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FOREST PRODUCTS LABORATORY - U. S. FOREST SERVICE - MADISON, WISCONSIN

SUBSTITUTES FOR ASH IN AUTOMOBILE BODIES

Ash has always been considered the most desirable wood for use in automobile bodies. It combines the properties of moderate weight, easy workability, high degree of toughness, and comparative freedom from warping. On account of the high price of ash, however, other woods are gradually replacing it in all but the most expensive cars.

The following description prepared by the Forest Products Laboratory gives some of the advantages and disadvantages of the substitute woods as compared with forest grown ash for automobile construction.

Maple. Hard maple is used for sills in many cars, and in some for the framework of the body and even the floor and running boards. Maple is fully as strong and stiff as a beam or post as white ash, but is not as shock-resistant. It is usually cheaper than ash and runs more uniform in strength. Maple warps very little, in this respect being superior to elm. On the other hand, maple is more difficult to season without checking than ash or elm, and it is said not to hold screws so well in motor car bodies. On account of the smooth, fine texture of maple, paint and enamel rub off it more easily, especially on curved surfaces which receive considerable wear, than off birch, which is slightly more porous. Because of its smooth-wearing qualities and comparative freedom from splinters, maple is preferred to all other woods for the floors of delivery trucks.

Elm. The principal use of elm is for frames, seat backs, and doors; very little, if any, is used for sills. White elm is preferred to rock elm, except for some of the

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bent parts, because it is more easily worked and is less subject to warping. For the same reasons lumber from old white elm trees, usually called "gray elm", is preferred to that from younger or vigorously growing trees. Old white elm is not so strong or tough as ash, on the average, but it varies less in strength than ash, especially that which comes from the southern swamps.

Birch. Yellow birch is a close rival of maple. It is used for sills, framework, and many minor parts. It is said to hold the paint better than maple on exposed parts.

Hickory. The true hickories are used almost exclusively for spokes and felloes. The pecan hickories, which are somewhat inferior as a class to the true hickories, might be used in body construction, although their hardness and tendency to twist would perhaps prove a serious drawback.

Red gum. Red gum is too weak and soft for the sills and other major parts of the frame, but is used for floor boards, seat risers, and other minor parts. One of the principal drawbacks to the use of gum is its tendency to warp with changes in moisture content. Quarter-sawed gum gives less trouble in warping than plain-sawed gum.

Oak. In automobile construction no distinction is made, as a rule, between the different species of oak or even between the red oak and white oak groups. In truck bodies, oak is one of the leading woods, being used for sills, cross sills, frames, floors, and stakes. In pleasure cars oak is rarely used for the frame or sills. Wormy oak is used for running boards, floor boards, and seats, and some sound oak for instrument boards and battery boxes. Top bows are made almost exclusively of oak, second growth being preferred.

Southern yellow pine. Under this heading are included longleaf, loblolly, shortleaf, and some of the minor southern pines. These have been found adaptable for running boards, floor boards, seat boards, and a number of small parts in the seats and frames.

Other species. Cottonwood is used for dash boards of pleasure cars and the boxes or bodies of trucks. Sycamore, beech, basswood, yellow poplar, cucumber, tupelo, gum, chestnut, Douglas fir, and western yellow pine have also entered into car body construction to a small extent.

The comparative merits of the different species in the four properties most important in automobile construction are given in the following table, the strength of forest-grown white ash being taken as 100. Actual strength values of these species are to be found in Department of Agriculture Bulletin 556, "Mechanical Properties of Woods Grown in the United States."

STRENGTH OF WOODS USED IN AUTOMOBILE CONSTRUCTION IN PER CENT OF THE STRENGTH OF FOREST GROWN WHITE ASH.

Species	Strength as a beam or post	Stiffness	Shock resisting ability	Hardness
HARDWOODS				
Ash, white, forest grown	100.0	100.0	100.0	100.0
Ash, black	71.3	79.3	90.1	62.3
Ash, white, second growth	122.5	117.6	119.6	118.9
Basswood	59.1	80.6	40.5	29.6
Beech	93.5	96.9	96.0	90.0
Birch, yellow	104.8	116.8	120.6	80.9
Chestnut	66.0	71.9	53.4	49.2
Cottonwood	60.6	79.0	54.3	35.3
Cucumber	85.4	112.4	76.7	54.9
Elm, rock or cork	98.8	92.9	140.5	101.6
Elm, white	79.2	79.5	89.5	57.1
Gum, red	80.7	91.5	75.5	59.0
Gum, tupelo or cotton	81.4	82.5	63.5	77.3
Hickories, pecan	103.5	103.8	119.7	139.6
Hickories, true	126.6	120.2	173.9	150.4
Maple, red	90.0	101.2	78.7	75.4
Maple, silver	66.9	68.5	71.7	64.3
Maple, sugar	104.7	105.9	90.5	103.0
Oaks, all kinds	92.6	101.3	94.9	104.5
Poplar, yellow	67.3	93.8	41.5	37.9
CONIFERS				
Fir, Douglas, Pac. Coast	95.7	122.1	59.9	58.3
Pine, loblolly	93.7	105.6	71.0	60.0
Pine, longleaf	112.2	122.1	77.7	74.8
Pine, shortleaf	94.1	100.6	69.7	64.0
Pine, western white	75.5	99.7	53.8	37.0
Pine, western yellow	67.0	75.6	42.9	41.0
Spruce, Sitka	69.5	94.1	63.3	44.9