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# BETTER JIGS AND FIXTURES

By R. A. FIELD, I. E. III

**P**LASTICS, developed only recently, are fabrication materials of great possibilities, though, as yet, they are limitedly utilized in industry. They are light, tough materials comparable to steel in many of their properties. Hardened, plastics can be machined, turned on lathes, milled, sawed, buffed, threaded, and tapped by ordinary wood-working tools. Because the present emergency has resulted in an acute shortage of steel, the adaptability of plastics has promoted their development and subsequent use, direct and indirect, in the manufacture of numerous products ordinarily made of steel.

For the economy and acceleration of the current war industrial program, plastic materials have been found especially applicable in the various tool manufacturing processes including drill jigs, formed router blocks, shaping blocks, chucking fixtures, punch jigs, saw jigs, form dies, and in practically any jigs and fixtures involving contours. Besides large savings in material expense, plastics have two outstanding advantages over steel in the tooling industry:

1. Duplicate tools can be made quickly for multiple operations through solid plastic casts.
2. Solid plastic jigs have the distinct advantage of forming a continuous surface where the metal is shaped, whereas the conventional steel jigs give support only at intervals of twelve to sixteen inches which can cause undesirable metal "wrinkles" during assembly.

The greatest economical application of assembly jigs has been in the aircraft industry. The economy in both time and material has been tremendous. For example, the drawings for a plastic jig for one cowl assembly in the aircraft indus-

try required only eight hours and the fabrication involved 125 hours. To design a conventional steel jig for the same part required thirty hours drawing time, while fabrication consumed approximately 300 hours. In addition to saving time, over 1000 pounds of steel were saved by the plastic jig.

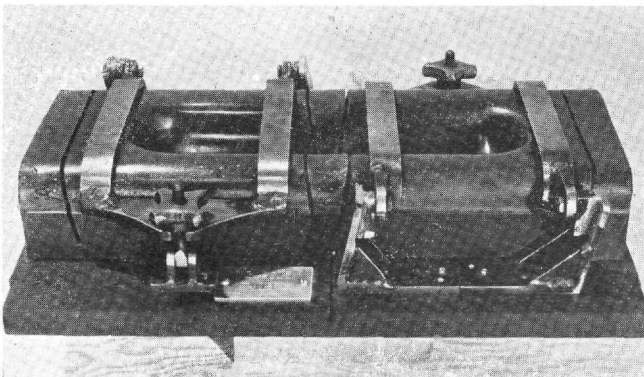
As the resultant physical properties of plastic jig and fixture castings are determined by the formula as well as the mixing, certain standards have been adopted. The character of the casting can be varied to some degree by altering the amount and type of filler and special formulas have been developed for specific purposes. However, a standard has been set up that is found acceptable for most plastic tooling. This is an acid-setting phenol formaldehyde composition, thermosetting liquid form. Here is the mix formula:

1. Resin, 67% by weight.
2. Catalyst, 8% by weight.
3. Filler, 25% by weight.

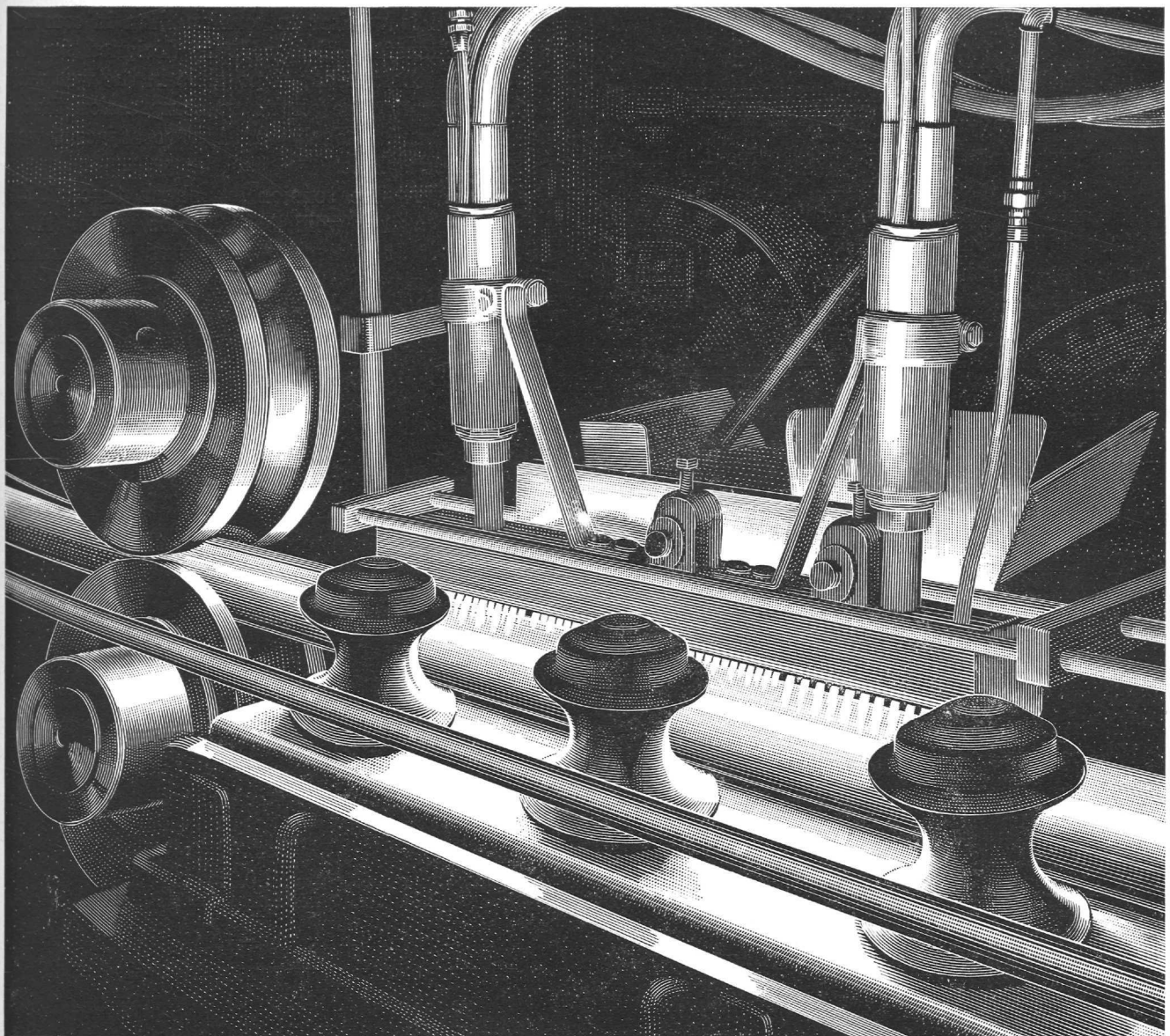
The filler is finely ground walnut flour. The ingredients are first carefully weighed, then the acid catalyst is added to the resin and carefully mixed. Immediately, the walnut shell flour is added and mixed, and when ready to pour the plastic is a dark brown viscous liquid. For uniform texture and quality the liquid plastic is thoroughly mixed in any type of power mixer. This mixture is then transferred to jacketed kettles to attain good flowability and uniform pouring temperature.

After the liquid plastic has acquired a constant temperature, it is puddled to remove trapped air. After puddling, it is poured into prepared plaster cast molds and placed into an oven for eight to twelve hours, depending on the mold shape and size, in a surrounding temperature of 150 to 180 degrees Fahrenheit for curing. When the casting is cured, it is removed from the oven, separated from the plaster mold, and spot sanded to remove any necessary rough surfaces. The finished jig or fixture casting is light brown, compact, tough, and light weight material suitable for mounting and subsequent use for assembly production.

Through the plastic tooling process, thousands of man-hours are being saved in addition to reducing the amount of steel required in jigs. Thus two critical materials—manpower and steel are made available to other manufacturers.



Plastic Drill Jig



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