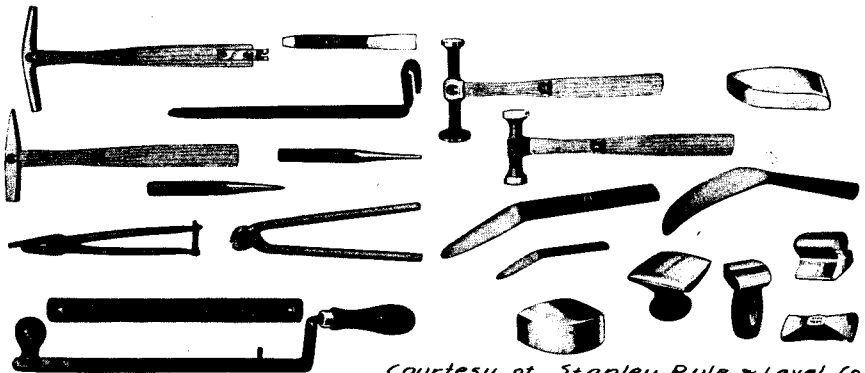


### BUMPING COWLING

"Bumping" is the term applied to shaping metal by hammering. It is done wherever it is necessary to bend or shape cowling that has a double curve such as in engine rings, engine cowl, fillets, strut ends, and in fact nearly every place where cowling is used. Bumping can only be done on malleable metals, that is, metals that are capable of being extended by hammering or rolling.

Dead soft aluminum is the most malleable of any metal used for airplane cowling, and for this reason it is usually employed where considerable bumping is required. Dural is a better material for cowlings than aluminum, due to its corrosion resisting qualities, however it is comparatively hard and brittle and therefore must be annealed before much shaping can be done. For further information along this line, see "Properties of Metals".

Bumping is accomplished by extending or stretching the metal by hammering. As can readily be seen, the metal must be supported on one side so that the hammer blows will flatten the metal and not simply dent it. The material is usually supported or backed up with a smooth surfaced iron block called a "dolly block". As the shape of the desired product varies greatly, many types, sizes and shapes of dolly blocks are used. The hammer used is usually of light weight with a rounded polished face. Here again special conditions call for special shape hammers. A few of the various types of dolly blocks, files, spoons, hammers, etc., used in cowling work are shown in Fig. I.



*Courtesy of Stanley Rule & Level Co.*

Assortment of Bumping Tools      Fig. I

The dolly blocks and hammers shown in Fig. I are also widely used in straightening and removing dents from damaged cowling.

For shaping or smoothing small objects, the material is often backed up with a closely-sewed, soft leather bag filled with sand, Fig. II. The sand bag can be shaped to fit the material being worked, and will change its shape to correspond with the changing shape of the metal as it is hammered. A satisfactory sand bag can be made using canvas in place of soft leather.

### BUMPING COWLING (continued)

If it is required to make a number of similar pieces, or for bumping out cowling that requires considerable stretching, a bumping mold is used. Concave molds are usually used and the material is stretched into the mold by hammering. Molds can be made of several materials, the most popular of which are hardwood and lead. Hardwood is inexpensive and can be cut to shape with wood tools. Lead is more expensive, but can be remelted and recast into a new shape any number of times. In hammering metal into a mold, the work should be started close to the edges and the material gradually worked into the concave. Care should be exercised to avoid working inward too rapidly or the metal will not have sufficient support and the hammer blows will tear instead of flatten the material.

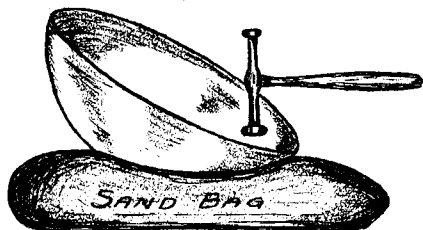


FIG. II

out any irregularities or dents. This will make a good mold, to which the new cowl may be fitted.

Bumped cowling should be smoothed to remove all traces of tool marks. This is done with the aid of a coarse "body" file. This file has one course of curved teeth grooves as shown in Fig. I. The body file is used, as it readily cuts soft metal without choking or filling up the gullets as quickly as the conventional type file. After all tool marks and high spots are removed, the cowl is then polished, using emery cloth and steel wool. If a higher polish is desired, the material can be buffed with an electric buffer.

Pneumatic and mechanically driven hammers are used in factories to shape large sections such as engine rings and nacelle cowls. The methods and principles are the same as for hand bumping, the difference being in the tools used.

Round and oval shapes such as propeller spinners, streamlines for landing lights, concave ends for tanks, etc., can be made by spinning. This is a method of rapidly turning a flat sheet of metal and gradually stretching it by working or rolling it back over a mandrel of the correct shape. This is done by holding a flat sheet of metal in a special lathe or turning machine, and working the material into shape as it revolves, by using a round ended hand tool.

In replacing a large section of damaged cowl of special shape, such as the nose cowl for a water-cooled engine etc., a good method is to hammer the damaged cowl back into the original shape and rivet in some stiffeners to hold it in that shape if necessary. Fill a suitable size box with mixed cement and just before the cement hardens, press the original cowl into the cement. After the cement has hardened enough to hold its shape, remove the cowl and smooth