Mold Making

THE MOLDING PROCESS

As you know, the lost-wax casting process uses wax models for casting. The *mold* you make will be used to make a large quantity of these models. A properly made mold will produce many wax patterns. But as with casting, mold making techniques require time to master. Let's begin with an overview of the mold-making process.

Figure 1 illustrates the basic steps of creating a mold for wax models. You can see that the original ring is now easily reproduced in great quantity. Generally speaking, the easier a piece is to make, the more profit it will provide the jeweler.

Molding provides advantages in several areas of production. First of all, it cuts down on the time it takes to reproduce a model. The original piece may take hours, even days to create. If you had to charge that amount of labor for every item you made, your services would be unaffordable. Molding allows you to produce a large number of replicas in moments—thus keeping your prices down and your store in business.

A second advantage of molding is the fact that it helps you meet your customers' demand. The key to a successful business, of course, is to sell as many items as possible. If you can make only three rings a day, and each day 20 people want to buy a ring from you, then you're losing a huge profit. You need to be able to accommodate the demand for popular pieces.

It's important for you to realize that the quality of any reproduced pattern will never be better than that of the original. For this reason, you can't overlook any steps in the production of an original piece. This will only further hinder the copy's quality. Since your mold will reproduce every scratch found on the original piece, you need to take extra care with that piece's creation.

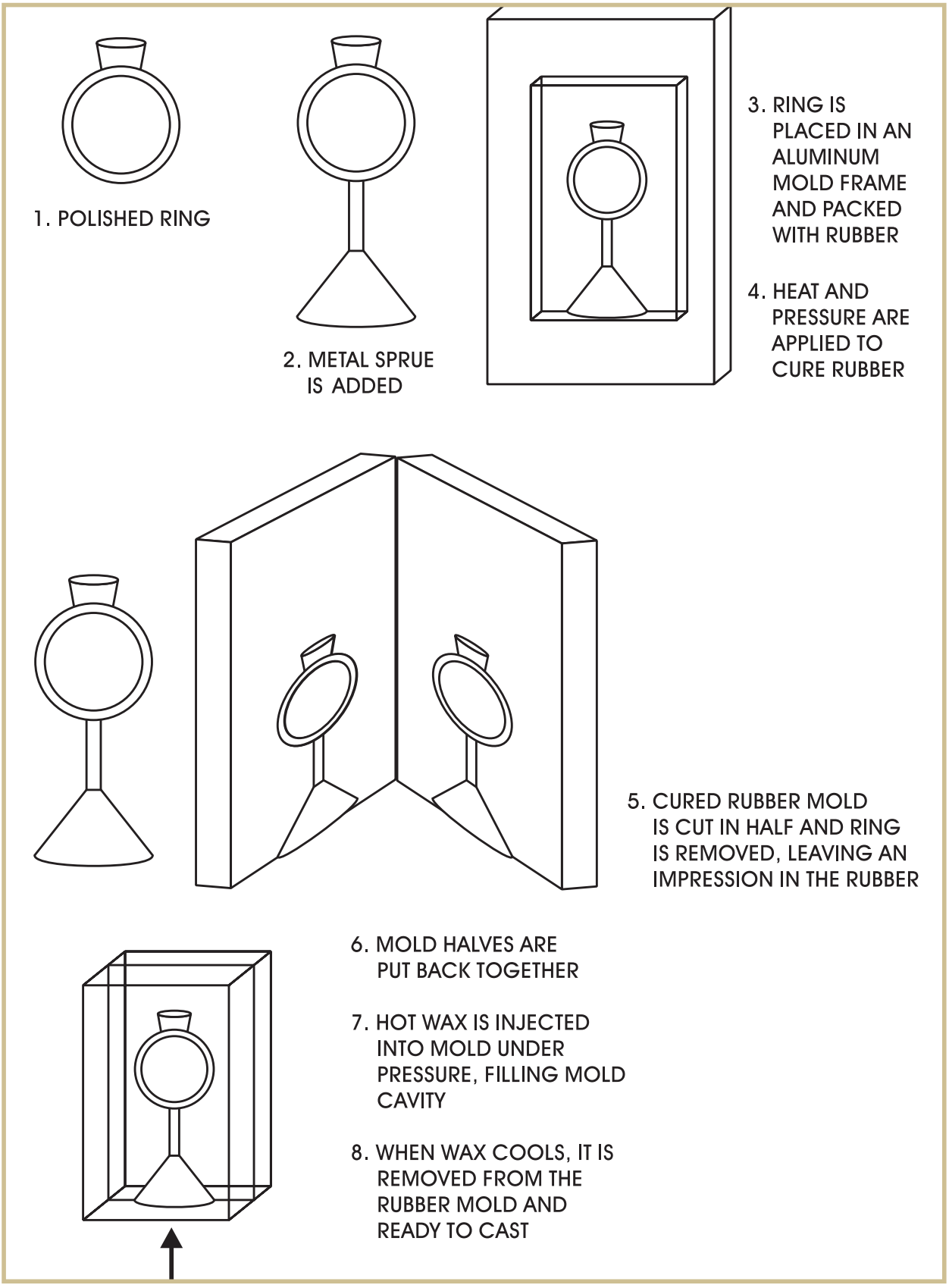


FIGURE 1—An Overview of the Moldig Process

Creating the Mold

Gathering Materials

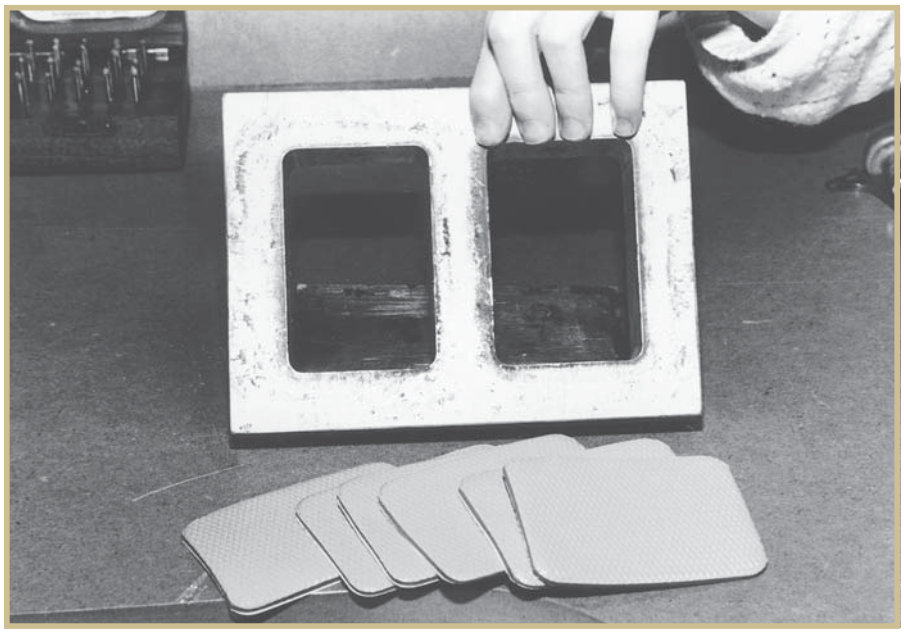
There are two main kinds of molds, those made from *natural rubber* and those made from *silicone rubber*. Generally, molds referred to as "rubber" molds are those made with natural *gum* rubber, a material that comes primarily from Southeast Asia. This type of rubber is used to make everything from tires to rubber bands.

The higher the percentage of pure rubber in a product, the more it generally costs. Not surprisingly, a higher content of pure rubber in a mold usually means better quality. If it didn't, everyone would just buy the cheaper molds.

Mold rubbers are generally available in strips about two feet long and 2 7/8 inches wide. They're also purchased in precut sections of 2 7/8 inches × 3 3/8 inches. These dimensions match the insides of most mid-sized mold frames.

The *mold frame* is made of aluminum, with a section machined out of the center where the mold rubber is placed. The mold frame shown in Figure 2 is a double mold frame used for making two molds at one time.

FIGURE 2—Sections of Precut Mold Rubber and a Mold Frame



Sprueing the Object

Just as you need a sprue inside a flask during casting, so do you need a sprue in molding so that wax may enter and fill the mold. The sprue used for molding is simply a piece of brass rod, similar to the brass wire supplied with your third instruction pack. This brass rod is soft-soldered to the object to be molded.

You must realize at this point that rubber molds are used for only certain types of objects, primarily those made of sterling silver, gold, brass, or other metals that withstand both heat and pressure. Plastic, pewter, wax, and other soft substances are molded with materials other than rubber.

The same principles of sprueing that apply to casting are followed in making of molds. The sprue should be large enough for wax to flow freely and fill all areas of the mold. A sprue should also be attached in an area of the model where it will be least detected when removed (Figure 3). If possible, you should try not to place the sprue close to a detailed area, where grinding and polishing could adversely affect the finished product.

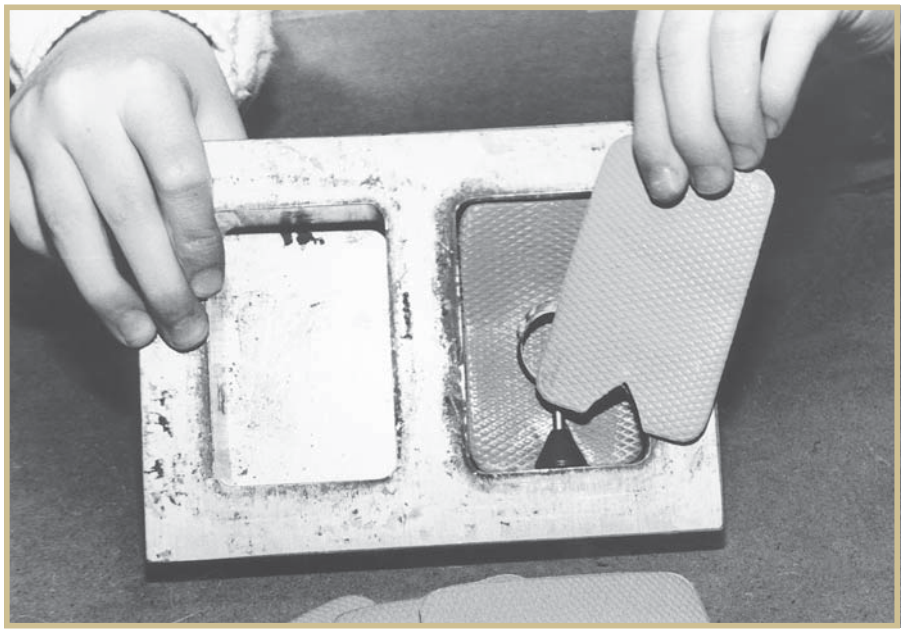
FIGURE 3—Soldering the Model to the Sprue Base

Packing the Mold

After your model is sprued, the mold is ready to be *packed*, or prepared. Lay the mold frame flat over a one-eighth inch aluminum plate, also called a *mold plate*. You want to use mold rubber that's precut to the dimensions of your mold frame. This rubber is covered with plastic on both sides to protect it from dirt contamination.

In this example, a mold frame of the thickness we're using requires a total of eight pieces of rubber to make the mold. The first two pieces are laid into the bottom of the frame. The third and fourth pieces are cut slightly to make room for the sprue base (Figure 4).

FIGURE 4—Cutting Rubber to Hold the Sprue Base



After you cut these areas away for the sprue base, place the third and fourth pieces into the frame. You're now ready to lay the jewelry item in to be molded. The areas you've cut away to accept the sprue will help to hold the item in place.

Four mold locks are now applied to the outside edge of the mold (Figure 5). *Mold locks* are small metal domes with sharp prongs on their bottoms. These prongs are pushed into the rubber. Mold locks help center the mold after you've cut it in half and prevent the halves from shifting within the frame. If the halves shift out of proper alignment, the model cavity will become distorted.

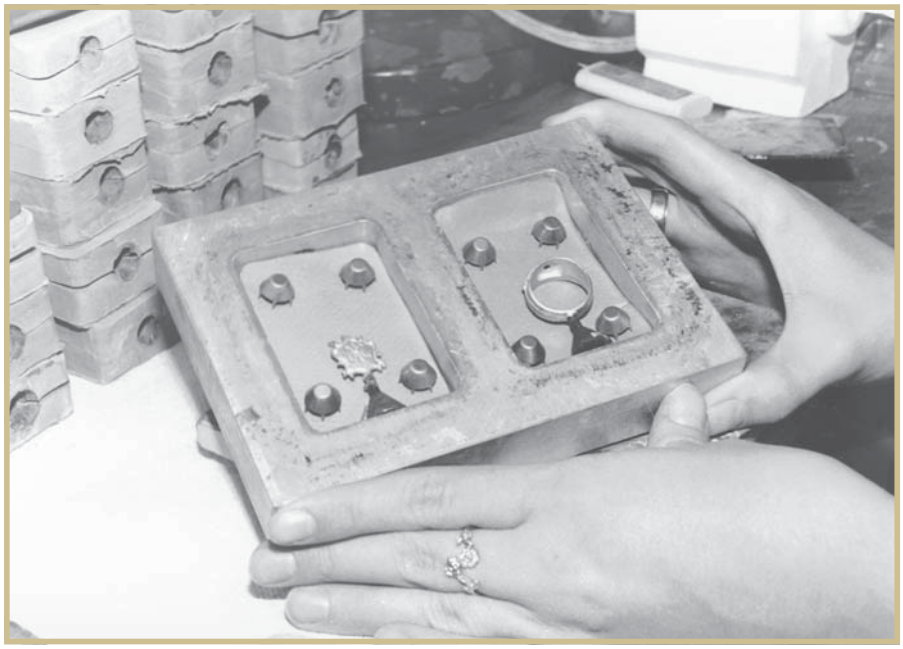


FIGURE 5—Applying Mold Locks

The pressure you place the mold under won't be enough to force the precut rubber into any stray holes in the object. It's therefore important to pack any holes with small pieces of mold rubber. In Figure 5, the object in the left mold is flat, and can simply be covered with another piece of rubber. The object in the right mold, however, requires additional pieces of rubber packed into the center of the ring and any cuts or crevices.

Curing the Rubber

After packing the model securely, you then add the final four layers to the mold and place a mold plate on top to cover them. The mold is then places in a *vulcanizer*, which will apply both heat and pressure to the rubber, causing it to expand and cure. *Curing* is the slight hardening rubber undergoes when heated. The process of curing through heat is called *vulcanization*.

The vulcanizer (Figure 6) is made up of two metal plates, or *platens*, which contain heating elements. The platens provide an even heating to both the top and bottom of the mold. The top platen is attached to a turnstile screw that may be tightened to secure the mold.

As the mold rubber is heated for the first few minutes, it softens. This allows you to tighten the screw even more. After five minutes of heat, though, the rubber begins to expand. The vulcanizer doesn't allow the expanding rubber to flow out of the mold, so pressure is both created and maintained within the machine. This pressure also adds to the vulcanization process. Temperature is controlled and monitored by indicators and dials at the base of the machine.

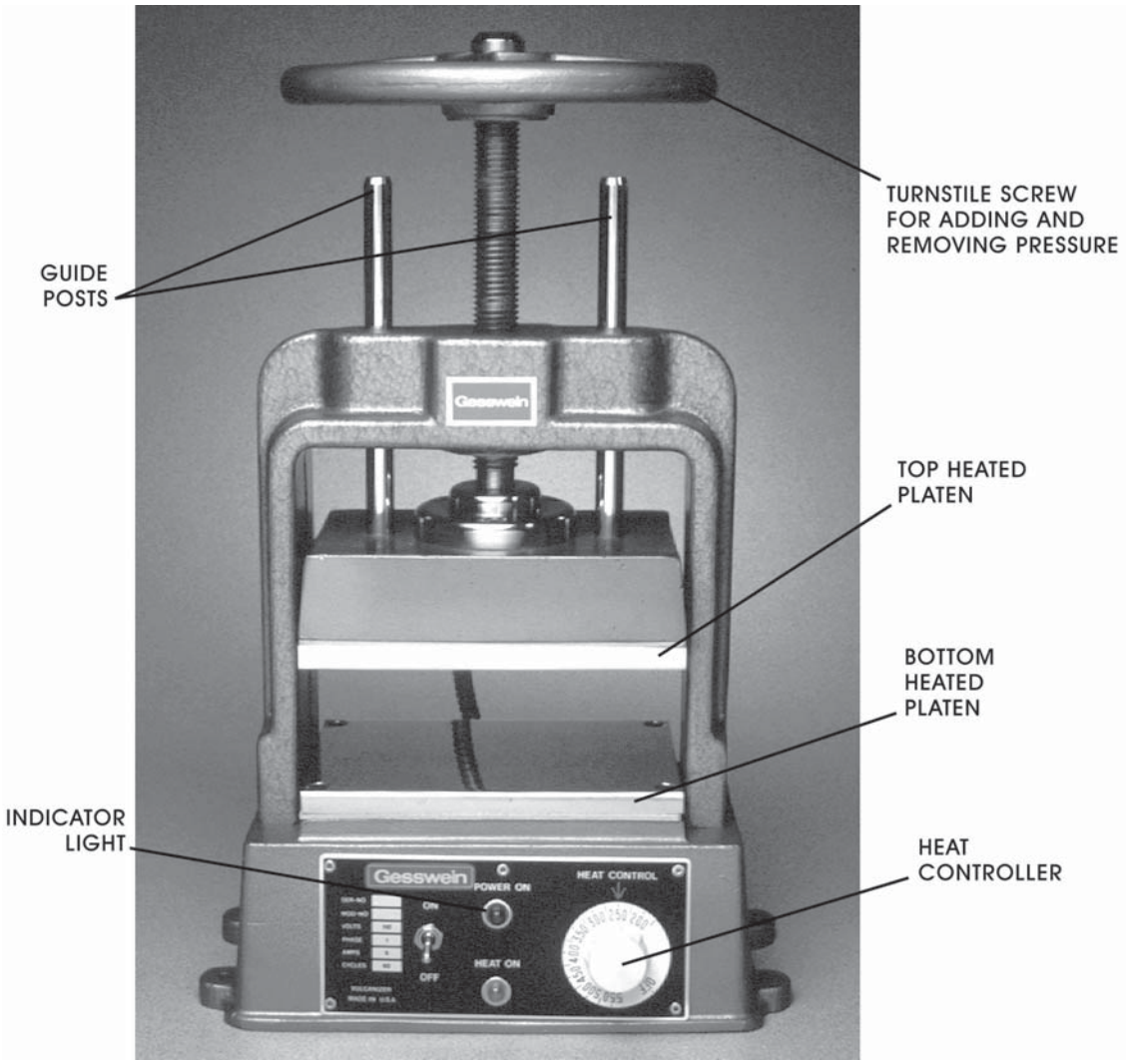


FIGURE 6—The Vulcanizer (Photo courtesy of P.H. Gesswein and Co., Inc.)

Vulcanization occurs at different temperatures and lengths of time for different types of rubber. The rubber you'll be using is a high-grade rubber that cures at a temperature of 325°F. It requires seven minutes of curing time at this temperature for every slice of mold rubber used. Since there are eight pieces of rubber in our example, the mold will require a total of 56 minutes to cure.

It's important that you *preheat* the vulcanizer to the desired operating temperature before using it. Once the vulcanizer has reached the appropriate temperature, set the mold inside it as in Figure 7 and apply pressure with the turnscrew.

After the allotted curing time, relieve the pressure on the mold by loosening the turnstile screw. Remember to remove the mold from the machine with tongs, as shown in Figure 8. (325° is hot!)

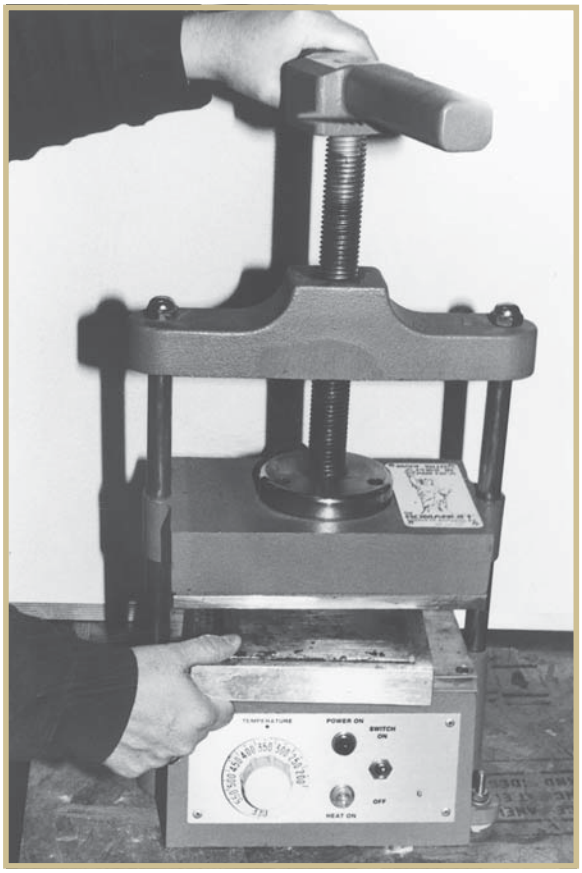


FIGURE 7—Placing Mold in the Vulcanizer

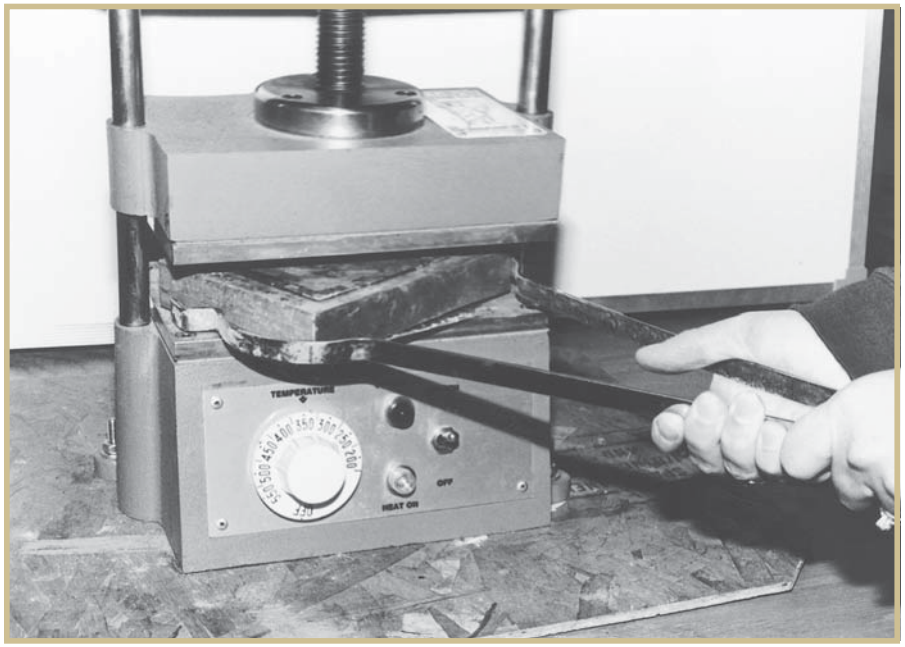


FIGURE 8—Removing Mold with Tongs

After removing the mold from the vulcanizer, place it in water to cool it. If you've molded an item with gemstones in place, splash water on it a little at a time. This gradual wetting will cool the piece at a slower rate. Some stones can't handle the shock of sudden cooling and may fracture if cooled too quickly.

Assay Your Learning 1

At the end of each section of *Mold Making*, you'll be asked to test your understanding of what you've just read by completing an "Assay Your Learning." Writing the answers to these questions will help you review what you've learned so far. Take a few moments to complete *Assay Your Learning 1* now.

1. Why should special care be taken when finishing an original model to be molded?

   _____

2. What is natural gum rubber obtained from?

   _____

3. *True or False?* A higher amount of natural gum rubber makes a mold rubber more expensive.

4. Mold frames are machined from what type of material?

   _____

5. You can apply _____ to the outside edge of a mold to keep the halves in alignment.

Check your answers with those on page 23.

CREATING THE WAX MODEL

Cutting the Mold

Now that you have your vulcanized mold, you must remove the model from the rubber. This is perhaps the most critical step in producing a usable mold. The *cutting lines* you create must allow the injected wax model to be easily removed. You should therefore study the original model before molding it so that you're familiar with its features.

The tools you need to cut the mold are a surgical knife and a metal can opener (Figure 9). Screw the can opener to the edge of the workbench—it will act as a wedge to keep the mold open while you cut. Be extremely careful with the surgical knife. To safeguard against injury, always keep your hands away from the direction in which you're cutting.