

Chapter 6

How to Make and Pour Molds

A trowel for handling sand (a garden variety will do), a pocket knife, a spatula, a couple of 1-inch-wide paint brushes, and a hand rammer are some of the other tools you'll need for serious mold making.

A typical hand-bench rammer for foundry work is made of hard wood, cylindrical on one end and wedge shaped on the other with a hand grip in the middle. Most of them are too large for the type of small scale work we are discussing, so a brass or steel cylindrical bar about one and one-half-inches in diameter and five or six inches long will work nicely. It is a good idea to have another rammer for working in narrow places. You can use a six-inch-long rectangular brass or steel bar 1/2-by-2-inch cross section.

The first step is to place the drag on the molding board as shown in Fig. 6-1 with the locating pins pointing downward. Drill holes in the molding board for the pins to fit into. Lay the pattern (shaded) onto the molding board approximately centered in the drag. In some cases it may be better to slightly offset the pattern in the drag so that the sprue is nearer the center of the drag. It is not necessary in this case because the pattern is small. The molding board can be any flat board slightly larger than the drag. Plywood about 3/4 to 1 inch thick will serve very nicely.

RAMMING THE MOLDING SAND

Sprinkle some parting dust or graphite powder on the pattern. Use the riddle to sift some molding sand over the pattern until it

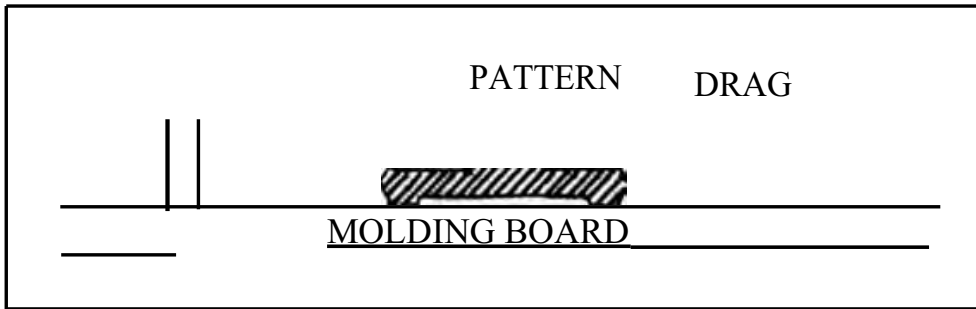


Fig. 6-1. Step 1: Lay the pattern (shaded) on the molding board and place the drag in position. The molding board can be any flat board slightly larger than the drag. It must have suitable holes in it for the locating pins.

is covered. Ram more sand in place over and around the pattern, eventually filling the drag with rammed sand above the top edge. Use a straight piece of board to strike off the sand level with the top of the drag as shown in Fig. 6-2.

It takes a little practice to do a good ramming job. First, the rammer should never strike the pattern forcibly because it may damage it or dislodge the pattern from its position. It is a good practice to press sand around the pattern with the fingers until a firm layer is built up around it. Ramming must be firm enough to consolidate the sand, but not hard enough to reduce the porosity which may prevent gases from escaping when the mold is poured. It is important that ramming is uniform throughout the mold. Any soft spots left may lead to distortion of the casting. Ramming is less critical if Petro Bond sand is used because less gas evolution occurs, so Petro Bond sand mixes can be rammed hard without problems arising from loss of porosity.

PARTING LINE AND SPRUE PIN

Invert the drag on the molding board by picking it up and

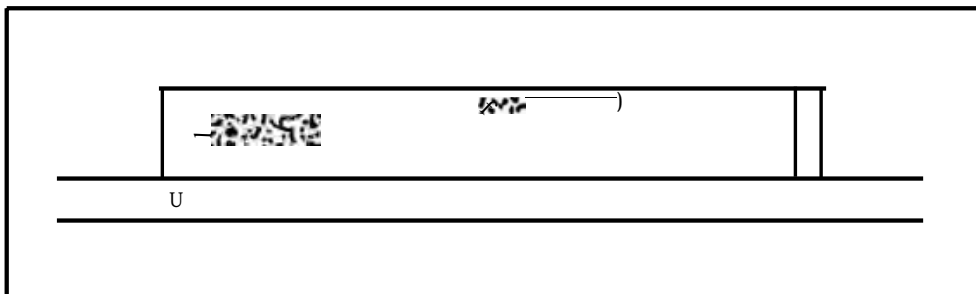


Fig. 6-2. Step 2: Sprinkle parting dust or powdered graphite on the pattern. Use a riddle to sift enough molding sand on the pattern to cover it. Add more molding sand and tamp it firmly over and around the pattern, filling the drag slightly above the top edge. Use a straight board to strike the sand off level with the top of the drag.

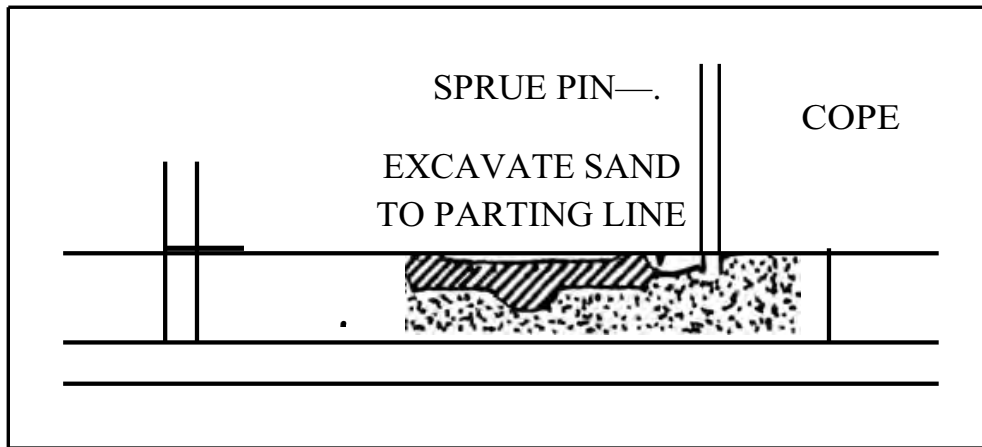


Fig. 6-3. Step 3: Invert the drag on the molding board. Excavate the sand around the edges of the pattern down to a suitable line of parting on the pattern. Place a sprue pin in the sand adjacent to the pattern. The sprue pin may be 1/2-inch diameter brass or copper tube. Position the cope on top of the drag.

turning it over. Use a knife blade and spatula to excavate the sand around the pattern down to a line of parting. On a complicated pattern, you may want to study the pattern carefully beforehand so there will be no problem finding the line of parting. On a simple pattern of the kind depicted in Fig. 6-3, the line of parting is fairly obvious; it is about half way down on the edge of the flange all around the circular pattern.

Place a sprue pin (1/2-inch diameter brass or steel tube) in the sand adjacent to the pattern and about one inch away from it. The location of the sprue is not important for symmetrical patterns because the metal can be fed in anywhere around the edge with equally good results. For more complicated patterns, the location of the sprue may require some judicious study for best results. We will get into that a little later in this chapter. If the pattern has some thin sections which are hard to fill completely, two or more sprues may actually be required to feed metal to several locations in the mold.

Place the cope into position on the drag. Sprinkle parting dust on the sand and the exposed pattern portions. You can apply parting dust by placing it into a cloth bag (an old sock will do) and shaking it gently over the surface to be dusted. Now sift enough molding sand from the riddle to cover the pattern. Add more molding sand and ram it in place, mounding it above the top edge of the cope as illustrated in Fig. 6-4.

FINAL PREPARATIONS (AND ELABORATIONS)

Carefully lift the cope off the drag and set it aside. Stand it on

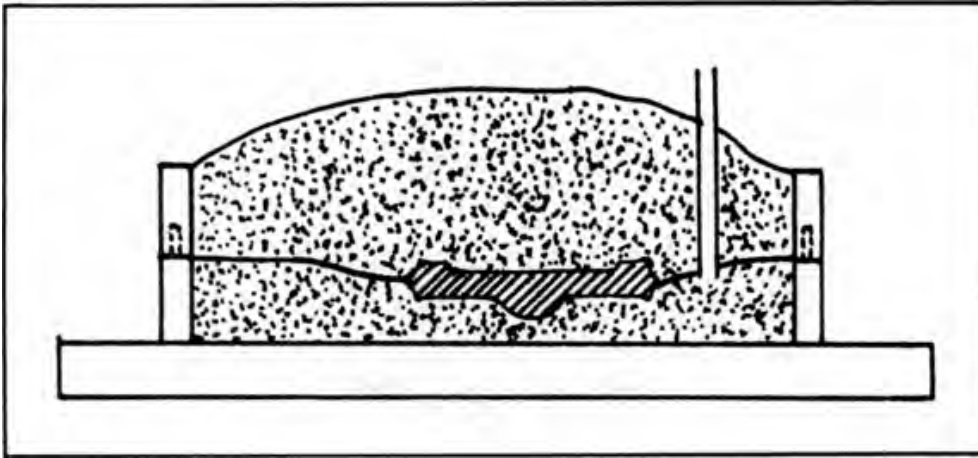


Fig. 6-4. Step 4: Sprinkle parting dust on the sand and pattern. Parting dust can be applied conveniently by placing it in a cloth bag (an old sock will work). Sift enough molding sand on top of the pattern to cover it. Now add more molding sand and ram it into place, mounding it above the top of the cope.

edge or lean it against something so that none of the sand is disturbed. Cut a channel in the sand from the sprue to the pattern edge. This gate may be v-shaped or rectangular with a cross-sectional area somewhat smaller than that of the sprue. Tap the pattern gently so that it is loosened from the sand. Carefully lift the pattern out of the drag, disturbing the sand as little as possible. Blow out any loose sand in the mold. Pull the sprue pin out of the cope and cut a funnel-shaped opening in the sand in the cope. Replace the cope in position on top of the drag. The mold is ready to pour. The completed cross-section of the mold is shown in Fig. 6-5.

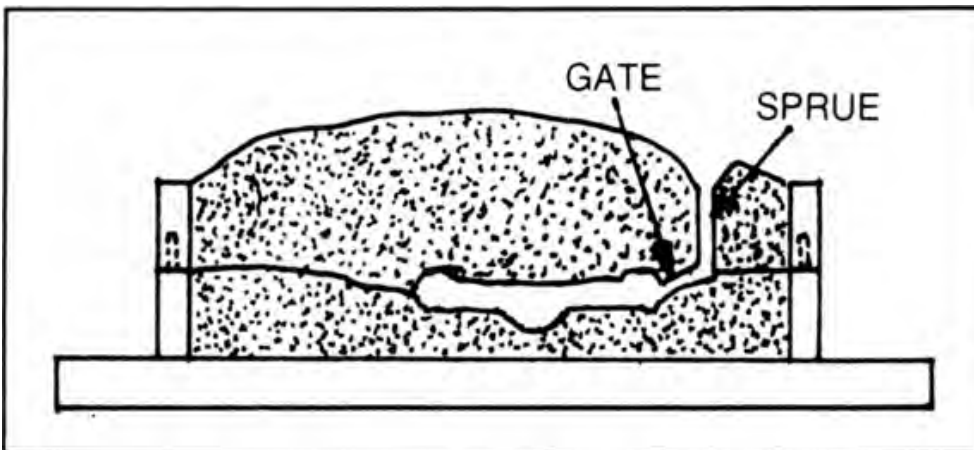


Fig. 6-5. Step 5: Carefully remove the cope from the drag and set it aside temporarily. Pull out the sprue pin and cut a funnel-shaped opening in the sand in the cope. Cut a channel (gate) in the sand extending from the sprue to the pattern. Tap the pattern very gently until it is loosened from the sand and carefully remove it, disturbing the sand as little as possible. Replace the cope on top of the drag, and the mold is ready to pour.

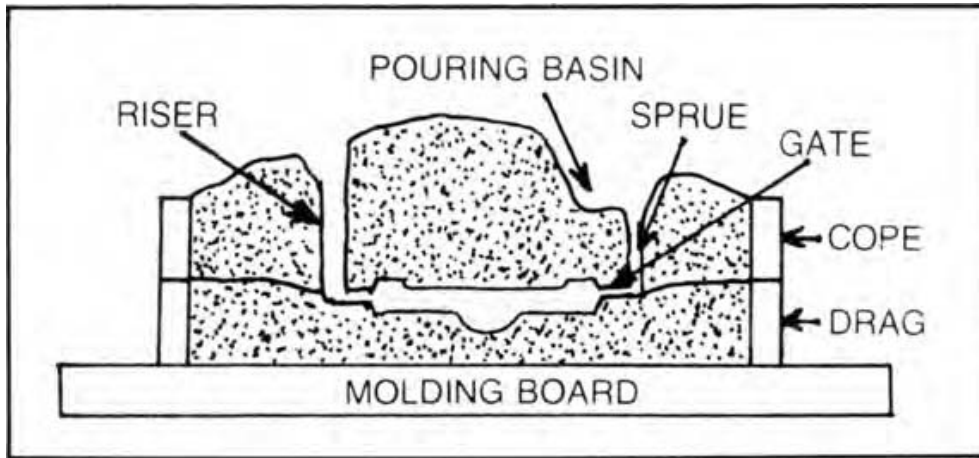


Fig. 6-6. A mold with riser. The riser will provide a reservoir of molten metal to feed back to the casting as the casting cools and shrinks, thereby tending to eliminate shrinkage cracks or voids in the finished casting. Risers are especially important if the casting has heavy sections.

The molding operation illustrated in this chapter involves a simple part. Large parts may require *risers* to prevent shrinkage cavities in the part when it is cast. Risers serve two useful purposes: they carry off sand or slag from the mold and they feed metal back to the mold as the part solidifies and shrinks. A typical mold with a riser is shown in Fig. 6-6.

If you want to make a casting with two relatively thick sections joined by a thin section, it may be impossible to feed metal into only one end of the mold. By the time the first thick section filled, and started to fill the other end through the narrow open-

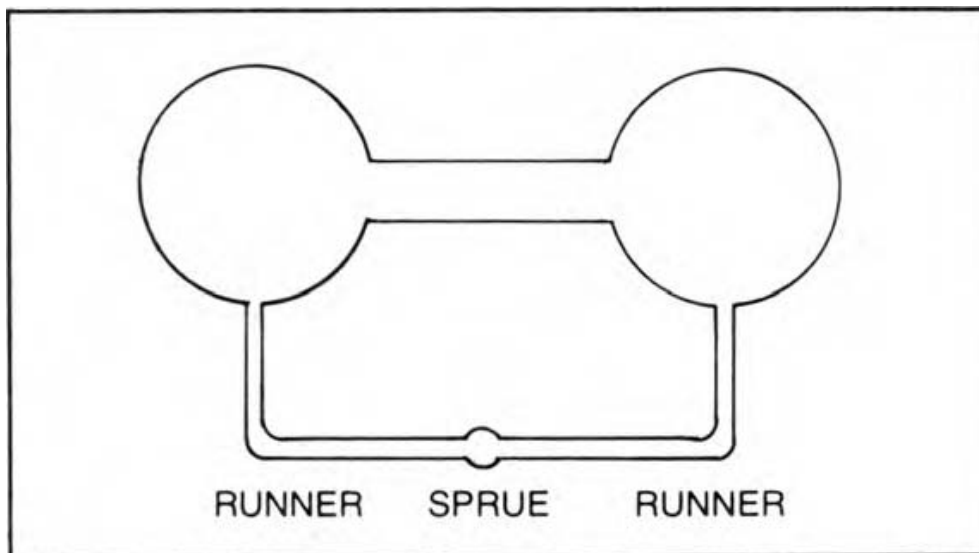


Fig. 6-7. A casting consisting of two heavy sections joined by a smaller diameter, dumbbell-shaped section is fed preferably from both ends using a runner to convey metal from the sprue to each end. The sketch is a plan view looking down on the casting from above.

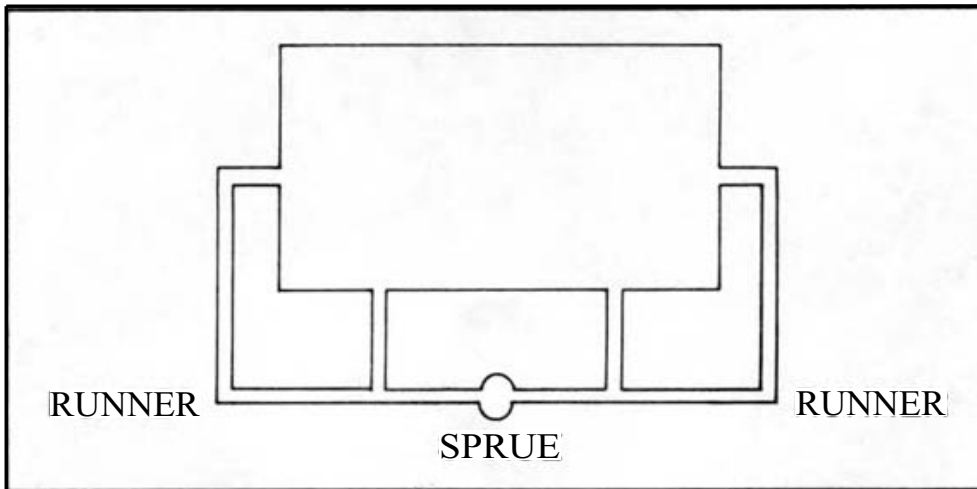


Fig. 6-8. A thin, flat casting such as a bas-relief plaque should be fed from several points around the periphery of the casting using a system of runners as shown in this plan view.

ing, there is a good chance that the metal would be cooled sufficiently to solidify in the neck. In this case, *runners* should be cut into the sand of the mold to carry metal from the sprue to fill both ends of the mold simultaneously. The scheme is shown in Fig. 6-7.

Large, thin castings should also be fed simultaneously from several positions around the edge, using runners as shown in Fig. 6-8.

The steps involved in molding a Trippe light bracket are recorded photographically in Figs. 6-9 through 6-14.



Fig. 6-9. The pattern, an original part, is laid on the molding board approximately centered in the drag. The holes in the part have been partially filled with clay to prevent unpredictable sand separation at these points during the molding process.