

Soapstone Pewter Casting

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The Three Rules of Casting

- ** Hot metal looks just like cold metal **
- ** Hot stone looks just like cold stone **
- ** Avoid horrible foundry accidents **

A (brief) History of Pewter Casting

The earliest pewter that has been found was in an Egyptian tomb dated to 1450 B.C.E. Pewter was used by the Romans and was introduced to Britain in the 2nd century C.E. Significant pewter production did not begin until the 13th century. Many industries sprang up around the casting of pewter badges, plaques and other items that had to do with pilgrimages. Pewter was also used in many household items. In 1474 the London Pewterers “purchased” from King Edward IV a royal charter for the legal control of pewter manufacture – the birth of the Worshipful Company of Pewterers still in existence today.

Soapstone has been used for casting various types of metal since before the Vikings. It was used to cast pewter, lead, bronze and other metals. Soapstone was itself also used to make many items, as it was so easy to carve but held up well to heat. Pots, bowls and lamps are only a few examples.

Materials in Period

Metal

- Lead – Straight lead was used in period. It has a reasonable low melting point (~620°F). Using lead has obvious safety risks that make it undesirable to use now.
- Tin – Used in some casting. Until 1300s the supply came almost exclusively from England so this was rarely found on the mainland. Melting point is 450°F.
- Pewter – Pewter in period is difficult to define. It was often a mixture of lead, tin, and traces of other metals. There have been mainland pewter mixtures found with over 50% lead and some found with no lead at all. For example, Canterbury bells were made with 97% tin, 2% copper and traces of bismuth and antimony. Most pewter mixes did contain lead. Melting points varied with the metal composition ranging from around 350°F to 600°F. The pewter that we are using is mainly tin with some copper and antimony and it has a melting point of about 425 °F.

Mold Materials

- Soapstone – Soapstone, or steatite, is almost entirely composed of talc. Good soapstone is very easy to carve, holds intricate detail and will last through hundreds of castings. Good soapstone should have an even consistency with few inclusions and should not be crystalline. When soapstone is hot it becomes somewhat brittle so care should be taken not to chip it. Soapstone was quarried in Norway and Iceland and has been used by various cultures throughout the middle ages. When carving soapstone, you will generate a lot of dust that you do not want to breathe in. Keep a dust mask handy.
- Cuttlefish Bone – This material is the internal shell of a certain mollusk that is soft enough to carve a good mold and keeps a decent amount of detail. These are only good for a limited number of castings. The material is slightly porous and doesn't leave as good a finish.
- Wood – Wood was used for molds but was obviously quite limited in the number of pours. The molten metal would eventually char the wood.



15th century badge of John Schorn mold

Tools & Equipment Needed

Carving Tools

Carving tools do not necessarily have to be sharp, just hard. Woodcarving tools are a good start. It is best to have more flat and rounded tools than pointy tools. It is easier to get a smooth finish on your mold if you don't have too many sharp edges on your tools, which can leave gouges. Tools for both rough and fine carving will be needed. I recommend a pocket hand drill for dots. Dremels are lovely *for carving the *sprue only**.

Sanding Tools

You will want both the face and the inside of your mold to be very smooth. Uneven spots on the face of the mold can cause the pewter to flow out of the mold. The pewter will catch scratches on the inside the mold to preserve for posterity. Medium grade sandpaper is good for the outside of the mold. Very fine sandpaper (1200 grit) is good for getting that shiny finish inside the mold.

Clamps/Pliers

These are tools that are useful when dealing with the very hot metal and rock. Many casters keep their molds together with one (gloved!) hand and pour the pewter with the other. If you find yourself without an extra hand to do this with, a decent sized clamp will do. Pliers are useful for removing the piece from the mold when it is done.

Melting Metal

You will need a vessel in which to melt your metal. This doesn't have to be terribly fancy but it must have a higher melting point than the pewter. Steel and cast iron are good. A thicker gauge means that the heat will be spread more evenly. You will need a ladle for pouring. You may want to use a pot for the actual melting.

Heat Source

Since the temperature doesn't have to get terribly hot, there are many effective heat sources. A propane torch or burner will work. You can use a pot on a stove. There are also electric casting pots that are both pot and heat source and are very useful for large batches. A campfire can work as a heat source but can obviously be a bit more finicky. I have a nifty setup where a propane burner is hidden inside a large cast iron pot with a hole drilled in the bottom to pass the propane through. A smaller pot is put into the larger pot and the gap is filled with lava rocks. The actual propane is hidden below or off to the sides. Tada! ...a period-looking propane brazier.

Finishing Tools

For finishing the piece you will want metal cutters or dykes to cut off the sprue. Rasps, small files and sandpaper are also good for getting rid of those sharp edges. Dremel tools can be useful here.

Safety Equipment

Don't forget these! Heavy work gloves, eye protection and a dust mask fall into this category. A stone tile is also good for keeping spilled metal from finding its way to you. Wear closed shoes. Long pants are good as well.

Other

Modeling clay or a kneaded eraser is essential for checking your mold. For keeping molds together during storage, you'll want some rubber bands on hand. A felt tip pen is great for marking out your patterns on your stone before you carve. If you have trouble getting your mold to pour, some talc powder (baby powder) tied up in some fabric will be helpful.



15th century Canterbury ampullae mold



15th century Cuttlefish bone mold

Types of Casting

Drop Casting

This is a quick method of casting where you pour directly onto the mold. Only one piece of stone is needed. The stone doesn't need to be so perfectly flat. The disadvantages to this method are that the back of your piece will not look very finished, and this method often uses extra pewter because the metal can fill up past the top of the stone. This method requires that the piece be carved in reverse (right is left and up is down).

Two-sided Casting

This type of casting uses two pieces of stone, sanded flat, put together. The metal is poured from a side seam through a funnel called a sprue. This creates a much more finished product than the drop casting. Two-sided casting can have a carving on one side with just a flat back or be carved on both sides. If carving both sides of the mold, it is best to register (see below) the mold so that the pieces come together the same way each time. This method requires that the piece be carved in reverse.

Multi-part Casting

Multi-part casting uses multiple pieces of stone, sanded flat, put together. This type of mold is used for more three-dimensional objects like buttons or belt plaques. The metal is poured from a side seam through two or more upper pieces of stone. Sometimes multiple sprues are needed to fill the entire mold. Multi-part molds must be registered so that the pieces come together the same way each time. This method requires that the piece be carved in reverse.



Multiple trinket mold

Preparing the Soapstone for a two-sided mold

Slabbing Stone

The width of the slab depends on the piece desired. For most pieces, 1" will be fine. That gives plenty of room for carving and also some room for sanding down mistakes. Soapstone can be cut easily with a hacksaw. A table saw or other power saw can also be used. Whenever using power tools on soapstone, you should use a dust mask and eye protection. All cutting should be done outside. The only way to deal with the dust is to water it down.

Cutting Stone to Final Size

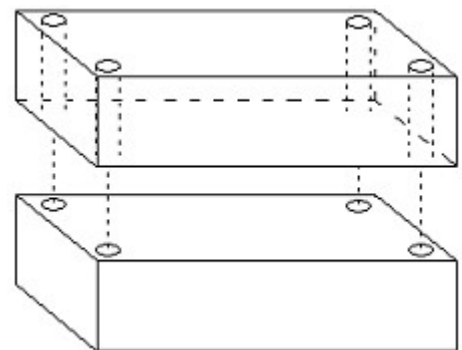
A 3"x3" piece of soapstone is a good size for most projects. Pieces that are much bigger get unwieldy. Obviously a bigger piece will be needed if you have a large project.

Sanding Smooth

For two or more part molds you will want the faces of your stone sanded smooth. Medium grain sandpaper will do the trick. Lay it on a flat surface and run the rock over it (rather than running it over the rock). This will avoid rounding the corners. I have a diamond sanding wheel that will work wonders on the stone's face. A power sander will also do the job. Sand outside and use a dust mask.

Registering the Mold

Registration is used to get the mold pieces to line up the same way each time. Use a drill press to drill straight down through one piece of mold and slightly into the next piece. Drill the hole only a bit at a time, blowing it out each time. The soapstone can crystallize during this process and cause the stone to crack. Once your holes are drilled, line up the holes (this doesn't have to be perfect) and pour lead in each hole. (Lead is used because it has a higher melting point. I use pewter also.) This will leave a pin through the stone with a nub on the end that fits perfectly into the hole in the other piece.



Mold Layout

Spacing

Make sure to leave at least $\frac{1}{4}$ " between the edge of your mold design and the edge of the soapstone or any other design. You will also want $\frac{3}{4}$ " left at the top to carve your sprue.

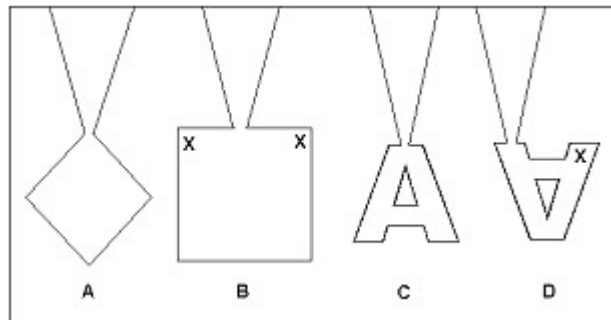
Sprue

The funnel used in multi-part molds to get the molten metal to the design is called a sprue. The sprue serves three purposes:

- It directs the metal into the mold.
- It provides a weight on top of the mold to compress the pewter and get better detail.
- As pewter cools, it contracts. The sprue provides a reservoir of extra pewter to pull from as this happens.

Mold Orientation

Your design should be laid out such that metal can flow down and sometimes sideways to fill the mold... **never** up (the X in the illustration). For multi-part molds, more than one sprue can be used if needed. You should also leave an exit path for the air that the metal will be displacing.



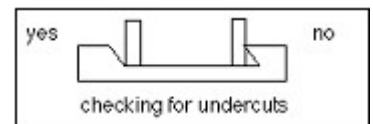
Carving out Design

Backwards!!!

When carving a mold remember that **left is right** and **up is down**. You should carve your design as the inverse of what you would like to see. Designs should face the opposite direction and lettering will need to be backwards! Also the lowest part of your mold will be the highest part of your casting.

No Undercuts

Make sure to avoid undercuts, where the cut at the surface is smaller than the cut farther down. The metal will flow into this area but once cool will not come out! You will have to break your mold to get it out.



Rough out blank, and then put in details.

Do not carve details right on the surface of the stone. There will need to be room for the metal to flow. Take care when carving out the blank that you do not gouge out too deeply. Even small scratches will shine through in the product. You can always take away more stone. It is difficult to add it back. To check the depth of your blank, you can use the modeling clay. I like to put a coin of the preferred thickness into the blank and move it around. Feel how it compares to the edges of the blank. You can also feel as you are moving it around when you go over high spots in the mold. Once you have the blank finished, smooth out the surface using rounded tools and fine sandpaper.

Working the Design

Now is a good time to draw out your design with that felt tipped pen. Double check that it is backwards! Work across your design adding depth first. Your design will be easier to see on the finished product if it sticks out a bit. Choose the right tool for the design. Often a rounded tool will be more appropriate than a pointed one. Remember – Speed Kills! Use the modeling clay often to see how your mold is looking. It is very difficult to tell just by looking at the stone. A hint on eyes: the eye should be carved as shallower as the head so that the eye on the cast piece is recessed from the head.

It's All in the Details ¹

With your basic design carved into your mold, your piece is looking nice. But sometimes the difference between nice and "really cool" is in the little stuff. Edging, detail lines and dots, lettering and diapering (background patterns) can make a major change to the impression your piece makes.



Here are two examples of the differences between the basic piece and the detailed piece.

Edging

Often putting a thin line around the perimeter of the object can give it a more finished look. This can be a rounded "hump" right on the edge (which has the added benefit of hiding irregularities in the edges of the blank) or it can be a finer line parallel to the edge.

The rounded hump type edging can be easily carved with a pointed, but dull, tool like a slightly rounded nail.

The parallel edging line is basically just detail lining.

Detail Lines

Detail lines, such as the center lines on the fleur de lys, or the strings on the harp, in the examples above, can be easily added with and sharp tool. These lines do not need to be very wide or deep. Even a fine line shows quite nicely. Start with a very fine line then pass back over the same line several times to achieve the width and depth you desire.

For curved line use a round tool such as a needle or ice pick. An edge tool such as an Exacto blade can be difficult to turn smoothly to follow such a line.

For straight lines, don't be afraid to use a ruler as a guide. Even though the ruler can't sit flush with the bottom of the mold, it can still make a much straighter line possible with a bit of care.

Dots

Small dots are wonderfully period. Many period badges make heavy use of them and some use them almost exclusively. They are quite easy and can add a lot of dimension to your work. They can be used in a solid row around the perimeter of a piece to create a fancy beaded look. They can add texture in your design as well.

Take any rounded object and hold it in place while spinning it between your fingers is all that is needed. A pocket hand drill is perfect for this!

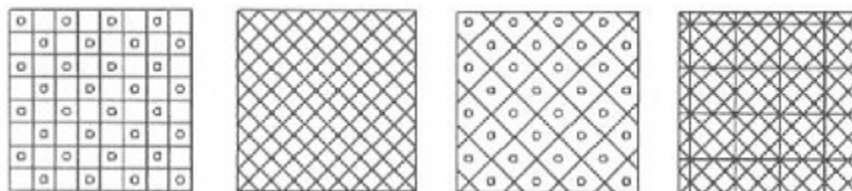
Lettering

Lettering as in the medallion on the right above is basically a series of small detail lines. However, you must remember to carve the mirror image if you wish the cast object to be legible. If you can read your mold, the finished piece will be backwards.

One way of making this easier on yourself is to write the words you want on a piece of paper with a sharpie and flip the paper upside down and use this as your guide. I also like to lay out my design using my computer and can print the inverse of the page.

Diapering

Diapering is a pattern used in the background such as on the medallion on the right above. These can be any pattern. Geometrical patterns using detail lines and dots are common. Here are a few examples:



¹ This section taken with permission nearly directly from Conde Fernando's notes with thanks!

Preparing Mold for Casting

Sprue

Now is the time to carve that sprue. This funnel can be pretty rough cut since it will be cut off and reused. The sprue should be $\frac{1}{2}$ " to $\frac{3}{4}$ " wide at the top and about $\frac{1}{2}$ " deep and should taper down and barely penetrate the design. You can always make it bigger later. Because carving the sprue involves larger chunks of rock, now is a good time for eye protection before you start launching rock splinters at yourself. (Trust me on this!)

Air Vents

When pouring in the metal, the air that was previously using the space will need to escape. Much of it will go back up the sprue. You may find some areas do not fill well and trapped air may be a culprit. Carving an air vent is as simple as a deep scratch going from that spot of the mold outward and upward to the edge of the stone. Pretty much carve these all over the place.

Final Check for Undercuts

Now, before pouring the metal, is a good to give your mold a last going over for undercuts. Check your sprue too.

Casting

SAFETY!!!!

See the three rules on the first page. Here is where they come into play. This metal isn't hot enough to kill you. Just to make you wish it had. But this is an activity that can be safe if you are aware of what you are doing.

First make absolutely certain that your mold is **bone dry**. If there is any moisture in your mold, when you pour the molten metal in, that moisture will expand and turn into steam, forcing the molten metal out of the mold in a volcano-like action. This is unpleasant and I do not recommend it. One way to be certain that the mold is dry is to preheat it in an oven. Passing a blowtorch flame over it once or twice will also do the trick. If you leave your mold for any period of time, water can have condensed on it and I would repeat the procedure. If you make any changes in the design, repeat the process (when you blow off the dust, trust me that you are also spitting on the rock!).

Touch everything as though it is hot.

Use gloves to touch anything that you are uncertain of. The only thing that you can be sure is hot is the molten metal.

Heat up your pewter until it is all melted. You will get a feel for what the metal looks like when it is ready to pour. You can overheat your metal. The hotter the metal is, the more likely it is to oxidize. This is the black or oily looking film on top. When your dregs are looking very oxidized, you can carefully pour out the last drops of good pewter and then tap the dregs out off to the side.

If you have a complicated piece, a light coating with **baby powder** will decrease the surface tension of the poured metal and allow it to travel further into your mold.

When Pouring

Use your gloved hand or a clamp to keep the molds together. The metal can force the sides of the mold apart and make a mess. As soon as the metal has solidified (only a couple of seconds), take the mold apart and let the piece fall out or remove it with pliers if it needs some encouragement. Let the piece cool.

Once the piece(s) are cool, **cut off the sprue** and any other excess metal. These parts can be melted and reused along with any failed pours. The piece can be finished further using sandpaper and rasps to remove excess and sharp edges. The filings can be reused but tend to produce more sparks. You may choose to wear eye protection while pouring. My experience, though, is that the metal is much more likely to target your hands.

Both casting and finishing your pieces use **highly repetitive motions**. Make sure that you are not cramped or strained doing this. Just like any other repetitive actions, doing it wrong can lead to problems like carpal tunnel or tennis elbow (my favorite!). Take a break every so often.

Having trouble?

Having trouble getting certain parts of your mold to fill? You may wish to try carving that portion of the mold a little deeper, adding air vents to that section and checking to make sure that you are not asking the pewter to defy gravity. If none of these things work, another thing to try is to have some baby powder inside a ball of fabric. Hit the ball against the rock until the powder starts coming out onto the stone. This will help break the surface tension of the pewter to let it travel farther.

Examples



*St. Thomas
Pilgrim Badge -
15th Century*



*Becket Returns from Exile
Canterbury Pilgrim Badge - 14th Century*



*Becket's Murder Weapon
Pilgrim Badge - 15th Century*



*Monogram of Maria Badge
(or possibly lovers token as
there is no crown)
14th-15th century*



*Annunciation Scene Badge
Walsingham Priory*



*Fleur-de-lys badge
from Walsingham?
mid 15th century*



*St. Guilhem le Desert plaque
12th century*



Dolphin Badge



*Falconry Badge
14th century*

Where to Get Supplies:

Cast Iron Ladle or Lee Ladle

Stamina Quality Components - <http://www.staminainc.com>
Luremaking - <http://www.luremaking.com>

Casting Pot (Hot Pot)

I recommend the Lee Production Pot IV or the Hot Pot 2
Stamina Quality Components - <http://www.staminainc.com>
Bass Pro - <http://www.basspro.com/>
Cabelas - <http://www.cabelas.com>

Blow Torch

Harbor Freight

Soapstone

Lee Valley & Veritas - <http://www.leevalley.com/>

Pewter

Home Depot (lead free solid core solder)
Rotometals - <http://www.rotometals.com>

Carving tools

Harbor Freight
Hobby shops
Art Supply stores
Pocket Hand Drill – www.hobbylinc.com

Sanding & Finishing Tools, Clamps, Gloves, Safety Glasses, Dust Mask, Stone Tiles, etc, etc

Harbor Freight
Home Depot

Modeling Clay

Art Supply Store

Recommended Reading

Egan, Geoff. Dress Accessories: c.1150 - c.1450. Stationery Office Books. London. 1996. ISBN 0-11-290444-0.

H.J.E. van Beuningen & A.M. Koldewey, Heilig en Profaan. 1000 laat-middeleeuwse insignes uit de collectie H.J.E. van Beuningen, Rotterdam Papers 8. Cothen. 1993. ISBN 90-9006769-8.

H.J.E. van Beuningen, A.M. Koldewey & D. Kicken, Heilig en Profaan 2. 1200 laatmiddeleeuwse insignes uit openbare en particuliere collecties, Rotterdam Papers 12. Cothen. 2001. ISBN 90-9014881-7.

Kunera. 27 April 2009. <<http://www.kunera.nl/Kunerapage.aspx>>.

Mitchiner, Michael. Medieval Pilgrim and Secular Badges. Sanderstead: Hawkins Publications. 1986. ISBN: 0904173194.

Spencer, Brian. Pilgrim Souvenirs and Secular Badges (Medieval Finds from Excavations in London) TSO. c1998. ISBN: 0112905749.

Spencer, Brian. Salisbury Museum Medieval Catalogue. Pt.2. Salisbury. Salisbury and South Wiltshire Museum. 1990. ISBN: 0947535128.

Virtual Museum of the Strong Collection. http://talbotsfineaccessories.com/cgi-bin/Strong_Collection.cgi