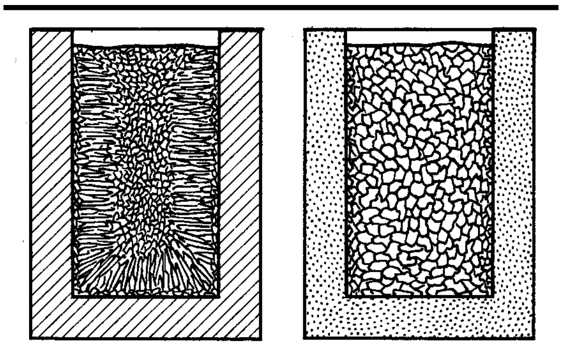

Figure 4.18
Different internal structures resulting from differing mold materials.

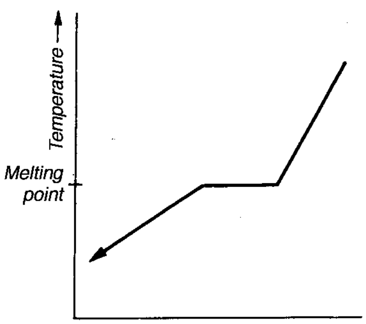

Figure 4.19
The volume change of a metal in relationship to the temperature.

Table 4.12
Volume reduction in pure metals upon freezing.

Metal	Volume Reduction in %
gold	5.03
silver	5.0
copper	4.25
lead	3.38
zinc	4.7
cadmium	4.72
tin	2.9

Rounded edges

Knowing that a cast object will shrink as it solidifies, it comes as no surprise that corners and sharp edges are likely to become rounded as a piece pulls away from the walls of a mold. This problem is less pronounced in centrifugal and vacuum casting, where the process exerts a continuous pressure on the solidifying metal as it cools. In other casting methods, the use of a large button is recommended to maintain pressure on the material. In objects with critical measurements the model should be made slightly oversize so as to allow for this inevitable shrinkage.

Shrinkage cavity formation (porosity)

The transition from randomly-oriented to lattice-oriented crystals that occurs as a metal solidifies can create voids or cavities in an otherwise solid sheet. These are sometimes large enough to be seen with the naked eye and sometimes microscopic; either way they weaken a metal and make a bright finish impossible.

Crystal formation normally begins at the walls of a mold as they conduct heat away and cool the metal. This just-solid metal takes up less room than it did a split second before, so the molten metal can be said to shrink away from it, creeping inward, toward the interior. This is seen in the characteristic funnel shape cavity that occurs in an ingot: the sides are solidified because of the relative cooling effect of the mold, and the top is cooled because of its exposure to air (figure 4.20a). This funnel shaped cavity is exposed to atmosphere and is therefore likely to oxidize.

New crystals form against this first level and grow inward toward the center of the molten mass. After the entire perimeter of the shape has solidified, further shrinkage will create voids and result in a porous structure. As the millions of crystals fall into a tightly packed crystal lattice, each grain is pulled this way or that to find alignment with existing grains. The result is the creation of many small cavities of various sizes (figure 4.20b). If there is molten metal in the area, it will be drawn into these cavities and will form dense metal. Shrinkage cavity formation cannot be completely avoided, but there are methods to limit the damage as much as possible.

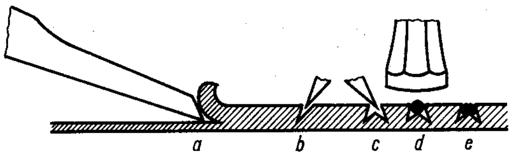

Figure 10.18
Inlay with engraved recesses.
a) raising a bead, side view, b) first cut c) second cut to insert wire, e) inserted wire hammered into place.

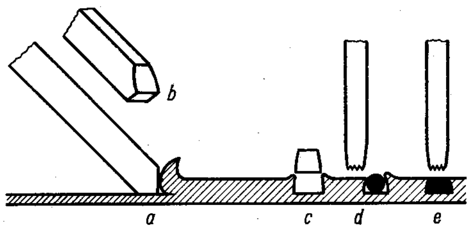

Figure 10.19
Inlay with chiseled groove.
a) chisel cut side view, b) chisel cut,c) chiseled groove, d) tapping down the ridge, e) hammered inlay completed.

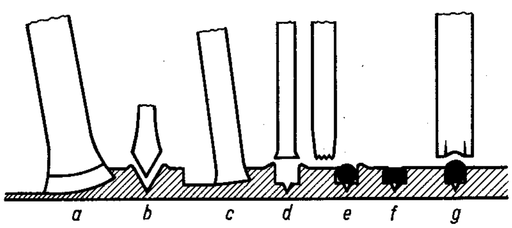

Figure 10.20
Inlay with punched grooves.
a) punch side view, b) incised groove, c) flat punches side view, d) enlarging the channel,e) hitting down the edge, f) finished inlaid wire, g) rounding off the inlaid wire for relief inlay.

the two first fingers and struck lightly with a small hammer. Particularly when first learning, avoid the mistake of gouging out too much at a time.Think of shaving off layers of metal until the proper depth is reached. The cavity should have smooth walls and a flat bottom and attain a uniform depth throughout.

It is usually best to first make the cavity walls straight, focusing on the correct shape for the cut. When this is achieved, use another chisel and go around the inside of the form to undercut the walls slightly. Where small wires are to be inlaid, an alternate method is to use a chisel to pull up a bur along the edge as shown in figure 10.20d.

Using punches

This method is similar to chiseling except that no metal is removed. Because of this it is not recommended for large inlays, though it can be very efficient for small wires. Select a sharp liner that will cast up a bur on both sides of its mark. Use magnification to check the results of the too (figure 10.20b).

Follow the first cut with another punch, this one a flat-ended punch that will widen the groove to accept the inlay (figure 10.20d). Only a small amount of metal is needed to secure the wire but it must stand up above the surface as shown. It is important to select tools of the proper size and strike each blow cleanly so the tiny bur is not accidentally pressed down.

10.3.3 FIXING THE INLAY IN PLACE

Wire inlay into undercuts

Use an annealed wire that is a proper fit for the groove. A wire that is too small will not be securely held while an oversize wire risks distorting the inlay (as well as requiring tedious extra finishing). Start at one end of the groove, tapping the wire lightly into place for a short distance, than proceed to the next area. The idea, seen in figure 10.18d and e, is to press the wire outward into the swallowtail or undercut area, locking it into place. The action has the added advantage of work hardening the inlay.

Once the wire is firmly pressed into place, use a smooth-faced planishing punch to even the surface and refine the inlay. Make a series of light passes over the wire and surrounding area, feathering the surface until it is flush.

In the case of a groove cut with a chisel or punch, in which the edge of the cavity has been thrown up in a delicate bur, the process is a little different.The wire is set into position and a slightly roughened matting punch is used to gather the material immediately adjacent to the groove and press it onto the wire, figure 10.20e. A variation on this is to create a roughened punch with a slight arc in its center, shown at figure 10.20g. This tool spans the wire and presses down on the inlay to lock it in place.Once it is secure, planishing hammers, files and sandpapers are used to make the surface flush.

With the shell in place, scribe a line along the inside wall that follows the irregular contour of the piece. Remove the shell and cut away metal down to this line, using burs, shears and files. Make an inside bezel and slide it into the larger bezel, using the previously trimmed piece as a guide for filing the inner rim.

Make an oval of wire, solder it closed, and planish it out to make a flat rim. In the end, this is the element that will hold the stone from the front. Bend this as necessary to fit closely onto the top lip of the outer (larger) bezel.The detail at figure 12.10b might make the location of this piece more evident.

When all soldering and finishing is complete, the cameo is slid into the setting from the back and the internal bezel used to lock it into place.This tight fitting ring should make a friction fit all around the inside of the primary bezel. It is further held by rivets, engraved stitches, adhesive or tin solder.

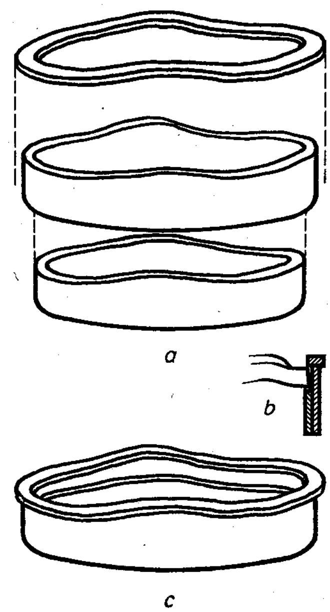

Figure 12.10
Framed setting.
a) separate pieces,
b) wall with inset cameo (side view),
c) finished setting.

12.1.8 PRONG SETTINGS

We might think of a prong setting as an open-backed bezel from which segments have been removed at equal spacing around the rim. The advantage of prongs is that they allow more of the stone to show; in this way a prong setting resemble the way you might hold a coin by its edges to show it to a friend. The disadvantage, not surprisingly, is that the fingers of metal are prone to snag on fabric, and can be bent back more easily than can a bezel.

Variations on prong constructions are as numerous as the shapes in which stones are cut.A few examples are shown in figure. 12.11, but these should be taken as only a glimpse of the many varieties that can be made. And keep in mind that each of these styles could be altered in proportion or metal to create several settings!

As mentioned above for frames, the bearing for a prong setting can either be added on or cut from the material itself. In those cases where an interior bezel is to be added, the upper edge must often be filed at an angle to properly fit the pavilion (underside) of a faceted stone.This situation is illustrated in the upper right corner of figure 12.11.

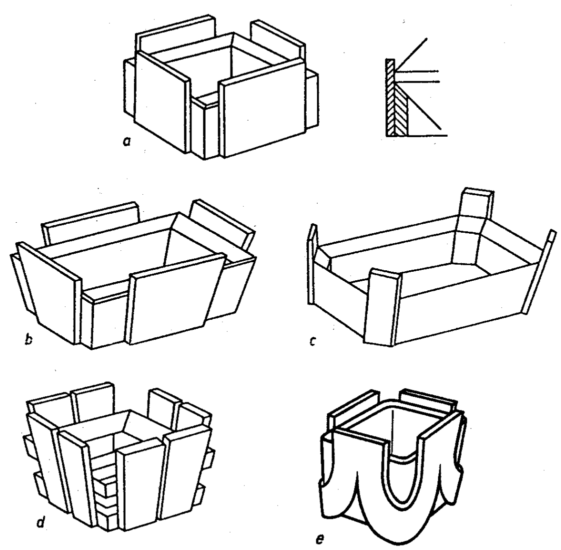

Figure. 12.11
Square prong setting.
a) vertical walled prong setting,b) and c) conical prong setting,
d) conical prong setting with split frame, e) special form of a square prong setting.

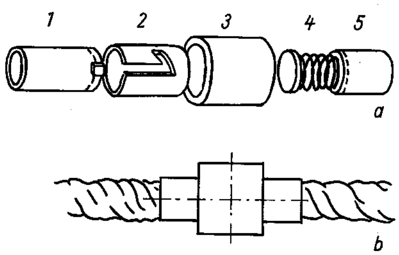

Figure 12.38
Assembly diagram for a hidden bayonet catch.

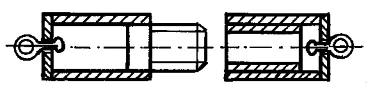

Figure 12.39
Cut-away diagram ofa basic threaded catch.

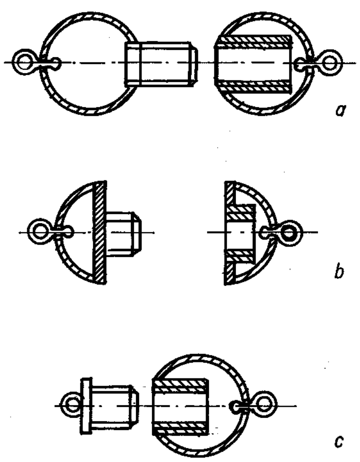

Figure 12.40
Examples ofthreaded catches hidden inside hollow forms.

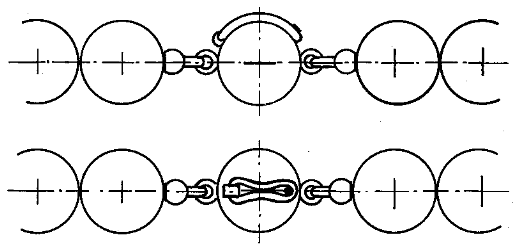

Figure 12.41
Side and top view of a practical but inelegant safety catch.

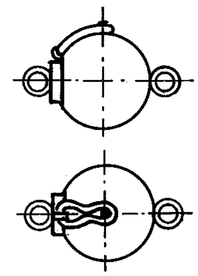

Figure 12.42
Safety catch on a single sphere.

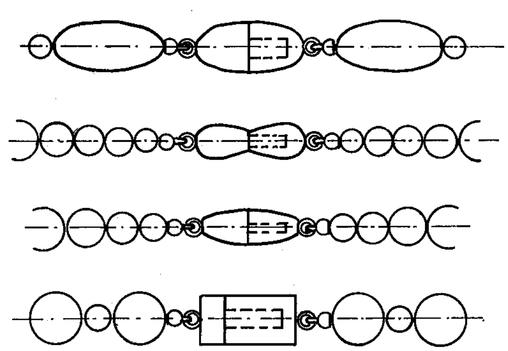

Figure 12.43
Threaded clasps can be designed to blend in to a wide range of shapes.

which a bead has been drawn. This wire will be bent up to make a jump ring and of course is free to rotate independent of the catch. A jump ring connection that was fixed to the catch would cause the necklace to wind up as the catch was being closed.

A thick-walled tube is threaded with a tap and die, cut to the correct length, and soldered into the outer tube. Obviously care must be taken in selecting these tubes to ensure a tight fit. A rod of the correct diameter is selected and tapped with matching threads. When the pieces are confirmed, a short length of the threaded section is sawn off and soldered into the other piece of the catch. It is useful to bevel the tip of the threaded section slightly to make it easier to engage the threads.

Many variations can be worked on the threaded closure, a few of which are seen in figure 12.40. In the first example, two spheres are purchased or made by soldering together two dapped domes. A tube is threaded on its interior walls with a die and a matching rod is cut with threads to make a tight fit. These are then soldered into position as shown at (a).

In the case of 12.40b, a single sphere is made to enclose the catch. One dome is decked and a thread-