sawing is that the slice wastes no sawdust.

APPENDIX.

The Bureau of the Census, in co-operation with the Forest Service, collects and publishes year by year statistics showing the output of lumber, lath, shingles, cooperage, veneer and certain other forest products in the United States and in the separate States. That work is independent of the studies of the manufactures which the Forest Service has made in several of the States. The latter supplements the former, and care is taken that work done by the Bureau of the Census, is not duplicated. The Forest Service begins where the Census leaves off—after lumber leaves the sawmill. There are certain products in their finished form when they appear in the Census figures, and for that reason they are outside the scope of the Forest Service's study, because they are not subject to further manufacture. If, however, a State's wood-using industries are to be fully presented, it becomes necessary to include some of the Census statistics. Such is one of the purposes of this appendix. The figures which the census gives are for all the States, but such only as relate to Texas are here presented and in condensed form for the year 1910, which are the latest available.

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