Carved Amber Award Medallions

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Summary

The art of carving gemstones in the intaglio technique has been practiced in many places for millennia. As early as the Roman days, such carved gemstones display specific symbols and were used as seals or signets. Amber is relatively soft and can be carved relatively easily to other gems, so it was commonly used for this art. As common as the intaglio technique was, I believe that reverse intaglio may also have been used, though I have not been able to document it.

Some time ago, I bought an amber cabochon carved with a Silver Oak for myself, and another amber cabochon with a Willow for my lady. Recently, I decided to attempt this art myself to provide medallions for awards we have won since then. I carved a Purple Fret for myself, and an Evergreen for my lady, in reverse intaglio. I sand-cast a pair of bronze settings to allow the amber cabochons to be worn as medallions.

While my persona, and therefore my library, focuses on a particular time and place, carved amber medallions such as this could have fit into nearly any time and place. The actual awards reflected on the badges are of the Middle Kingdom. This was my first effort at carving gemstones, and I plan to make more medallions like this in the future.

Historical Documentation

Carved Gemstones

The four gemstones shown to the right are from Ribe, dated to the Roman Age (Jensen 19). These gemstones are carved with seals or signets of various types, and likely made their way to Ribe as trade items.

The patterns carved into them are reverse relief, and thus designed to form an impression in soft material such as wax. These signets are carved in a technique called intaglio (Newman), which could be described as the reverse of relief carving. Intaglio goes back to the ancient Greeks (Newman).

Reverse intaglio is a technique in which a gem is carved as a cabochon, then carved in intaglio on the back side, so that the relief pattern is viewed through the gem. The optics of the cabochon slightly magnify the apparent size of the design. The origin of this art appears to be in some dispute. Newman states that it originated in 1860, but he also states that the Crystal of Lothair, a large intaglio rock crystal carved in the 9th Century for

Lothair II, was probably meant to be viewed from the back of the carving, in which case it too would be reverse intaglio. In any case, I find it highly improbable that artists carved intaglio for hundreds of years and never once noticed how their carving looked from the other side of the gem. Newman also states that reverse intaglio gems were sometimes painted to lend color and realism to the carving.

Amber is well suited to reverse intaglio, because it is transparent. It is also soft and easy to carve, if proper care is taken to account for its brittle nature. Amber has been carved in a wide variety of cultures and time periods, and was especially popular in China (Newman).

Gemstones are small and carving them requires them to be fixed in place. Theophilus describes using chaser's pitch, which is fairly hard when cold but soft when warm, to glue a gemstone to a piece of wood (189). Biringuccio describes a similar use of pitch (388).

Bronze Casting

The archeological evidence for metal casting in medieval Europe is extensive. However, some question remains as to whether medieval craftsmen employed sand casting, or exclusively used fired clay molds. Because the bronze casting is part of the display, not the entry, I will be brief.

Evidence of casting in hard-clay molds is widespread. At the museum in Ribe, I saw hundreds of clay molds that had been pieced back together. These reassembled mold fragments showed that the craftsmen of Ribe could cast metal in many types of tools and jewelry, including brooches. Traces of metal in clay crucibles found there show traces of bronze, brass, lead, silver, and gold (Jensen 31). Furthermore, the mold fragments found in any one location show that craftsmen routinely cast the entire variety of objects, rather than specializing in keys, brooches, and so on (Jensen 33).

The archeological digs at the Coppergate site in York, England, dated to Viking Age, also provide further information about clay casting. These included many crucibles, ingot molds, and cupels (Bayley, 799). The crucibles show evidence of being used to melt all manner of alloys (Bayley 803), including brass, bronze, and silver (Bayley 799). Likewise, a wide variety of copper-alloy items were found in York, including strap-ends, buckles, brooches, and finger-rings (Hall 103-105).

The process of clay casting is, in theory, simple. A "master," or original, is carved from wax, including a wax sprue or gate to pour the metal. This master is carefully packed in clay, which is fired to pour out the melted wax and harden the clay. While the molds are hot, the metal can be melted and poured in. Finally, when the casting has cooled, the clay mold can be broken apart to free the metal item for finishing (Theophilus, 106). Clay mold casting can create nearly any shape including intricate shapes with undercuts, but requires one wax master for each item cast.

The use of the sand casting technique is more difficult to prove, because a mix of fine sand and clay is not recognizable in an archeological dig as a casting component. However, sand casting produces a rougher surface on an unfinished piece than clay mold casting. A sand-cast piece has tiny pits and bumps which, in my own experiments with clay versus sand casting, do not occur with a fired clay mold. Some artifacts show this type of bumpy surface and could, therefore, have been cast in sand. Sand casting is documented by Biringuccio in the 16th Century (324-328), but I have not been able to prove any earlier dates when it was used.

Sand casting is different from clay casting, in that the mold is made from two halves of packed sand, mounted in frames that fit together. One half of the mold is packed and dusted with powder to prevent it from sticking to the master or the other half of the mold. The original is pressed into the mold and dusted again. Then, the second frame is set in place and the second half of the mold is packed down, around the master model. Finally, the two halves are pulled apart to extract the master and cut sprue, gates, and vents. Sand casting can create any shape that does not have undercuts, can make many castings from the same master model, and usually requires more finishing work because of the parting line left between the mold halves. However, the effort of packing the sand can gradually damage the master.

In either case, it is believed that the mold masters were usually made from wax originals, because beeswax was readily available, easy to carve, and has an advantage over wood or bone in that its lack of grain makes detailed carving easier. A copy of the wax master, of clay, lead alloy, or other durable material, was usually made as a basis for future castings (Jensen 33). Such a lead master could be used with clay to mold wax masters for clay molds, or directly in sand-casting.

Finishing

Finishing jewelry consists of shaping, smoothing, and polishing. There were many abrasives available in period, chosen by their availability and relative effectiveness on the material being worked. Theophilus describes the process of shaping with a flat hone (102) or flat sandstone (189). He describes a variety of files (93) and wire brushes (86) for shaping and smoothing harder metals such as brass and bronze. He describes smoothing as done with a piece of oak covered in ground charcoal (102) or fine sand and cloth (152). He describes polishing with a cloth covered in chalk (102) or powdered clay tiles and water (128), or saliva-moistened shale followed by ear wax (115). Biringuccio describes shaping as done with files, smoothing with cane dipped in powdered pumice (366) or sand and water (390), and polishing using tripoli powder (366, 374), or a wheel of copper or lead with powdered gems (122), emery (123), or lime (372).

Materials and Tools

I purchased the amber cabochons, because I did not want to try to cut and polish my own stones until I had some experience with carving them. They had minimal inclusions, which suited my purpose, and the internal fractures within the amber were not large enough to obscure the design.

I used bronze for the setting, because it is affordable, has a beautiful appearance, and has unique properties that make it just as challenging as silver or brass. I purchased the bronze from a jewelry supply outlet, because I lack the knowledge to safely alloy my own bronze.

The tools needed are:

- Carving tools, such as those used for small-scale wood carving
- Block of wood, to attach the amber
- Heat-sensitive glue (i.e. hot glue gun), to hold the amber to the block of wood during carving
- Casting sand, talcum powder, mold frame, and palette knife, to make the casting molds
- Miscellaneous small dowels and wires, for making gates and vents in the mold
- Small dowel and bits of wood, to shape the mold
- Crucible with tongs and a heat source that can keep the crucible at 2000° F
- Fire extinguisher, fire-resistant apron, and safety glasses
- Brass, bronze, pewter, or silver raw material, and flux (boric acid crystals)
- Spoon and/or graphite rod, for stirring molten metal in the crucible
- Oven or kiln, with controllable temperature capable of 300° F
- Wire cutters or jeweler's saw, to remove the sprue and vents
- Files, sanding equipment, and polishing equipment, to file and polish the cast piece
- Dust filter mask, for polishing
- Heavy welding-type insulated gloves, for handling crucible tongs, hot molds, and metal
- Light leather gloves, for holding items while grinding and polishing

Method of Construction

Carving the Amber

Glue the amber to the block of wood, flat side up. I used a hot glue gun, rather than chasing pitch, because it is readily available and less messy. With the point of a knife or skew chisel, score thin lines on the flat side of the cabochon as a guide to where you will carve. These medallions were intended to display specific awards, and therefore the patterns I used were Midrealm awards, the Purple Fret and an evergreen tree (since, at the time, the Order of the Evergreen lacked a registered badge).

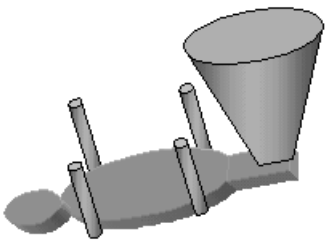
Carving amber bears more resemblance to scraping than to cutting. Amber is brittle and will crack or fracture if subjected to too much pressure. Carve or scrape away only tiny shavings on each cut to avoid cracks and breakage. When you are satisfied with your carving, put it in hot water to soften the glue and peel away the glue from the amber.

To make the patterns more visible, I applied ink to the back. Ink has the advantage over paint because it is translucent and I liked the resulting effect, but I cannot document that this technique was used in period. I planned to mount the amber in a metal setting that would reflect the light back through the gem.

Preparing the Mold

I did not make a wax original, but built the mold by manipulating the sand directly. Put the flat side of the mold frame on the bench, fill it with sand, and pack it down firmly, but not hard. Press the back of the amber cabochon into the mold about 1/2 mm. Wiggle the amber a bit to make the impression slightly larger than the gem. Also, press the end of the dowel where the loop will be to the same depth, and with a toothpick or jeweler's screwdriver put little indents around the edge of the cabochon where the prongs will go.

Then, turn the frame over, powder it, and sprinkle finely crumbled sand half an inch thick. Fill the top frame with sand and pack it down. Separate the halves. In the top half of the mold, tamp the prong indentions and the loop indention back down flat and make the indention of the cabochon deeper and slightly larger. In the bottom half of the mold, enlarge the holes where the prongs will be with a toothpick, jeweler's screwdriver, or similar object, and make the loop deeper. Then, make a gate and sprue channel. The diagram shows the completed casting you are trying to build, though the prongs have been exaggerated slightly for clarity. Put the mold halves together and set the mold up to pour.



Melting and Pouring

Heat the metal in the crucible, using a kiln, oven, or torch. Silver, brass, or bronze should be heated to about 2000° F; it will have a "sheen" on the top and glow orange when the metal is above its "flow" point. Pewter can be heated to about 600° F. Most metals develop an oxide crust on top which you should scrape away. With any metal, it is ready to pour when it reaches "flow" temperature, that is it should be as liquid as water or mercury. If

the temperature is too low, the metal will not flow properly and may not enter all the recesses of the mold. If the metal is too hot, it may oxidize or implode by cooling unevenly. When the metal is at or slightly above flow temperature, pour it into the mold. Pour it all in one smooth motion into the sprue channel, taking only about one second to do so. This also takes practice to do well.

After the visible top of the sprue cools to a darker color, carefully separate the mold halves, take out the casting (it will still be very hot), and tap the sprue on the bench to remove the burned sand. Then, polish the casting a bit to see if the pattern came out well. If it did not, you can melt it down and try again. If it came out well, cut off the vent and sprue with the saw or wire cutters.

Finishing

First, drill the hole through the loop. I used a drill press because it is quicker on metal than my hand drill. Then, shape the casting by removing flash and filing the prongs down to the desired size. I used half-round hand files and a Dremel-size coarse sandpaper drum, held in a drill press, for this process. While the drill press made shaping easier, it did not seem to get the job done any faster than the hand tools. I shaped certain easy-to-reach areas, such as the prongs edges with a 600-grit belt sander in order to speed things along. When you think you are done, test-fit the cabochon into the setting and ensure it goes in smoothly. If it does not, file the inside of the prongs and/or bend them slightly with pliers until the gem fits.

Bronze is fairly hard, so I was able to polish it quite well with a fine wire brush wheel followed by a medium buffing wheel with the black polishing compound. I tried using a succession of the white, black, blue, and green polishing wheels and the result was only slightly better that the wire brush and buffing wheels, though these high-tech polishers are excellent on brass, pewter, and silver. While such polishing wheels are designed for a handpiece or Dremel tool, I use them in my drill press at a slow speed (1100 rpm) which is safer and gives good results.

The final step is the set the gem. Put the cabochon in place and gently bend the prongs to close down over it. Ensure when you are doing this that you do not put pressure on the amber.

Lessons Learned

This was my first project dealing with gems of any sort. While amber is easy to carve compared to other gems, it was still much more brittle than the wood with which I have more experience.

I had originally planned to make the cabochons into pendants by cutting a channel around the base and wrapping them with wire, but after almost cutting myself several times, I decided to cast some settings instead. Because of this change, one of the cabochons has a channel cut partway around its base. Building the cast settings "in the mold" with no original was a new experience for me also, but it worked quite well, and each setting is unique as a result. Each setting is also unique because I broke a drill bit while making them, so one has a larger hole.

It took 30 minutes to carve each gem. Casting each setting took about 30 minutes, and another 30 minutes to finish each setting. The total time for two medallions was 3 hours.

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