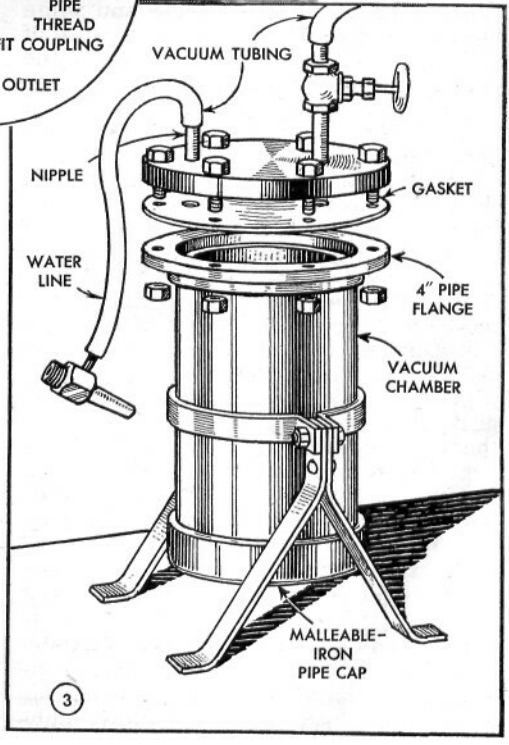
IMPREGNATING WOOD
in a vacuum chamber

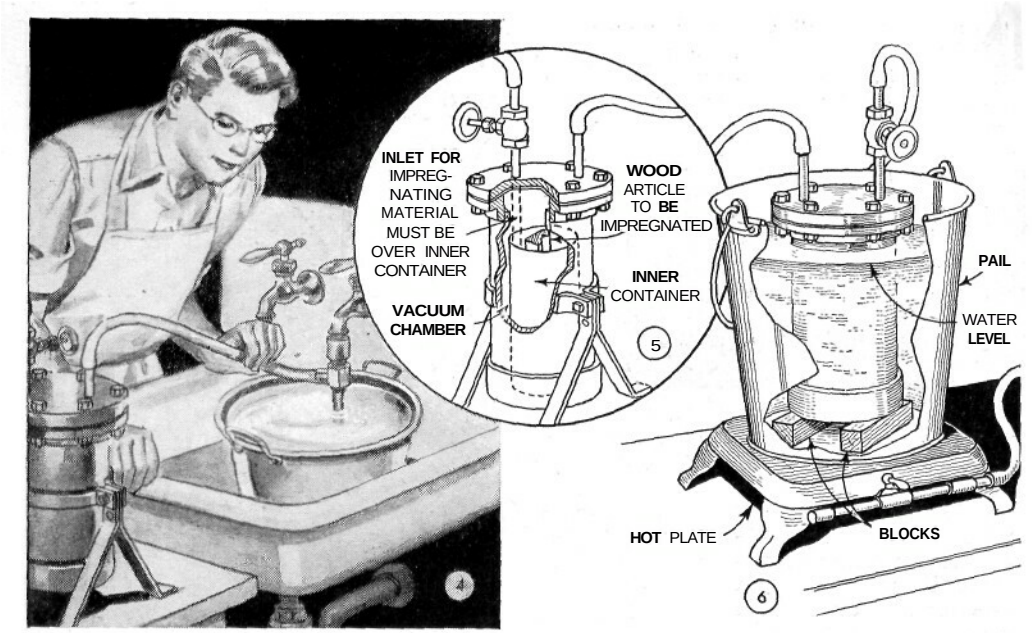
How wood is toughened and hardened with resin plastics; also preserved, flameproofed, waterproofed and dyed

By J. B. Mullen

SOFTWOOD, inexpensive and easy to work with ordinary tools, offers many unusual opportunities in craftwork, as it can be substituted for items normally made of glass, plastics or metal, if it is impregnated in a vacuum chamber. For example, ash trays can be made of flameproofed softwood, and toys can be given a color penetration instead of a surface coat of paint which chips off. Although the equipment described here is intended for small items only, larger units of the same general type, but using vacuum pumps, can be built for larger work.

For small work, all that is needed to vacuum-impregnate softwoods, such as white pine and balsa, is a small water-jet vacuum pump obtainable at any laboratory supply house for about a dollar, and a few pieces of pipe and fittings. A 4-in. pipe nipple, 6 in. long, will serve as a vacuum chamber. One end of this is sealed with a pipe cap, and the other is fitted with a standard flange over which a gasket and cover plate ½ in. thick are secured with bolts. Two holes are drilled and tapped in the cover to take ¼-in. pipe nipples, one of which is fitted with a globe valve, Fig. 3. The unit is supported by flat-iron legs. A hot plate or a water bath, as shown in Figs. 1 and 6, should be provided to heat the unit when required. For a permanent installation, the water jet, Fig. 2, can be screwed into a valve over the sink, or, for a temporary installation, it can be attached to a faucet with an adapter as in Fig. 1. Heavy rubber tubing,





such as vacuum or pressure tubing, should be used to connect the water jet to the vacuum chamber. Another length of the hose is run from the globe valve to a pail containing the impregnating solution.

Waterproofing: Softwood articles such as toys can be waterproofed with melted paraffin to which is added powdered white shellac, about 5 percent. Balsa and white pine are best for impregnation because of their porosity. Before impregnation, the parts should be cut to finished size because frequently it is difficult to impregnate all the way through a piece, and if much cutting is done after impregnation, the raw wood may be exposed. If the vacuum chamber is to be used for more than one type of impregnation, it is best to use an inner can or pail to hold the wood and impregnating mixture as shown in Fig. 5. A large tin can with the top cut off will serve for this purpose. In use, pieces to be impregnated are placed in the vacuum chamber or in the inner container, after which the gasket and cover are bolted in place. Then, the valve is closed tightly and the water turned on to evacuate the chamber. In the meantime, the wax-shellac mixture is heated ready for use when the evacuation is complete, and the vacuum chamber also is heated, as in Fig. 6, so that the wax mixture will remain fluid. Evacuation of the chamber will take only a few minutes if all connections are tight. If in doubt, hold the outlet jet in a pan of water as shown in Fig. 4; bubbling indicates incomplete vacuum. Pumping should be continued for several minutes after bubbling ceases to remove air from the pores of the wood.

When the chamber is fully evacuated, the intake hose is submerged in the melted wax-shellac mixture, Fig. 1. Then the globe valve is opened slowly and enough of the molten mix is sucked into the chamber to submerge the wood completely. After this, the valve is closed, the intake hose removed from the wax mixture, and the unit allowed to remain hot, under vacuum, for a few minutes to permit the hot mixture to penetrate the wood. Then the valve is opened slowly, the water pump shut off, and the cover removed. The saturated wood now can be removed and allowed to drain and cool, and the remaining wax mixture removed from the vacuum chamber before it chills and sets.

Flameproofing: The flameproofing process used on ash trays and similar articles is the same as used for waterproofing, except that no heat is required. The flameproofing solution is made by dissolving ammonium phosphate, dibasic, 7½ oz.; ammonium chloride, 5 oz.; and ammonium sulfate, 5 oz.; in water, 100 fl. oz. After saturation, the wood is removed from the vacuum chamber and allowed to dry.

Preservation: Vacuum impregnation is suitable for preserving small articles exposed to water or weather, such as stakes for marking plants. For this purpose, hot creosote is widely used, though any of the common preserving materials are satisfactory. Another method is to saturate the wood with a concentrated solution of zinc chloride or zinc sulfate. Besides preserving

wood, the zinc sulfate will flameproof it.

Coloring: Toys and decorative articles can be colored by impregnating them with a water solution of dye of any desired color. Dyes soluble in gasoline or alcohol can be used if the swelling action of water on the wood grain is undesirable.

Hardening: Softwoods can be hardened and toughened somewhat by impregnating them under vacuum with a synthetic-resin mixture, which then is heated to harden it. Novelties such as bracelets, toys, small wooden ornaments and model-airplane parts can be treated beneficially by this method. The resin as received is a thick liquid. To thin for use, liquid resin, 10 vols., should be mixed with denatured alcohol, from 5 to 10 vols., so that it pours freely, and stirred thoroughly with a paddle until the mixture is uniform, using as little alcohol as possible. To this mixture is added a hardening solution, 1 vol., made by dissolving c. p. (chemically pure) hydrochloric acid, 1 fl. oz., in water, 3 fl. oz. The impregnating solution should be mixed fresh before use. After the wood is saturated, it is removed from the chamber and allowed to drain, and then is placed in an oven at a temperature of about 150 deg. F. for half an hour. Complete hardening will require about 2 hours.